Effects of Teaching Materials on the Development of Receptive Identification Skills for Students with Autism

Jennifer Parra
California State University, Monterey Bay

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Effects of Teaching Materials on the Development of Receptive Identification Skills for Students with Autism

Jennifer Parra

Action Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Masters in Arts in Education

California State University, Monterey Bay

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Effects of Teaching Materials on the Development of Receptive Identification Skills for Students with Autism

By: Jennifer Parra

APPROVED BY THE GRADUATE ADVISORY COMMITTEE

Dr. Josh Harrower, Thesis Advisor, Master of Arts in Education

Dr. Lou Denti, Coordinator, Master of Arts in Education

Digitally signed by Dr. Kris Roney
Date: 2015.06.20 08:45:33 -08'00'

Dr. Kris Roney, Ph.D. Associate Vice President
For Academic Programs and Dean of Undergraduate & Graduate Studies
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Abstract

Research examining the teaching of receptive language acquisition often does not specify or give examples of the teaching materials used. Given that students with autism need highly structured learning opportunities to acquire new skills, specific parameters should be formulated to guide teachers in their development of teaching materials that facilitate learning and generalization that is not confounded by extra stimulus information that may serve as a cue for the learner that is not under the scope of the original target receptive identification task. An investigation of the difference between acquisition rates of receptive labels between subjects who have experienced different interventions was conducted in order to determine whether sets of picture cards, one that contains no additional stimuli, or one that does, facilitates quicker acquisition. An alternating treatment, multiple baseline design across individuals (Kennedy, 2004) with three subjects was conducted. The systematic control over the interventions implemented should allow for valid cause and effect conclusions.
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CHAPTER 1: PROBLEM STATEMENT

Introduction

Different methodologies are used for teaching receptive language skills. Whatever method is used to increase a student’s receptive vocabulary, teachers must make decisions regarding what materials to use when teaching new labels. However, there is limited research pertaining to what materials are effective for teaching receptive language acquisition to students on the autism spectrum. An alternating treatment, multiple baseline design was used to determine whether using materials with no additional stimuli is more effective in aiding students to attain generalization than using materials that have additional stimuli. If a student has learned a target word by attending to an incorrect stimulus in the teaching materials, the student has not learned the receptive language skill targeted. The student will likely have challenges generalizing the skill outside the original stimulus without further teaching. Development of teaching materials that facilitate learning and generalization that is not confounded by extra stimulus information could ensure that students are not incorrectly assigning a word to the incorrect attribute of the image. For example, if a teacher is targeting receptive identification of emotions and three example targets are; happy, sad, and angry. The materials that the hypothetical teacher selects are; happy: young boy smiling with a red hat, sad: girl crying with glasses, angry: older man with a furrowed brow and a beard. The student may attribute ‘happy’ to people with hats, ‘sad’ to people with glasses and ‘angry’ to people with beards. If the teacher had made her own materials using the same person with the same clothes and background, then the only feature that the student would have to cue them to happy, sad, and angry would be the person’s facial expression, which is the goal of presenting the student with the content.
Problem Statement

Program materials, mainly those used during receptive identification, expressive identification, matching, etc., often contain additional cues that a student can incorrectly reference and assign to an irrelevant feature of the image. After looking through previous research there appears to be a lack of documentation and training associated with the development of teaching materials for receptive identification tasks. For students with severe disabilities, often the language level of the student does not match the chronological age. Given a student’s language delay, directions that are presented concisely, clearly, and using consistent language, sets the student up for successful responding. By developing teaching materials that are also clear and concise, the students may also benefit by increasing their success pertaining to receptive language. Dube (2010) examined the limitations of controlling stimuli or stimulus features based on an observable response; eye gaze and head movements. The research assessed whether an individual has observed all of the relevant stimuli to determine if the challenge is related to attending, or if the individual has not observed all of the relevant stimuli.

Students with developmental disabilities generally require very structured and systematic interventions in order to acquire new skills and language. A part of those systematic interventions generally include many presentations of the teaching materials. If the teaching materials chosen have cues that are misleading then the materials aren’t serving the student. If the duration it takes the student to acquire a label is lengthy then the likelihood of the student being able to generalize the skill is low, so teaching the label no longer becomes functional. Therefore, there is a need to develop a better understanding of how to develop teaching materials that will most benefit the students. If the student can generalize a skill they can use it
functionally and independently, which is ultimately what gives the student more access to their community and daily living.

**Statement of Purpose**

The goal of this research is to determine whether developing teaching materials (e.g. pictures) without extra stimuli decreases the trials to criteria when learning new receptive labels. In addition, whether initially selecting or developing images that have only the most salient feature presented, reduces the amount of time it takes to reach generalization across several stimuli. Students who are young and have a severe disability often require numerous teaching trials to acquire new receptive language. Receptive language is the language we hear and understand, therefore, it is imperative for the students to have a strong foundational receptive vocabulary in order to begin to function independently in their environment. Selection of appropriate teaching materials for receptive identification tasks can be challenging. If there is a way to decrease the amount of time it takes for this vocabulary to be bolstered, it will give the students more opportunities to learn more complex language and have more time to teach additional important skills.

**Researcher Background**

I have been working at a non-public, non-profit school for students with autism and related disabilities since 2010. The educational and treatment approach used at the school is based on the principles of applied behavior analysis (ABA), a methodology that applies principles of behavior to learning. The mission of the school is to provide scientifically based educational and clinical services to produce measurable and lasting improvements in the lives of the students and families we serve. Teaching programs are developed based on each student’s educational and behavioral needs. Individualized educational plans are designed for each student
with annual objectives and measurable outcomes. Objectives emphasize the development of language skills, academic skills, social skills, leisure skills, and self-help and safety skills. Student's progress is closely monitored by detailed data collection.

**Theoretical Model**

Applied behavior analysis (ABA) is a scientific approach for discovering environmental variables that reliably influence socially significant behavior and for developing a technology of behavior changes that takes practical advantage of those discoveries (Cooper, Heron, & Heward, 2007). The interventions developed under and ABA model aim to improve the behaviors under study while demonstrating a reliable relationship between the intervention and behavioral improvements. An ABA model employs the methods of scientific inquiry, which include: objective description, quantification, and controlled experimentation.

In 1938 B.F. Skinner’s *The Behavior of Organisms* (1938/1966) was published and the experimental aspects of behavior analysis formally began. From the descriptions of Skinner’s laboratory research, two perceptions of behavior were described: respondent and operant (Cooper, Heron, & Heward, 2007). Respondent behavior is reflexive and is a biological process that occurs involuntary to the person and occurs whenever an eliciting stimulus is presented (e.g. getting scared increases heart rate). In contrast to reflexive behavior, which has clear eliciting events, is operant behavior. Operant behavior often appears to be emitted by an organism voluntarily. Operant behaviors are not elicited by preceding stimuli, but are influenced by stimulus changes that have occurred post-behavior previously. Skinner completed experiments that have made fundamental contributions to the analysis of the effects of consequences on behavior. The systematic manipulation of the arrangements of stimuli that precede and follow behavior has become the cornerstone of behavior analysis. Skinner’s investigative procedures
produce clear, reliable, functional relationships behavior and various types of environmental events (Cooper, Heron, & Heward, 2007).

Applied Behavior Analysis is the science in which tactics derived from the principles of behavior are applied systematically to improve socially significant behavior and experimentation is used to identify the variables responsible for behavior change. ABA is concerned with the improvement and understanding of human behavior (Cooper, Heron, & Heward, 2007). The principles of Applied Behavior Analysis informs the following research because the research bellow aims to clearly identify variables that effect acquisition of a socially significant behavior.

**Research Questions**

This research will attempt to answer the following questions:

1) Which of two sets of instructional materials results in quicker acquisition of receptive identification tasks: picture cards with or without extraneous stimuli?

2) What is the effect on a student’s ability to generalize a learned receptive label to novel stimuli (e.g., 3-D representation, other 2-D pictorial representation) when initial teaching materials are uniform without additional cues for the student to incorrectly identify as the targeted response?

**Definition of Terms**

- **Alternating Treatments Design:** Alternating treatments design is a stimulus treatment design, where the different conditions are administered in an alternating fashion. The different conditions are administered in the same phase, usually on the same day. The interventions are administered under the different stimulus conditions, and are administered an equal number of times across each condition of administration so that the interventions are not uniquely associated with a particular stimulus.
• **Applied Behavior Analysis:** The science in which tactic derived from the principles of behavior are applied to improve socially significant behavior and experimentation is used to identify the variables responsible for the improvement in behavior (Cooper, Heron, & Heward, 2007)

• **Expressive Language:** Expressive language skills encompass the many ways of conveying a message. Expressive language skills include learning the forms of language, such as verb forms, plural endings, and how to use pronouns, as well as the content of language, which leads to an event being related clearly and appropriately.

• **Generalization:** Any measurement of a learner’s performance of a target behavior in a setting and/or stimulus situation in which direct training has not been provided.

• **Multiple Baseline Design:** An Experimental design that begins with concurrent measurement of two or more subjects in a baseline condition, followed by the application of the treatment variable to one of the subjects while the baseline condition remains in effect for the other subjects. After the maximum change has been noted in the first subject, the treatment variable is applied in sequential fashion to each of the other subjects in the design. Experimental control is demonstrated if each subject shows similar changes when, and only when, the treatment variable is introduced (Kennedy, 2005)

• **Operant Behavior:** Behavior whose future frequency is determined primarily by its history of consequences. Operant behavior is selected, shaped, and maintained by the consequences that have followed it in the past.

• **Receptive Language:** Receptive language means the ability to understand or comprehend language heard or read. Ex: from a field being given the direction, “Hand
me the pencil”, and the student scanning the field and identifying the pencil based on the label presented.

- **Respondent Behavior**: Behavior that is elicited by antecedent stimuli. Respondent behavior is induced, brought out, by a stimulus that precedes the behavior; nothing else is required for the response to occur.

- **Stimulus**: An object or event that evokes a specific functional reaction in an organ or tissue. In this case what attribute of an image that makes the brain attend to a word and have the body complete a response.

- **Trials to Criterion**: A special form of recording; a measure of the number of responses or practice opportunities needed for a person to achieve a pre-established level of accuracy or proficiency.

**Summary**

Chapter one provided an overview of the purpose of this study on implementing an alternating treatments design with two conditions; materials with additional stimuli and martials with no additional stimuli. The following chapter will provide the literature that related to teaching receptive identification methods and how fields of vision and arrays can affect development of skills.
CHAPTER 2: REVIEW OF LITERATURE

Introduction

This literature review provides a context for the research topic discussed in this thesis, which examines which of two sets of instructional materials results in quicker acquisition of receptive identification tasks: picture cards with or without extraneous stimuli. Additionally, if there is an effect on a student’s ability to generalize a learned receptive label to novel stimuli (e.g., 3-D representation, other 2-D pictorial representation) when initial teaching materials are uniform without additional cues for the student to incorrectly identify as the targeted response.

Different methodologies are used for teaching initial receptive language (Kurt, 2011; Schreibman, 1975; Touchette & Howard, 1984). However, there is limited research pertaining to what methodologies are effective for teaching receptive language acquisition to students on the autism spectrum (Kurt, 2011). Whatever method is used to increase a student’s receptive vocabulary, teachers must make a decision pertaining to what materials to use when teaching new labels (Brady & Smouse, 1978; Dittlinger & Lerman, 2011). Educational settings which are comprised of students with moderate to severe disabilities face challenges when teaching receptive identification targets and generalizing those targets to novel stimuli after the initial stimulus has been learned. Program materials often contain additional cues that a student can reference and attribute incorrect features to the given verbal direction paired with a pictorial representation (Dube et al., 2010; Kinlock, McEwan, Foster, 2013). If a student has learned a target by attending to an incorrect stimulus within the teaching material, the student has likely not learned the receptive vocabulary targeted and will not have the skill to generalize to novel stimuli (Blackledge, 2003; Kinlock, McEwan, Foster, 2013). If instructional materials are developed without extraneous stimuli, students may acquire that new receptive label more
quickly than if the student was presented with materials that had extraneous information within the image.

Documentation regarding specific materials used when teaching students using pictorial representations, is often lacking (Gilles, 1980). Given the lack of documentation pertaining to what materials are being used during instruction or during research, it is unclear whether stimuli used to teach vocabulary are appropriate for functional acquisition (Quill, 1997).

Within the ambiguity of the effectiveness of teaching materials, is the uncertainty of which teaching materials are optimum for the human eye to examine. Guidelines should be developed in order to generate teaching materials that facilitate learning and generalization that is not confounded by extra stimulus information that may serve as a cue for the learner that is not under the scope of the original target identification task. If a student is initially presented with teaching materials that are devoid of additional cues will the student’s ability to generalize a learned receptive label to novel stimuli (e.g., 3-D representation, other 2-D pictorial representation) be increased? When initial teaching materials are uniform and additional cues are removed from each image incorrect attribution to irrelevant features can be reduced.

Within the following literature review, previous research pertaining to different teaching strategies and how the acquisition rate for the student was affected based on how verbal directions were presented and how the array of a field of targets was set up. The information delineated from this research gives credence to the fact that there are additional confounding factors that need to be taken into account when presenting students with a direction associated with teaching stimuli. After teaching strategies are discussed, the ways in which control can be established over stimuli that is presented to students. In addition to maintaining consistency and control over the presentation of stimuli, the effects of certain additional information
presented with directions will be discussed. Determining whether additional cues are effective in helping students learn new skills will be addressed. Then there will be a short discussion pertaining to how biologically the eye reacts to certain stimuli, and how much the eye can process when presented with visual stimuli.

**Teaching Strategies/Methodologies**

There is a narrow scope of research related to receptive language development in students with autism (Kurt, 2011). Discrete trial training is one of the most common methodologies used to teach receptive language. Kurt (2011) assessed two different discrete trial training procedures; one of which was the standard method of discrete trial training and the other was the standard method paired with visual supports based on gestures and sign language. The two different strategies were used on two different male students with autism whom previously had challenges gaining functional receptive vocabulary. After baseline was taken for the selected targets a series of trials were conducted for each condition. The conditions were comprised of discrete trials training sessions with visual supports based on gestures and signs and discrete trail training sessions carried out with verbal instruction only. An error-less learning methodology using physical prompts with graduated guidance was used during instruction until criteria for mastery of each target was reached. Maintenance data was taken three and ten weeks after mastery. The results concluded that both students did not reach mastery criteria as quickly in the verbal only training session condition as they did in the sessions paired with visual supports. Maintenance was also successful at a higher percentage for the discrete trial training sessions that were paired with visual supports. These findings indicate that in some cases there needs to be additional care when presenting visual stimuli that will support the student’s success when attending to pictorial representations.
Within discrete trial training there are also differing procedures that can be carried out. Grow (2011) discussed faulty stimulus control that could be present in simple-conditional or conditional-only methods of discrete trial training when teaching receptive identification. The simple-conditional method involves simple discrimination tasks in which a teacher increases the level of difficulty of discrimination after criteria is reached at the lower level of discrimination. The conditional-only method teaches several stimuli in one field, resulting in less position bias, or extra-stimulus bias.

The experiment was conducted on three children diagnosed with autism that had a fluent matching repertoire, accepted physical prompts, and had receptive identification goals specified in their IEPs. Baseline probes were taken to teach the participants how to respond during the teaching procedures and to become familiar with the type of stimuli that would be presented. Trials were run using both the simple conditional and conditional-only methods to determine which method was more effective and if one method was prone to specific error patterns. During the simple conditional method, a series of nine steps were carried out starting with discrimination training across three stimuli in the set, where only one target was taught at a time. Initial discrimination focused on the student discriminating the target from stimuli meant to distract. Subsequent difficulty in discrimination was introduced as the student showed mastery of a presented field. After the field contained all three targets, position bias was accounted for by switching the placement of each of the targets. The conditional-only method skips discrimination to non-targets and teaches all three targets at one time.

The findings indicated that the conditional-only method had more success in relation to acquisitions of the targets, had quicker target acquisition, and was less prone to error patterns than the simple-conditional method. This is an indication that presenting stimuli in a field in which
the student is required to effectively scan a field is a strategy that can effectively decrease errors and, in effect, decrease the latency of receptive label accretion.

**Stimulus Control**

After finding a teaching procedure that is effective, and promotes quick attainment of skills and generalization, the orientation of the materials and the requirements for complete attendance to the images should be assessed. Kinlcoh (2013) assessed several factors encompassed in teaching matching skills. Two different methodologies were used; matching-to-sample and stimulus-pairing. Matching to sample entails, an instructor prompting the response and the student responding. The instructor then delivers verbal praise, a correction, or no response depending on the response of the student. Alternately, the stimulus-pairing procedure is used by an instructor modeling the matching response several times prior to allowing the student to try independently.

In addition to the two different teaching procedures, two other parameters assessed were, matching from a field of one to many, and matching from a field of many to one. The populations that were used for the experiment were neuro-typical undergraduate students. Participants were seated at a computer in a room devoid of distractions and presented with nonsense syllables in black font on a white background. The participants were split up into test groups based on matching-to-sample teaching procedures and stimulus-pairing teaching procedures. Different participants were also presented with different orientations for their matching tasks within the two types of teaching procedures. The orientations for matching included; linear, many-to-one, or one-to-many. The findings concluded that in both stimulus-pairing and matching-to-sample procedures, there was quicker acquisition when matching from a field of one to many. These findings indicate that it is imperative to be consistent when
presenting teaching trials and the orientations of materials has a marked effect on acquisition of skills.

dube (2010) examined the limitations of controlling stimuli or stimulus features based on an observable response, eye gaze and head movements. the experiment used a group of neurotypical individuals and a group of individuals with an intellectual disability that were able to perform matching-to sample tasks. a color touch sensitive computer screen, an automatic token dispenser, and a hidden eye tracking apparatus were used consistently across all teaching sessions. teaching sessions were comprised of two black symbols displayed on a white screen initially, the subject would touch one of the symbols and they would disappear, then three symbols, one of which was identical to the initial one selected, and the subject was required to select the matching symbol. all subjects received feedback to whether they selected correctly and were reinforced with tokens for correct responding, which they could trade in at the end of the session. the research assessed whether an individual had observed all of the relevant stimuli to determine if the challenge was related to attending, or if the individual has not observed all of the relevant stimuli. the results relating to accuracy and observing durations showed a tendency for higher accuracy following longer observing durations. the findings raise questions whether incomplete observations result in the variability in responding in individuals with an intellectual disability. this is important because it establishes a baseline of how much extra stimulus information is appropriate for quickest acquisition of targeted visuals.

extra stimuli

from the information above, it is apparent that certain types of prompts that are supposed to be useful to the student to acquire a skill can potentially be harmful to the student’s ability to learn or generalize a skill. supplementary stimuli can overshadow a student’s ability to use
deductive reasoning to learn a new skill (Dittlinger, 2011). Dittlinger (2011) conducted research to determine whether the reason that pairing pictures with the associated word slows sight word acquisition is due to a previously learned association between the spoken work and the picture or due to the presence of the picture as an extra stimulus prompt.

The experiment was conducted on three children diagnosed with autism and they were all assessed to the experiment to determine previously learned targets. There were four conditions in this experiment; the word-only (unknown picture) condition, the instructor presented words without corresponding pictures, the word-only (known picture) condition, the instructor also presented words without corresponding pictures, the paired (unknown picture) condition, the instructor presented the picture paired with the word, and the paired (known picture) condition, the instructor presented the picture paired with the word. During the baseline phase, sixteen targeted sight words were used, four for each condition. The instructor would give a verbal direction to touch the target word or word paired with its corresponding picture. Having the four conditions allowed the experimenters to determine whether the picture presence in sight word learning hinders acquisition based on previous experience with the materials or the actual picture is serving as an incorrect cue for the student. The results indicated that all participants learned the sight words more quickly when they had no prior access to the targeted word and when there was no additional picture stimulus present.

Known and unknown words or pictures can have implications on label acquisition (Liittschwager, 1994). Liittschwager discussed circumstances in which children can determine what object a novel word relates to without the speaker indicating to the student which object they are referencing. This determination of object to word relationship is called mutual exclusivity. According to Liittschwager, mutual exclusivity helps young children learn novel
labels for objects. The theory behind mutual exclusivity is that if a child is presented with a known object and a novel object, and the teacher presented the student with an unknown word, the student would reject a second label for the known word and attribute the novel word to the novel object. Twenty-four two year old typically developing children were assessed using items known and unknown to the child. Testing sessions were conducted using a variety of 3-D items, and the experimenter would ask the child to identify either a known or unknown word.

Experimenters also assessed attainment of novel words for items that the child had their own label for; for example, a child might call a unicorn a horse. The results of this experiment indicated that the two year olds were not consistently using mutual exclusivity to respond to new targets, which was in contrast to previous experiments done pertaining to mutual exclusivity.

**Biological Factors**

In addition to a student attending to a cue, and utilizing skills they have learned to obtain a new receptive label, biological processes do have optimum parameters and finite limitations. Sharpee (2009) conducted research pertaining to the stimulatory effects of different visual fields on the eyes of anesthetized, paralyzed cats and macaques. Two different visual fields were used; Cartesian and polar coordinated fields that ranged from 1-10 different degrees. The differing degrees correspond to how complex the visual field was to a magnitude of the degree. Neural responses to the visual stimuli were collected using tetrodes inserted in the primary visual cortex of the animals. Both the cat and macaque were presented with the 1-10 degree Cartesian and polar fields and the waveform of the neuronal activation was graphed. The findings indicated that when the cat and macaque eye was subject to a simpler, less complex, more ordered field there was more neuronal stimulation, and the stimulation was more consistent and the electronic feedback was more predictable. When the fields became more complex, the neurons responded
less consistently and less of the actual field was processed by the cat and macaque’s eye. These findings indicate that the less complex the field, the more the cat and macaque’s can access the whole field, and the more complex the field, the less of the field is assessed by the cat and macaque eye.

**Summary/Conclusions**

Findings of research conducted in the domain of receptive identification teaching and the environmental conditions that those receptive labels are taught are indicative that there are many factors that can aid or hinder acquisition and generalization of receptive vocabulary. If students have challenges attending to all of the features in a stimulus, having extra stimuli in teaching materials could be a potential factor confounding the student’s ability to initially learn the receptive label and to be able to generalize the label to novel stimuli (Doughty & Hopkins, 2001; Dube et al., 2010). In addition to students having challenges with attending to the correct stimulus within a cue, there are many factors that can affect the success of the student, one of which is the biological makeup of the eye and brain. Sharpee (2009) found that there are specific visual fields that elicit more neuronal activity than others. How visual fields are presented to an observer can have an effect on whether the observer completely sees the stimuli (Allen & Courchesne, 2003; Sharpee, 2009).

Additionally, to observer fluency is the observer’s previous history with the stimuli. People use process of elimination and mutual exclusivity to learn new skills. These are skills that are consistently observed in typically developing children that may not be consistent or spontaneous in children with a cognitive delay. This inconsistency when using deduction could lead to false learning based on an assumption by the student. This could lead to a child initially learning a label incorrectly (Liittschwager, 1994).
Given this information, there is no standard for developing teaching materials and setting up teaching materials. There is little documentation within experiments regarding specifications of the teaching materials used. Kinlcoh (2013) completed research that found that students obtain matching tasks more quickly when matching from a sample of one-to-many. This is an indicator that the visual field is an imperative component to consider when presenting stimuli. The complexity of teaching materials used could be an additional factor in the ability for a student to learn a new receptive label.
CHAPTER 3: RESEARCH METHODS

Introduction

In this section the methods I am using to gather and analyze data will be described.

- Which of two sets of instructional materials results in quicker acquisition of receptive identification tasks: picture cards with or without extraneous stimuli?

- What is the effect on a student’s ability to generalize a learned receptive label to novel stimuli (e.g., 3-D representation, other 2-D pictorial representation) when initial teaching materials are uniform and have no additional cues (Dube, Dickson, Balsomo, O’Donnell, Tomanari, Farren, & McIlvane, 2010) for the student to incorrectly identify as the targeted response?

Overall research design

A quantitative research design which emphasizes objectivity in measuring and describing events observed in an environment was used in this research. This type of research focuses on objectivity by primarily utilizing numbers, structure and control (Walpole, Roscoe, & Dube, 2007). The differences between acquisition rates of receptive labels between subjects who have experienced different interventions were investigated. Additionally, a multiple baseline across individuals, single-subject design (Kennedy, 2004) with three subjects was conducted. The systematic control over the interventions implemented should allow for valid cause and effect conclusions.

Specific research plan

The type of action research used in this thesis is an alternating treatment, multiple baseline across individuals design. A multiple baseline design is a style of single case design research involving the careful measurement of multiple persons, traits or settings both before and
after a treatment. It has several advantages over AB designs which only measure a single case. It is important to note that the start of intervention conditions is staggered (started at different times) across individuals. Given that treatment is started at different times we can conclude that changes are due to the teaching procedure rather than to a chance factor. By gathering data from many subjects, inferences can be made about the likeliness that the measured trait generalizes to a greater population. Multiple baseline experiments are most commonly used in cases where the dependent variable is not expected to return to baseline levels after the treatment.

**Setting**

The setting of my study is a non-public non-profit school for students with autism and related disabilities in Santa Cruz, California. The following information is taken from the city and school websites.

**Community.** The principal industries of Santa Cruz are agriculture, tourism, education (UCSC) and high technology. Santa Cruz is a center of the organic agriculture movement, and many specialty products as well as housing the headquarters of California Certified Organic Farmers. The area is predominantly white and is fairly affluent.

**School.** The school provides students with autism and/or developmental disabilities ages 5 to 21, comprehensive, extended year educational and clinical services regardless of their race, national or ethnic origin, age gender, or religion. The educational and treatment approach used at the school is based on the principles of applied behavior analysis (ABA), a methodology that applies principles of behavior to learning. The mission of the school is to provide scientifically-based educational and clinical services to produce measurable and lasting improvements in the lives of the students and families we serve. Teaching programs are developed based on each student’s educational and behavioral needs. Individualized educational plans are designed for
each student with annual objectives and measurable outcomes. Objectives emphasize the development of language skills, academic skills, social skills, leisure skills, and self-help and safety skills. Student's progress is closely monitored by detailed data collection.

Class. The class in which the research project is to be conducted is comprised of 10 student ages 7-14, 9 of whom are boys and 1 of whom is a girl.

Participants

Students. I will be using 3 students from my classroom.

- “Sally” is a 13 year old girl with a diagnosis of Autism, Childhood Apraxia of Speech (CAS), a sensory processing disorder, and an expressive/receptive language delay. She has been attending the school, a school utilizing Applied Behavior Analysis (ABA), since October 2007. Sally has received speech and language services at the school for an hour a week on a “push-in” basis. She is an independent girl who enjoys puzzles, routine, engaging with her instructors, and playing the Wii.

- “Mark” is a 13 year old boy with a diagnosis of Autism, Childhood Apraxia of Speech (CAS), developmental coordination disorder, sensory processing and moderate cognitive impairments. He has been attending the school, a school utilizing Applied Behavior Analysis (ABA), since October 2007. He is a child that demonstrates deep motivation and desire to communicate. He appears to be a visual learner and has demonstrated excellent cooperation and patience when completing novel tasks. Some of the items he gravitates toward include looking at pictures, reading books, completing puzzles, and swinging on the swing.

- “Danny” is a 13 year old young man with Autism. He is accompanied throughout the day by a 1:1 instructor who provides positive reinforcement through a token economy.
and verbal praise. He is an extremely bright and social young man who enjoys sensory activities, attention from his instructors, and gross motor activities like walking or riding an adult tricycle.

Data Collection Procedures

Across all phases of the study, each participant’s responses to probes designed to measure the dependent variable, correct identification of receptive labels from an array of pictures were assessed. The probes that were used are 6 emotions. The emotions include (e.g., happy, sad, angry, excited, surprised, confused). To assess student’s knowledge of each emotion during probe sessions, an array of 3 pictures with only one depicting the target emotion was displayed. For example, placing out a picture of happy, sad, and angry and verbally asking the participant to touch or hand over the picture within 3 seconds of the given verbal direction. If the verbal direction was “Hand me happy” the correct response would require the student to hand over the picture of a person who is happy within 3 seconds of the direction. There are two sets of pictures for each emotion. For one set of pictures, all of the emotions is represented by one individual with a neutral background, the same clothes, and the same hairstyle. The other set of pictures is a mixture of different people with different backgrounds, and hair styles. Each probe was scored according to the total number of correct responses made by each participant out of the 6 emotions. For each participant the 6 emotions were randomly assigned to either the no-additional stimuli condition or the additional stimuli condition, so that there are 3 emotions in each condition for each participant.

Baseline. Baseline was collected for 3, 5, and 7 sessions. Each set of materials was tested during baseline and for each participant baseline was stable across both sets of materials. Participants were not reinforced based on their responses during the baseline phase, but were
intermittently reinforced for participation. During baseline, an array of 3 pictures (i.e., one correct response and 2 distracters) were displayed and the discriminative stimulus delivered (e.g., “show me happy”). The students were given 3 seconds to respond to the verbal direction. If the participant touched or indicated the correct picture within 3 seconds of the verbal direction, then a correct response was scored. If the student touched an incorrect picture, or if the student didn’t respond within 3 seconds of the discriminative stimulus, it was scored as an incorrect response. This procedure continued for all 6 emotions, and the students were not reinforced for any responses, but were reinforced for participation intermittently.

**Intervention.** Two instructional materials were directly compared during the intervention phase using an Alternating Treatments Design. Condition 1 will consist of picture cards with additional stimuli present and Condition 2 will consist of picture cards that are simplistic and devoid of additional cues. During the intervention sessions, participants will receive training on each emotion within each set progressively once they demonstrate criterion based performance on the trained emotion. Following criterion based performance, which is all 3 trials correct in 3 consecutive sessions; participants will be provided instruction of the second set of 3 emotions progressively. Both sets will be taught using the same teaching procedures. Intervention procedures will follow an antecedent prompt and test format of instruction. Antecedent, prompt and test can be through of as an errorless teaching strategy. It is a teaching procedure in which the child is prompted to make the correct response immediately, ensuring a correct response each time. The antecedent, prompt and test strategy refers to the instructor providing and antecedent (the verbal direction), prompting the correct response in an errorless way, and then representing to test if the student can replicate the skill just prompted. The prompt is then slowly faded in order to promote accuracy with the least amount of errors and frustration. First the student was
cued to scan the field of 3 using a token or marker from their token economy system. The experimenter then provided the discriminative stimulus “Point to___”, then, from behind, hand over hand prompted the student to point to the correct target. The experimenter then sat down in front of the student rearranged the picture cards, scanned the field, and repeated the verbal direction “Point to ___”, and waited for the student to respond. After the student reached criteria the experimenter introduced extra directions after the student independently responded to see if the student retained the correct response after several distracters. The last session tested if the student was able to independently and correctly receptively identify the target.

Maintenance of the acquired labels was embedded within the instructional sequence (i.e., participants were assessed on maintenance of previously mastered emotions during daily probe sessions). In order to assess generalization of the emotions, 3 generalization measures were conducted. During the first generalization session, the same probe procedure as used in baseline was used, but with novel pictures for each emotion. During the second session, identical probe procedures were used but with an additional set of novel pictures in a novel environment. Finally, during the third generalization procedure, an additional set of novel pictures were used.

**Data Collection.** For this study, I plan to measure the effect of the independent variable (i.e., whether an image has additional cues or not) on the dependent variable (i.e., the number of trials it takes for the student to generalize to novel stimuli). I plan to use a discrete trial data collection method. Participants will be assessed based on their responses on a total of 6 emotions across baseline, intervention, and generalization sessions. Only correct responses will be recorded during sessions and counted toward criterion-based performance which will be independent correct identification of each of the emotions in each set in 3/3 trials for 2 consecutive days.
Data Collectors. The data was collected by a credentialed teacher and inter-observer data was collected by an additional credentialed teacher.

Data Analysis

The study is an alternating treatment, multiple baseline design. Following the criterion based performance and intervention, visual inspection of graphed data will determine whether there was a change in the behavior/skill.

Inter-observer Agreement (IOA). I will try and reduce threats to internal validity by collecting inter-observer agreement data across baseline, intervention, and generalization sessions. The person collecting the IOA data was a credentialed teacher with experience taking IOA data. A second observer independently scored 30% of all sessions. Inter-observer (exact) agreement for acceptance was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. The mean inter-observer agreement for correct responding was 95% (range, 83%-100%) for Participant 1; 90% (range 67%-100%) for Participant 2; and 95% (range, 83%-100%) for Participant 3. The behaviors of the experimenter will be held reliable by implementing the intervention sessions identically across participants.

Threats and Limitations

There are several limitations that should be noted for this investigation. One limitation of the study includes the small sample size in each of the conditions. There are only 3 sets of materials in each condition so it is more difficult to see if there is a clear difference in acquisition rate of each of the receptive labels. Also, the generality component of the study may not show that the student can generalize the skill in a majority of novel situations since the generality portion of the study only included 3 novel exemplars. A limitation to this generalization strategy is that the student only had to show generalization in one session for each of the novel stimuli.
Further information would need to be collected regarding how the student performs in multiple situations and it would likely be beneficial for the receptive language skill taught to be additionally addressed across language domains. Additionally, this study was only conducted with students who are on the severe end of the autism spectrum, so the results can’t be applied to typically developing students or students that don’t have a severe disability.

Summary

This chapter provided the details of where the study took place, description of the participants, and description of the data collection procedures. By using an alternating treatment research approach, I was able to assess and reflect on the differences between teaching materials that have additional information versus materials that have no additional information. The next chapter will analyze and interpret the findings of the use of each set of teaching materials and its impact on student acquisition of receptive identification of emotions in pictures.
CHAPTER 4: Findings

The goal of this research was to determine if different types of teaching materials have an effect on acquisition and generalization of receptive identification skills of students with autism. The purpose was to determine whether quicker acquisition occurred with teaching materials that had no additional stimuli or with materials that did have additional visual information. This study also additionally evaluated whether the teaching materials selected had an effect on whether the student was able to generalize the information quickly or not. Results are reported for all three participants (See Figure 1). Unconnected data points in the intervention phase indicate that a criterion change occurred.

Participant 1 (Danny)

During the first baseline session, Danny attended to the fields of pictures presented in both conditions. He also made an attempt after each presentation of the discriminative stimulus. Danny showed position bias for the right side of the field in both conditions. In subsequent baseline sessions Danny continued to respond quickly but incorrectly. The average number of correct trials during baseline for the ‘no additional’ condition was 0.11 with a range of 0 – 1. In the ‘additional’ condition the average number of correct trials was 0.22 with a range of 0 – 1.

In the intervention phase for the ‘no additional’ condition, Danny showed challenges with correctly responding after an initial prompt. After 13 sessions a criterion change was made toward independence. Overall it took him 23 sessions to reach criteria in the ‘no additional’ condition for mastery prior to the implementation of the generality component of this research. In the ‘additional’ condition it took Danny 22 sessions to reach criteria to move on to the generality component. For the ‘no additional’ condition it took Danny 9 sessions to show
generalization to the novel stimuli presented. In the ‘additional’ condition it took him 4 sessions to show generalization to 3 novel stimuli.

Participant 2 (Mark)

During the baseline sessions Mark made attempts for each presentation of the stimuli in both conditions. In the ‘no additional’ condition the average number of correct responses was 0.06 with a range of 0 – 1. In the ‘additional condition the average number of correct responses was 0.13 with a range of 0 – 1.

During the intervention phase in the ‘no additional’ condition, Mark showed systematic increase in his ability to receptively identify the images presented. It took him 20 sessions to reach criteria for mastery of the initial teaching materials. The generality component was then introduced and it took him 4 sessions to correctly identify 3 novel images of the corresponding emotions. Mark showed mastery of the ‘additional’ condition in 22 sessions. After the initial intervention phase was mastered the generality sessions took place. Mark showed generality to 3 novel stimuli in 10 sessions. It took Mark over twice as many sessions to show generality to 3 novel stimuli in the ‘additional’ condition than in the ‘no additional’ condition.

Participant 3 (Sally)

The baseline phase for Sally consisted of 7 sessions. During the ‘no additional’ condition the average number of correct responses was 0.19 with a range of 0 – 1. In the ‘additional’ condition the average number of correct responses was 0.23 with a range of 0 – 1. During trials it appeared that Sally had a position bias for the left of the field. This position bias could account for some of the correct responses that occurred during baseline.

During the intervention phase in the ‘no additional’ condition it took 13 sessions to reach mastery of the initial materials (3 correct responses across 3 consecutive sessions). After the 13
sessions the generality component was introduced. It took Sally 3 sessions to correctly receptively identify 3 novel examples of the emotions taught in the intervention phase. In the ‘additional’ condition 11 sessions were completed in order for Sally to reach criteria for mastery of the initial teaching materials. The generality sessions were then presented and it took Sally 10 sessions to show generality to 3 novel examples of each exemplar taught.

Summary

This chapter revealed my findings quantitatively. The data collected shows consistent findings across all three participants in the generality component of this research. Each of the participants showed acquisition of the 3 generality images more quickly in the ‘no additional’ condition than in the ‘additional’ condition. Two out of the three participants learned the receptive labels more quickly with the initial ‘additional’ condition materials but as stated above took longer to generalize the receptive label. For all three participants initial learning of the receptive label was fairly close for each condition.
Figure 1. Number of correct responses for each condition across three participants. Unconnected data points in the intervention phase indicate that a criterion change occurred.
CHAPTER 5: Discussion

Summary

The purpose of this study was to examine the effects of two different sets of teaching materials on acquisition and generalization of receptive identification labels by student with ASD. Findings from this study suggest that utilizing teaching materials that have no additional information in the image resulted in quicker generalization for all students, as a functional relationship was demonstrated between the use of no additional stimuli materials and the acquisition of the receptive label and the three generality images. All three students reached criteria across all sets of images in both the initial intervention and generality components. The data also indicated for two out of the three subjects the materials with additional stimuli yielded quicker acquisition of the label but then resulted in slower generalization. One of the subjects took longer to reach criteria to move on to the generality component in the ‘additional’ condition. Overall, both conditions resulted in acquisition of the receptive label and there was only a 1 -2 session difference in conditions regarding how long it took each student to learn the label using the non-generality images.

The current research contributes to the literature in a number of ways. First, the current study validates previous findings that there are additional confounding factors that need to be taken into account when presenting students with a direction associated with teaching stimuli. Second, the students in the current study had a diagnosis of autism. This specific population is different from previous studies pertaining to additional factors that could affect acquisition of receptive identification labels. It is possible that the students in this study could have different patterns of responding as compared to other participants in previous studies. Additionally, the methodology utilized in this study can be utilized by any educator. As long as the person
developing the teaching materials constructs them in such a way that they make the targeted label the most salient feature of the image then the student will likely be able to attain generalization and comprehension of the new vocabulary.

**Limitations**

There are several limitations that should be noted for this investigation. One limitation of the study includes the small sample size. The results discussed in this research have limited potential for generalizing to other students because of the small sample size. There is restricted replication of the findings so this limits the claims pertaining to functional relation between the independent and dependent variables. Additionally, the study involves a lack of implementation of instructional and probe sessions with three dimensional representations. Although generalization measures which assessed descriptor knowledge across novel two dimension stimuli were included, this is not comparable to implementing a training or probe session in a naturalistic manner. It is possible that during non-table top sessions, correct independent responding could increase or decrease depending on a variety of variables. For example, each person modeling each emotion assessed will have different ways of representing that emotion on their face.

In addition to the form of the generality component, only a small number of generality probes were taken, so it is unknown whether these initial correct responses will result in lasting or robust changes in the students’ ability to maintain or generalize the skill in future situations. An additional limitation to this research is the narrow scope of receptive labels. The study was conducted with receptive identification tasks relating only to attainment of comprehension of emotions in a two dimensional representation.
Implications for Practice

This study also provides several implications for practice. It is reasonable to believe that teachers can be trained to assess visual perception factors that could influence acquisition of new knowledge. Deciding what skills to teach is in and of itself a task that requires careful consideration, the materials that are used in conjunction with the content should also warrant critical thought. Therefore, the results of this study will be used to inform my future practice. I will develop materials for students displaying a receptive language delay which utilizes exemplars that are devoid of additional cues that the student may be incorrectly attending to. This attention to material selection can also be applied to other receptive language acquisition tasks other than identification of emotions. I plan to use this approach to train other teachers and support providers in order to increase the likelihood that students will generalize information more quickly.

The strategies outlined in this study could be used across populations (e.g. typically developing children, individuals with other disabilities, individuals with mild to moderate disabilities) in order to promote quicker acquisition of receptive labels. The implementation of developing materials that have no additional stimuli also has the potential to be carried out in other settings and contexts.

Recommendations for Future Research

There are a number of recommendations that can be suggested for future research based on the data collected in the current investigation. For example, development of teaching materials that are devoid of additional cues could be implemented in other content areas. (e.g. prepositions, basic concepts, actions). The observer’s previous history with the stimuli is also a factor in the student’s responding. People use process of elimination and mutual exclusivity to
learn new skills. These are skills that are consistently observed in typically developing children that may not be consistent or spontaneous in children with a cognitive delay. This inconsistency when using deduction could lead to false learning based on an assumption by the student. This could lead to a child initially learning a label incorrectly (Liittschwager, 1994). The current research validates reducing mutual exclusivity and should be tested in more contexts.

For the purposes of future replication, it would be beneficial to use participants with varying disabilities and potentially students who are typically developing. It would be interesting to see if there is a discrepancy in how long it takes different populations to acquire a new label and attain generalization. Another recommendation to consider is adding more generalization measures to the study. It would be beneficial to look at three dimensional representations, two dimensional pictures in different environments, presentation of the task by additional people, etc. It would also be interesting to see if the acquired knowledge of the receptive identification task has an effect on students’ abilities to complete directions that reference the receptive label taught. This could also lead to research pertaining to the effects of teaching skills across language domains and whether it is beneficial to teach in one domain first or to teach across domains concurrently.

Conclusion

This study found that teaching materials that have no additional stimuli require more trials for initial mastery, but facilitate quicker generalization. Students have challenges attending to all of the features in a stimulus and having extra stimuli in teaching materials is likely a factor confounding the student’s ability to initially learn a receptive label and hinders the ability to generalize the label to novel stimuli (Doughty & Hopkins, 2001; Dube et al., 2010). In addition to students having challenges with attending to the correct stimulus within a cue which this
research supports and how visual fields are presented to an observer can have an effect on whether the observer completely sees the stimuli (Allen & Courchesne, 2003; Sharpee, 2009).

Given this information, there is no standard for developing teaching materials and setting up teaching materials but, training teacher and support providers to be mindful of this information may give students with autism quicker access to the information that they require to be more independent in their environment. There is little documentation within experiments regarding specifications of the teaching materials used. This research is a small step in delineating information about how teaching materials can affect receptive identification skills. This study indicated that the visual field is an imperative component to consider when presenting stimuli. The complexity of teaching materials is a factor in acquisition of new receptive labels for students with autism.
References


