PRESENTING NON-TARGET STIMULI IN CONSEQUENT EVENTS TO CHILDREN WITH AUTISM: A STUDY ON THE EFFECTS OF FUTURE LEARNING

by

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(Under the Direction of David L. Gast)

ABSTRACT

The purpose of this study was to evaluate the effects of presenting non-target stimuli in the consequent event on the future learning of non-target stimuli for 5 children with autism using a constant time delay (CTD) procedure to teach students to read sight words. Following criterion level performance in the future and non-future conditions, students were taught using a CTD procedure to read the future target words and a new set of target stimuli. An adapted alternated treatments design was used to compare the effectiveness and efficiency of the two instructional conditions. Results indicated that presentation of future target stimuli does not interfere with current target stimuli instruction. Future research needs to be conducted to determine if students will require fewer sessions and less instructional time to achieve criterion on future target stimuli compared to initial target stimuli.

INDEX WORDS: Autism, Autism Spectrum Disorders, Future Learning, Incidental Learning, Instructional Strategies, Non-target stimuli

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DEDICATION

This thesis is dedicated to my grandmother, Helen Hauke, whose love and compassion continues to inspire me every day.

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CHAPTER 1

INTRODUCTION

Rationale

Identifying effective and efficient instructional strategies for children with autism should be of paramount importance for researchers, due to the practical implications for the classroom teacher. Instructional efficiency, as defined in this study, is instruction that has a positive effect on future learning of non-target stimuli (Wolery & Gast, 1990). The majority of research studies that investigate the acquisition of non-target information for children with disabilities involve incorporating instructive feedback, or non-target information in the consequent event following a predetermined response to the target stimulus (Werts, Wolery, Holcombe, & Gast, 1995). Only three studies have examined the effects on future learning of presenting non-target information during current target instruction (Wolery, Doyle, Ault, Gast, Meyer, & Stinson, 1991; Holcombe, Wolery, Werts, & Hrenkevich, 1993; Wolery, Schuster, & Collins, 2000). Table 1 provides a summary of the literature involving non-target stimuli and children with disabilities.

The participants in this study were elementary-aged children with autism, which differ in age and disability from the participants used in previous studies investigating effects on future learning. This study expanded on previous research by incorporating a generalization condition for both future and non-future target stimuli. This research is important for classroom teachers, as well as anyone who teaches children with autism, because efficient instructional practices result in increased learning. This study is beneficial to classroom teachers of children with

autism, who are always striving to find instructional strategies that increases the learning of students, especially if the results occur without additional direct instruction or preparation time.

The purpose of this study was to (a) evaluate the effects of presenting non-target stimuli in the consequent event on the future learning of non-target stimuli, (b) compare the effectiveness and efficiency of the future and non-future condition (c) assess generalization of the target and future target words, and (d) draw conclusions and make recommendations for future research.

Research Questions

1) Will the presentation of future target stimuli during instruction of current target stimuli result in more efficient (fewer number of trials, fewer number of sessions, fewer number and percentage of errors, and fewer minutes of instructional time through criterion) future learning of non-target stimuli for children with autism?
2) Will including non-target stimuli in the consequent event during instruction of current target stimuli affect the effectiveness (the percentage of unprompted correct responding) and/or the efficiency (the number of trials, number of sessions, number and percentage of errors, and minutes of instructional time through criterion) of the constant time delay procedure for children with autism?
3) Will children with autism be able to generalize acquired sight words from the instructional environment of the classroom to natural conditions throughout the school? Generalization will be measured by the percentage of correct identification of stimuli during pre-test and post-test conditions.

Table 1
Review of Literature Involving Presentation of Non-Target Information and Children with Disabilities

Reference	N	CA	Diagnosis	Research Question/Purpose	Dependent Variable	Independent Variable	Experimental Design	Results	Commentary/ Critique
Doyle, Gast, Wolery, Ault, & Farmer (1990)	2F 2M	18-2 17-9 17-7 16-7	Mild to moderate MR	Assess effectiveness and efficiency of CTD; assess acquisition of incidental information presented in the consequent event following correct responses	% of correct responses to target, incidental, and observational information; # of target facts; # of trails, # of errors; % of errors; direct instructional time	CTD to teach sets of facts; incidental information presented following praise statement	Multiple probe design across behaviors	CTD effective at teaching each student all facts; same-task, different-stimuli condition resulted in more efficient learning; all participants learned information through observation in the in the same task, different stimuli condition	Repeated exposure and differential reinforcement increased acquisition of observational learning
Fiscus, Schuster, Morse, & Collins (2002)	4	8-12	Moderate to severe cognitive disabilities	Investigate the effectiveness of CTD to teach chained tasks and acquisition of related and unrelated instructive feedback	# of sessions, # of errors, % of errors, direct instructional time to criterion; % anticipations; % accuracy of incidental information	CTD to teach steps in 3 chained food preparation tasks; incidental information in prompt and consequent event (related to target) and consequent event (unrelated to target)	Multiple probe design across behaviors	CTD effective in teaching 3 participants chained food preparation tasks; 3 participants learned some related incidental information; 3 participants learned 100% of unrelated incidental information	Instructive feedback not functionally equivalent (i.e. reading sentences, reading words, labeling objects)
Gast, Doyle, Wolery, & Ault (1991)	4M	7-10 8-2 8-4 8-10	Mild MR	Investigated the effectiveness of CTD and acquisition of incidental information in a small group arrangement	# of trials, #of errors; % of errors, direct instructional time to criterion; mean percentage of correct responding	CTD to teach sight words; incidental information (spelling of the target words)	Multiple probe design across conditions	CTD effective in teaching sight words; each participant learned some of the spelling of the targeted words	Efficiency measures represent group criterion

Notes: M = male, F = female, MR = mental retardation, CTD = constant time delay

Table 1
Review of Literature Involving Presentation of Non-Target Information and Children with Disabilities (cont.)

Reference	N	CA	Diagnosis	Research Question/Purpose	Dependent Variable	Independent Variable	Experimental Design	Results	Commentary/ Critique
Holcombe, Wolery, Werts, & Hrenkevich (1993)	2F 2M	5-0 3-8 4-9 4-10	Develop-mental delays	Comparison and assessment of the effects of instructive feedback on future learning of target stimuli	# of trials, # of errors, % of errors, direct instructional time to criterion; percentage of correct responding	CTD to teach four stimulus variations; presentation of instructive feedback	Parallel treatments design across subjects	CTD effective in teaching 3 of the 4 participants future behaviors; presenting instructive feedback did not interfere with current target stimuli; future behaviors required less direct instructional time	Repetition across 4 sets of similar stimuli
Ledford, Gast, Luscre, & Ayres (2007)	6M	5-9 5-9 6-3 6-9 8-3 8-4	Autism	Assess acquisition of incidental and observational information in a small group arrangement	% correct responses for target information, observational information and incidental information	CTD to teach functional sight words; presentation of incidental information (visual signs)	Multiple probe design across behaviors replicated across 6 participants	Participants learned 89-96% of observational and incidental information; participants generalized learned information to natural context	A group criterion (each dyad) was used for participants to move to the next criterion
Parrot, Schuster, Collins, & Gassaway (2000)	3F 2M	6-3 6-6 6-7 7-1 8-0	Moderate to severe MR	Examine effectiveness of simultaneous prompting procedure to teach a chained task; assess acquisition of instructive feedback	% of correct responses to 16 step task analysis; % of correct responses to instructive feedback; # of sessions, total training time; total probe time; daily probe errors, types of errors	Simultaneous prompting procedure to teach hand washing task analysis; instructive feedback presented after completion of certain steps in the task analysis	Multiple probe across subjects	Simultaneous prompting procedure effective at teaching a chained task; all participants acquired some instructive feedback (57%-100%)	Two participants did not reach criterion levels using simultaneous prompting procedure

Notes: M = male, F = female, MR = mental retardation, CTD = constant time delay

Table 1
Review of Literature Involving Presentation of Non-Target Information and Children with Disabilities (cont.)

Reference	N	CA	Diagnosis	Research Question/Purpose	Dependent Variable	Independent Variable	Experimental Design	Results	Commentary/ Critique
Stinson, Gast, Wolery, & Collins (1991)	3F 1M	9-8 10-1 10-5 10-8	Moderate MR	Assess acquisition of incidental information when presented in praise statement; assess acquisition of other students' words and incidental information	% of correct responses for target words; mean percentage of correct target definitions; mean percentage of correct observational definitions	PTD to teach reading of sight words; presentation of incidental information (definitions) in consequent event	Multiple probe design across four word pairs	PTD effective at teaching each student target words; participants learned at least 50% of incidental and observational words and definitions	A group criterion used to allow for evaluation of observational learning (all students had equal # of opportunities)
Taylor & Schuster (2002)	1F 3M	16-5 16-9 17-3 20-7	Moderate MR	Assess effectiveness of SLP method; examine acquisition of non-targeted information	% of independently completed steps; % of functional words acquired as non-targeted information	SLP to teach a TA of doing laundry; 8 functional words presented as non-target information in consequent event of task steps	Multiple probe across subjects	SLP effective at teaching participants how to do laundry; participants acquired non-target information (62.5%-100%) and generalized non-target information (87.5%-100%)	Flashcards used with natural environment presentation of non-targeted information
Wolery, Doyle, Ault, Gast, Meyer, & Stinson (1991)	3F 5M	6-10 8-5 9-5 9-9 10-7 11-1 11-8 13-7	Moderate MR	Comparison of the effects of future target stimuli on target stimuli	# of sessions, # of trials, # of errors, % of errors, direct instructional time to criterion; mean percentage of correct responding	PTD to teach photograph names and words; incidental information (words) in consequent event	Adapted alternating-treatments design	Future stimuli has no effect on target stimuli; presentation of non-target stimuli resulted in more efficient future learning of stimuli; 7 participants learned some future target words in consequent event	Experiment II was systematic replication of Experiment I; similar results found

Notes: M = male, F = female, MR = mental retardation, CTD = constant time delay, SLP = system of least prompts, TA = task analysis, PTD = progressive time delay

Table 1
Review of Literature Involving Presentation of Non-Target Information and Children with Disabilities (cont.)

Reference	N	CA	Diagnosis	Research Question/Purpose	Dependent Variable	Independent Variable	Experimental Design	Results	Commentary/ Critique
Wolery, Schuster, & Collins (2000)	3F	15 17 19	Mild to moderate MR	Comparison and assessment of future learning of non-target stimuli in the antecedent and consequent events	# of sessions, # of errors, % of errors to criterion; percentage of correct responding	CTD to teach sight words; presentation of future target words (unrelated to target words) either in the antecedent or consequent event	Adapted alternating-treatments design	Future stimuli has no effect on target stimuli; presentation of non-target stimuli resulted in more efficient future learning of stimuli; no difference between antecedent and consequent presentation of non-target stimuli	Control set of stimuli were not taught; no generalization

Notes: M = male, F = female, MR = mental retardation, CTD = constant time delay

CHAPTER 2

METHODS

Participants

Participants included 4 students with an eligibility of autism based on the state of Massachusetts eligibility requirements. All participants received special education services in a substantially-separate classroom for children with autism spectrum disorders in a public school system in the Greater Boston area of Massachusetts. The age range of participants was 7 years, 4 months to 9 years, 6 months. Related services included speech-language therapy, occupational therapy, physical therapy, counseling services, and music therapy. The functioning levels of participants varied, ranging from mild to severe intellectual disabilities. Before beginning the study, the investigator assessed participants using the *Childhood Autism Rating Scale (CARS)* (Shopler, Reichler, & Renner, 1988) to assess the appropriateness of an autism diagnosis and the Brigance Comprehensive Inventor of Basic Skills (BCIBS; 1993) to obtain an estimate of pre-instruction sight word reading ability. Some participants had previous experience with the *Edmark Sight Words* program (1992). All participants had previous experience with sight word instruction and constant time delay procedures. All participants had experience with the primary investigator, who was the students' special education teacher. IQ scores are not available for all participants, due to inconclusive findings during attempted evaluations. Table 2 shows an individual description of participants.

Jeff was 6 years, 9 months when he underwent a neuropsychological evaluation and was diagnosed with Pervasive Developmental Disorder-NOS. The examiner also noted that he showed some early indications of characteristics that are associated with Asperger Syndrome. He was 6 years, 10 months when he received his first psychological evaluation to obtain special education services under the eligibility of autism. A measure of general cognitive ability was obtained using the Wechsler Intelligence Scale for Children- Fourth Edition (WISC-IV; Wechsler, 2003). Results indicated a Full Scale IQ of 87, placing him in the 23rd percentile rank. During the testing, the examiner noted significant difficulties and peculiarities with language processing. Jeff's responses to questions throughout the testing provided samples of his abstract thought processes and the unusual language he commonly uses in social conversations. His teacher completed the Behavior Assessment Scale for Children: Teacher Rating Scales (BASC:TRS; Kamphaus & Reynolds, 1992), which provided a composite score that indicated significant problems with attention and hyperactivity.

Jeff could identify all uppercase and lowercase letters, as well as provide the sound for each letter in the alphabet. He could expressively identify some months of the year, days of the week, and number words. He could read 14 out of 53, or 26%, of primer level basic sight words. He could match approximately 30 words to pictures of common environmental objects. He was not able to segment or blend letters together to make a word. He could identify numbers 0-20 and rote count to 20. He exhibited 1:1 correspondence when counting up to 12 objects. His weaknesses included fine motor skills, adaptation to change, and social communication. He had difficulty recognizing and expressing ideas, concepts, and his feelings and often became rigid and resistant when he did not know how to do something. He required multiple reminders and continuous redirection to remain on task, follow directions, and complete his work. He had

extreme difficulty interpreting social situations, understanding social cues, and interacting with peers. He struggled with transitioning appropriately from one activity to the next. Upon termination of an activity or when given an unknown task, he became easily frustrated and exhibited a variety of behaviors including crying, yelling, verbally refusing to comply, aggression, and elopement. He required a highly structured environment and clear behavioral expectations to limit the frequency and severity of his tantrums.

Alex was 6 years, 11 months at the time of his most recent psychological evaluation to determine continued need for special education services under the eligibility of autism. Due to limited participation, difficulties with attention, and delayed expressive and receptive language skills, the examiner discontinued the Wechsler Intelligence Scale for Children- Fourth Edition (WISC-IV; Wechsler, 2003) after three attempted administrations. Alex's mother completed the Adaptive Behavior Assessment System- Second edition (ABAS-2; Harrison & Oakland, 2000) to obtain a measure of his general adaptive behavior, as well as his functioning level in specific adaptive skill areas. According to parent report, Alex obtained a general adaptive composite score of 65 and a percentile rank of 1.0. Results of this assessment indicate that Alex has significant deficits in the skill areas that encompass the practical, everyday skills required to function and meet environmental demands, including self-care and communication skills.

In order to obtain an estimate of his academic abilities, Alex was administered the Woodcock Johnson III- Tests of Achievement (WJ III- ACH; Woodcock, McGrew, Mather, 2001). He received a standard score of 88 in the Broad Reading Cluster, 73 in the Broad Math Skills Cluster, and 77 in the Oral Language Cluster. Due to refusal behaviors, Alex did not complete the written language subtests, and therefore did not receive a standard score in the Broad Written Language Cluster. Results of this testing indicated that Alex is working in the

below average range in all academic clusters. Although he received his highest rating in the reading cluster, it may not be a valid representation of his reading abilities since he was primarily reading words and letters in isolation. When presented with the passage comprehension subtest, Alex obtained a standard score of 17, which is in the profoundly deficient range.

Alex frequently engaged in delayed echolalia and repetitive self-talk. He was able to communicate using complete sentences, but often used echolalia and pronoun reversal. He struggled with appropriately gaining a peer or adults' attention, but is capable of verbally communicating his wants/needs (e.g., "I need help with my backpack."). He could identify all uppercase and lowercase letters, as well as provide the sound for all letters in the alphabet. He ccould expressively identify color words, the days of the week, months of the year, and numbers from zero to ten. He could read 36 out of 53, or 68%, of primer level basic sight words. He was not able to segment or blend letters together to make a word. He exhibited 1:1 correspondence when counting up to 30 objects. He could identify numbers 0-100 and rote count to 100. He could answer a variety of social questions. His strengths included rote memory, fine motor skills, and following two-step directions. His weaknesses included repetitive behaviors, social communication, and adaptation to change.

He frequently initiated conversations with familiar peers and adults that consist of making a repetitive comment about a previous, ongoing, or future activity (e.g., "I'm going to write about pancakes in my journal."). He required prompting to respond to and initiate conversations on novel topics with peers and adults. When presented with a non-preferred task, he became easily frustrated and anxious and will often exhibit tantrum behaviors, including yelling, crying, throwing objects, dropping to the floor, and self-injurious behaviors (e.g., biting hands, hitting head, pounding on desk). Alex occasionally exhibited aggression towards both

teachers and peers, which consists of head butting, pinching, and making verbal threats (e.g., "I'm going to hit you."). In addition to the related services provided to him at school, he attended a social skills group for children with autism for one hour each week.

Ivan was 2 years, 6 months when a private psychologist diagnosed him with Pervasive Developmental Disorder. Ivan was 7 years, 3 months at the time of his most recent psychological evaluation to determine continued need for special education services under the eligibility of autism. Due to difficulties with attention, repetitive responding, and delayed expressive and receptive language skills, the examiner discontinued the Wechsler Intelligence Scale for Children- Fourth Edition (WISC-IV; Wechsler, 2003). Ivan's parents did not return or complete the Adaptive Behavior Assessment System- Second edition (ABAS-2; Harrison & Oakland, 2000). The Gilliam Autism Rating Scale-Second Edition (GARS-2; Gilliam, 2006) was completed by Ivan's teacher. An autism index of 98 (45%) was obtained from the assessment, indicating significant impairments in the areas of communication, social interaction, and stereotyped behaviors, suggesting a "Very Likely" probability of autism.

Ivan could identify all uppercase and lowercase letters, as well as provide the sound for each letter in the alphabet. He could add and subtract two-digit numbers, identify and state the value of coins, count change under $1.00, and tell time. He could read 39 out of 53, or 74%, of primer level basic sight words. He was capable of producing full sentences, but rarely responds to questions or initiates conversation without verbal prompts. When presented with an unknown direction or question, he engaged in echolalia. His repetitive interests, which consisted mainly of counting and sorting, interfered with his ability to follow simple directions, transition to different tasks, and complete his work. He initiated social interactions with familiar teachers and students, but required prompting to engage in meaningful, reciprocal conversations. He rarely asked

questions. He frequently spoke loudly, interrupted others, violated other's personal space, and had difficulty waiting his turn. His weaknesses included attention, motor skills, and social communication. He struggled to attend to verbal or visual stimuli during instruction, since objects and noises in his environment easily distracted him. His strengths included adaptive skills, adaptation to change, and fine motor skills.

Lisa was 5 years, 7 months when she received her first psychological evaluation to obtain special education services under the eligibility of autism. Based on the Wechsler Preschool and Primary Scale of Intelligence- Third Edition (WPPSI-III; Wechsler, 2002), Lisa achieved a Verbal IQ of 57, a Performance IQ of 63, and a Full Scale IQ of 55, indicating a significant delay in her intellectual ability. To obtain a measure of her personal and social skills, Lisa's teacher completed the Vineland Adaptive Behavior Scales (VABS; Sparrow, Balla, & Cicchetti, 1984), which resulted in a standard composite score of 66, indicating that Lisa is exhibiting skills well below the average range in communication, daily living skills, socialization, motor skills, and adaptive behavior. Lisa was 8 years, 10 months when she received her most recent psychological evaluation, which established continuing eligibility to obtain special education services under the eligibility of autism. Cognitive assessments were attempted, but discontinued and considered invalid, due to significant difficulties with attention, following directions, and impaired expressive and receptive language skills. The Gilliam Autism Rating Scale-Second Edition (GARS-2; Gilliam, 2006) was completed by Lisa's teacher and parent. Results from the assessment indicated significant impairments in the areas of communication, social interaction, and stereotyped behaviors, suggesting a "Very Likely" probability of autism.

Lisa could identify all uppercase and lowercase letters. She could provide the sound associated with approximately 20 letters. She was not able to expressively identify the months of

the year, days of the week, or number words. She could read 3 out of 53, or 6%, of primer level basic sight words. She could identify numbers 0-30 and rote count to 40. She exhibited weaknesses in attention, rote memory, and engaging in meaningful, reciprocal conversations. She required frequent verbal prompts to respond appropriately, since she communicates most wants and needs through yelling or exhibiting aggressive behaviors. When engaged in a preferred activity, she would communicate with an adult using 3 to 4 word sentences. She had extreme difficulty interpreting social situations, understanding social cues, and interacting with peers. She desired social interactions with peers and adults, but struggled with how to interact appropriately. She often exhibited inappropriate laughter and crying. She frequently engaged in pretend play with toys; however, she preferred to play alone and required prompting to engage with peers, take turns, and share with others. She required multiple reminders and continuous redirection to remain on task, follow directions, and complete her work. She struggled with transitioning appropriately from one activity to the next. When given a direction, she often refused to comply and exhibited aggressive behaviors including grabbing clothing, pinching, scratching, kicking, biting, and throwing objects.

Inclusion Criteria and Pre-requisite Skills

Inclusion criteria included: (a) having an eligibility of autism from a school psychologist based on the state of Georgia eligibility requirements, (b) obtaining a CARS score that is indicative of an autism diagnosis, and (c) Individual Education Plan (IEP) objectives that relate to sight word reading.

Pre-requisite skills for participation included: (a) ability to follow simple requests (e.g., respond to attentional cues and task directions) (b) ability to verbally imitate all target words, (c) ability to wait 3 s for a teacher-delivered prompt, (d) having an identified reinforcer, and (e)

ability to demonstrate on-task behavior during 1:1 instructional sessions lasting 15 minutes. Pre-requisite skills will be assessed through teacher observation and direct testing in a 1:1 arrangement. Participants not meeting all of the pre-requisite skills were excluded from the study. Permission for participation was obtained from each child's parent/guardian. There was no attendance requirement.

The ability to follow simple requests was assessed in a 1:1 arrangement by the instructor presenting a known object (e.g., pencil, marker, scissor) to the student and stating, "(Name, look.). If the student oriented eye gaze towards the teacher or materials, then the instructor delivered descriptive verbal/social praise (e.g., "Good looking.") and then asked, "What is it?" If the student responded correctly, the instructor delivered descriptive social praise (e.g., "Nice job, that is a pencil.") If the student did not respond to the attentional cue, the instructor ignored the error and waited 3 to 5 s before presenting another object and delivering another attentional cue. In order for a trial to be marked correct, the student had to immediately respond to the attentional cue and respond to the task request within 4 s. One session consisted of 5 trials. Criterion for mastery of this prerequisite skill was 100% correct responding for 3 consecutive sessions with 15 different known objects.

The ability to imitate all target words was assessed in a 1:1 arrangement by the instructor presenting the task request, "Say (target or future target word)" and giving the student 4 s to respond. If the student verbally imitated the response, the instructor delivered descriptive praise (e.g., "Perfect, speaking). If the student did not imitate the word or imitated the word incorrectly, the instructor ignored the error, waited 3 to 5 s, and then presented the next word. Each session consisted of 20 trials, one trial of verbal imitation for all target and future target

words. Criterion for mastery of this prerequisite skill was 100% correct responding for 3 consecutive sessions.

The ability to wait 3 s for a teacher delivered prompt was assessed in a 1:1 arrangement by the instructor presenting an unknown object (e.g., thumbtack, spatula, paperclip) to the student and giving the task request, "What is it?" If the student correctly waited 3 s for the instructor's prompt, the instructor delivered the controlling prompt (the name of the object) and delivered descriptive social praise to the student (e.g., "Nice waiting for the answer.") If the student responded before the prompt, the instructor said, "Wrong. It's okay to wait if you don't know the answer". If the student responded incorrectly after the prompt, the instructor ignored the prompted error. The instructor waited 3 to 5 s before beginning a new trial. Criterion for mastery of this prerequisite skill was 100% correct responding for 3 consecutive sessions with 15 different unknown objects.

A reinforcement preference assessment was conducted in a 1:1 arrangement with each student to ensure a reinforcer had been identified using multiple-stimulus without replacement (MSWO) preference testing as described by DeLeon and Iwata (1996). An item or activity was considered a reinforcer if it was chosen first, second, or third by the student over 4 consecutive sessions. The ability to exhibit on-task behavior was assessed by the instructor working 1:1 with a student for 15 minutes on a skill that is still in the acquisition phase. To receive a correct for the session, the student had to exhibit on-task behavior for the entire 15-minute interval. On-task behavior was defined as the student sitting in the chair. Criterion for mastery of this prerequisite skill was 100% correct responding for 3 consecutive sessions.

Item Selection

Target and future target stimuli were selected through student screenings, parent surveys, and teacher input. Based on each student's IEP, the special education teacher developed a pool of possible stimuli (100 words) from words found in the natural environment around the school, as well as from the *Edmark Functional Word Series* (Austin & Boeckman, 1990). After receiving parent and teacher input, the investigator made a list of 50 possible stimuli. The 50 sight words were typed in lowercase black letters, using size 36-point Times New Roman font on 3 x 5 in unlined white index cards. During screening sessions, each participant was assessed on each item individually. Each student completed three screening sessions (one per day), with 25 sight words per session. A trial during a screening session consisted of a general attentional cue (i.e., "Name, look"), a general attentional response (i.e., student looking at instructional material or instructor), a task direction (e.g., "What word?"), and a 3 s response interval. Correct responses were defined as the student correctly reading the word within 3 s of the task direction. Correct responses resulted in the delivery of verbal praise and a token. An incorrect was defined as the student providing no response within 3 s of the task direction or the student responding incorrectly within 3 s of the task direction. Incorrect responses resulted in removal of the stimulus and the instructor waiting 3 to 5 s before presenting the next trial. Participants received social praise on the average of every third trial to maintain student responding (e.g., "You are doing an excellent job sitting."). A word was eliminated from possible use in the study if a student was able to read the word during any of the three screening sessions. Stimuli were placed into 4 groups of 5 words each, based on the number of letters, number of syllables, and first letter of each word (words with the same beginning letter will be placed in different word sets). See Table 3 for word sets for all participants.

Settings and Arrangements

All screening, instructional, and probe sessions occurred in the participants' special education classroom, a classroom measuring approximately 27 x 36 ft. The classroom contained the following: (a) 7 student desks with 7 small chairs (b) 1 teacher's desk with 1 adult-size chair, (c) 1 rectangular table with 4 small chairs, (d) 3 student computers (e) a 6 x 9 ft carpet for group activities, and (f) a 9 x 9 ft carpet for play and leisure activities. All screening, instructional and probe sessions occurred in a designated 1:1 area, located in a corner at the far end of the classroom. This area measured approximately 5 x 5 ft and consisted of one student desk and two chairs. The area consisted of one white wall, one white wall with windows, and one blue partition. The blue partition measured 6 x 6 ft. The wall with the window had shades pulled down, to eliminate outside distractions. The side of the desk was against the blue partition. The student and teacher sat across from each other at the desk. The student sat in the chair with his back towards the classroom, facing the wall with the windows. All of the walls within the instructional setting were bare.

The generalization setting consisted of the school hallways, office, and cafeteria. School hallways were approximately 9 ft wide. The walls were made out of cement bricks and are painted a soft white. The floor was tiled in a soft beige color. Room numbers were engraved on plaques beside each door. Student artwork and inspirational signs hung throughout the hallways and on doors. The office was approximately 30 by 20 ft and consisted of a copy machine, cubbies, and a large desk. The cafeteria was approximately 60 by 50 ft and consisted of 12 circle tables and 96 small blue chairs. During generalization sessions, the instructor stood next to or in front of the participant. The special education teacher was the primary investigator for the

experiment. Students not involved in the experiment, participated in their normal classroom activities under the supervision of a paraprofessional and/or general education teacher.

Materials and Equipment

Instructional materials consisted of twenty 3 x 5 in unlined index cards containing the stimuli (i.e., sight words) typed in lowercase letters in black font. The words, using various font types and sizes, were created using *Microsoft Office Word (2003)*. The fonts used included Times New Roman and Verdana, with 10 stimuli being randomly assigned each font. The font sizes included 48-point and 36-point, with 10 stimuli being randomly assigned each size. Data was recorded onto data sheets specifically designed for each measurement by the investigator using *Microsoft Word 2003*.

Generalization stimuli consisted of 20 pieces of paper, measuring 8.5 x 11 in, in the landscape position, with one sight word centered in the middle of each sheet of paper. Each sheet of paper was yellow with a 1/2 in black border going around the entire sheet of paper. The stimuli was centered in the middle of the paper using 72-point, Comic Sans font. All words contained lowercase letters and were written using a black font color.

Prior to implementation of the study, the instructor conducted reinforcer assessments with each participant. Based on teacher observation and parent input, participants were presented with a box of potential reinforcers. During individual sessions, participants were permitted to access chosen items (i.e., all objects will be presented simultaneously) and the instructor recorded the order in which the student chose each item or activity. This procedure was repeated four times, with one session occurring each day. This procedure, multiple-stimulus without replacement (MSWO) preference testing as described by DeLeon and Iwata (1996), was used to identify five secondary reinforcers for each participant (see Appendix A).

Prior to each session, participants were presented with an individualized choice board, which contained five 2 x 2 in pictures of reinforcing items and activities. Participants were asked to choose an item or activity from the selection. After the student received five tokens, he would earn a picture of the chosen item or activity, which could be exchanged at the end of the session for 1 minute of play. Tokens consisted of plastic pennies, which are similar in size, color, and appearance to a real penny.

Response Definitions and Recording Procedures

A general attentional response was required for each participant during all trials for every condition (Screening, Generalization, Probe, and CTD). For the screening, probe, and CTD conditions, the general attentional response consisted of the participant looking at the instructional material or instructor upon presentation of the attentional cue, "(Name), look." For the generalization condition, the general attentional response consisted of the participant looking at the generalization material or instructor upon presentation of the general attentional cue, the instructor pointing to the word while saying, "(Name), look." The target behavior was defined as the participant verbally stating the name of the word using the correct phonetic pronunciation. Generalization behavior was defined as the participant verbally stating the name of the word using the correct phonetic pronunciation within 3 s of the question, "What word?"

The following five responses were recorded during the CTD experimental conditions: (a) unprompted corrects, (b) prompted corrects, (c) unprompted incorrect, (d) prompted incorrect, (e) no responses. The following three responses were recorded during any screening, probe, or generalization condition: (a) unprompted correct, (b) unprompted incorrect, (c) no response. An unprompted correct was defined as the participant stating the correct word within 3 s of the question, "What word?" A prompted correct was defined as the participant stating the correct

word within 3 s of the controlling prompt, the instructor's model prompt. An unprompted incorrect was defined as the participant stating an incorrect word within 3 s of the question, "What word?" A prompted incorrect was defined as the participant stating the incorrect word within 3 s after the instructor's model prompt. A no response was defined as the participant not stating any word within 3 s of the instructor's model prompt. Self-corrected responses were scored as incorrect. Since the number of opportunities and time to respond within each observation session remained constant, event-recording procedures with controlled trial presentation were used for screening, generalization, probe, and CTD sessions, as well as generalization sessions (see Appendix B). A correct response was recorded by a written '+' symbol, an incorrect response was recorded by a written '-' symbol, and a no response was recorded by a written '0' symbol, in the appropriate box on the corresponding data sheet.

General Procedures

Inappropriate behaviors for Jeff, Alex, and Lisa were managed on an individual basis, according to each child's behavior intervention plan. Ivan did not exhibit inappropriate behaviors with the frequency, duration, or severity that required a behavior intervention plan at this time.

Jeff exhibited a number of inappropriate behaviors including aggression, crying, and refusal to follow directions. All occurrences of aggression from Jeff were blocked, redirected, and ignored. Aggression included physical aggression (e.g., hitting and kicking) and verbal aggression (e.g., threats, name-calling, and teasing). If Jeff exhibited crying behaviors, teacher withheld attention for crying and prompted him to use appropriate language to express his frustrations (e.g., "This is hard.", "I need help.", "I made a mistake."). If Jeff verbally refused to complete a task or follow a direction, teacher provided him with verbal and visual reminders of

the activity that he is working for, along with a verbal reminder of how he can earn his tokens (e.g., "You earn your tokens by sitting in your seat"). If Jeff still verbally refused to complete a task or follow a direction, teacher approached the student and used graduated guidance to help student complete the task demand.

Alex exhibited a number of inappropriate behaviors including verbal stereotypy (e.g., scripting from movies, books, and the computer, making animal noises, repeating words and phrases out of context), aggression, and verbal refusal behaviors. Teacher withheld attention for all instances of verbal stereotypy. Teacher provided descriptive verbal praise for all appropriate communicative attempts (e.g., "Can I go to the bathroom?", "I don't like handwriting", "I want to eat snack."). Aggression included physical aggression (e.g., hitting, kicking, head butting, pinching, throwing objects), verbal aggression (e.g., threats, name calling, teasing) and destruction of property (e.g., ripping paper, breaking pencils, kicking furniture, pounding on desk). All occurrences of aggression from Alex were blocked, redirected, and ignored. Teacher did not stand behind student, due to head-butting behavior. If student had access to any objects that could be thrown (e.g., pencil, scissor, blocks), teacher did not stand directly in front of student. If he exhibited a destruction of property that prevented him from continuing a task, teacher provided him with the materials he needs to complete the task, using the original materials as much as possible. For example, if Alex broke a pencil, a teacher would not allow him to get up and get another pencil nor throw his broken pencil away. Teacher would give Alex the piece of the broken pencil (with the point) and he would be expected to finish his task using that pencil. If Alex rips, crumbles, or defaces any part of his paper or other instructional materials, a teacher restored the material. Teacher did not provide Alex with new instructional materials nor require him to fix the instructional materials (e.g., flatten out his paper, erase

scribbling marks, use tape to fix ripped paper). All instances of verbal refusal behaviors were redirected and ignored.

Lisa exhibited a number of inappropriate behaviors including aggression, yelling, and refusal to follow directions. All occurrences of aggression from Lisa were blocked, redirected, and ignored. Aggression included physical aggression (e.g., grabbing, hitting, scratching, kicking, biting, pinching, throwing objects) and destruction of property (e.g., ripping paper, breaking pencils, kicking furniture). When Lisa exhibited screaming behaviors, teacher would verbally prompt her to use appropriate language to express her feelings (e.g., "I don't like handwriting.", "I want to go to music", "I really like reading books."). If Lisa verbally refused to follow directions, teacher will repeat the request. If Lisa did not comply, teacher gave her a warning, repeated the direction, and then stated or a teacher is going to help you (e.g., "Lisa, this is your warning. Sit in your chair or a teacher is going to help you.). If Lisa did not comply within 3 s, physical redirection was used to assist her in following the direction. Lisa had a 10 min DRO for having a calm body. If Lisa had 10 min without any instances of physical aggression, she circled a "yes" on her self-monitoring sheet and she received verbal praise and an edible of her choosing.

Two instructional sessions (one for future condition and one for non-future condition) were conducted each day a participant was present. Sessions were held in the morning and afternoon, separated by at least one hour. Generalization conditions consisted of 20 trials, one trial for each target or future target word, over 3 days. Each probe condition consisted of 20 trials, one trial for each target or future target word. Each instructional condition consisted of 15 trials, three trials for each target word. Maximum session length for all conditions was 20 minutes. All conditions were conducted in a 1:1 arrangement. The 20 words were divided into

four sets of five words each, based on the number of letters, number of syllables, and first letter of each word (words with the same beginning letter will be placed in different word sets). Word sets were counterbalanced across conditions and participants. The order of the conditions (future and non-future) were counterbalanced across participants. See Appendix C for target and future target stimuli per condition.

The first condition to be implemented was screening to identify target and future target word sets for all participants. Following generalization pretests, the initial probe condition was implemented to measure the percentages of correct responding to target and future target words. The intervention conditions (e.g., future condition and non-future condition) were implemented next to teach students to read the words sets. The future condition included a token, verbal praise, and presentation of the future target stimuli in the consequent event for correct responding, while the non-future condition will include a token and verbal praise only for correct responding. Once the participant reached criterion, a second probe condition was conducted to measure acquisition of target and future target words. Following the probe condition, participants were taught to read future target stimuli. Once the participant reached criterion, a final probe session was conducted to measure maintenance of target and future target word sets, followed by a generalization post-test.

Throughout all conditions, reinforcement was delivered for appropriate attending behaviors on the average of every third trial (i.e., a VR-3 schedule of reinforcement). Three conditions (Generalization, Word Probe, and CTD) were implemented using an adapted alternating treatments design (Sindelar, Rosenberg, & Wilson, 1985). Screening sessions occurred to identify both target and future target stimuli. Upon completion of screening sessions, the conditions were implemented in the following sequence: Generalization Pre-test, Word Probe

1, CTD 1 (future and non-future), Word Probe 2, CTD 2, Word Probe 3, and Generalization Post-test.

Generalization Procedures

The purpose of generalization pre/post tests was to assess stimulus generalization from a classroom environment to natural conditions. Generalization was assessed by asking participants to read words in the natural environment (e.g., throughout the school) prior to instruction and upon completion of all word sets. A generalization trial consisted of the instructor walking the participant to within 3 ft of the word and pointing to the word while presenting the attentional cue, "(Name), look." Following the attentional response, the participant orienting eye gaze towards the instructor or material, the instructor asked, "What word?" Incorrect responses and no responses were ignored. Correct responses were reinforced on a CRF schedule with verbal praise (i.e., "Great job!", "Excellent work!", "Good answering!"). During all generalization sessions, verbal praise was delivered to participants for appropriate social and attending behaviors (e.g., looking, walking quietly, standing calmly) on the average of every third response (i.e., a VR-3 schedule of reinforcement) to maintain student responding. Generalization data for the pre and posttest was collected in 3 sessions over 3 days, with each participant having 20 generalization trials per session, one trial per target or future target stimuli. The time of day for generalization assessment sessions (i.e., morning or afternoon) was counterbalanced across participants. The generalization condition differed from the instructional condition in the following ways: (1) stimuli was presented in the natural environment, (2) stimuli was not presented directly in front of the student, (3) stimuli were a different size. The maximum length of a generalization session was 20 minutes.

Probe Procedures

Prior to beginning instruction, probe sessions were conducted for a minimum of three sessions or until data are stable. The purpose of the probe condition was to assess correct expressive identification of all target and future target stimuli. These sessions were conducted in a 1:1 arrangement and consisted of 20 trials, with all target and future target words intermixed and presented once per session (i.e., 15 target words and 5 future target words). An additional probe session occurred following a participant reaching instructional criteria in each condition (i.e., future and non-future). During these sessions, stimuli assessed included target and future target words for the future condition and consist of 20 trials, 2 trials per word (i.e., 5 target words and 5 future target words). For the non-future condition, stimuli assessed included target words only and consist of 10 trials, 2 trials per word. The final probe condition for both conditions consisted of 20 trials, 2 trials per word. All probe sessions were conducted in a 1:1 arrangement. Each probe session lasted no more than 20 minutes.

A trial during any probe session consisted of an attending cue, attending response, task request, and a 3 s response interval. The instructor held the target stimulus in front of the student and presented the attending cue, which consisted of the instructor saying, "Name, look". Following the attending response, the participant looking at the flashcard, the instructor provided the task request, "What word?" Incorrect responses and no responses resulted in the instructor ignoring the error, removing the word card, and waiting 3 to 5 s before presenting the next trial. Correct responses were reinforced on a CRF schedule with a token and verbal praise (i.e., "Great job!", "Excellent work!", "Good answering!"). During all probe sessions, verbal praise was delivered to participants for appropriate social and attending behaviors (e.g., sitting, looking) on

the average of every third response (i.e., a VR-3 schedule of reinforcement) to maintain student responding.

Constant Time-Delay (CTD) Procedure

A CTD procedure was used to teach each student 4 sets of 5 sight words. Each instructional session consisted of 15 trials (3 trials on each of the five stimuli in a set). Two instructional sessions were conducted, separated by at least one hour, each day a participant was present in school. The first instructional session in each condition useda 0 s delay, in which the instructor immediately followed presentation of the stimulus and the task request, "What word?" with a controlling prompt (i.e., a verbal model of the correct response of the target word by the teacher). An individual criterion of 100% prompted corrects was used to move from a 0 s delay session. Subsequent sessions were conducted using 4 s delay trials until the participant reached criterion level responding on the word set (i.e., 90% unprompted correct responses over three consecutive sessions, with the first response to each target word resulting in an unprompted correct when reinforced for two days on a VR-3 schedule of reinforcement). The instructor reinforced participants on a CRF schedule until they achieved 90% unprompted correct responses over 1 day, with the first presentation of each target word resulting in an unprompted correct. Once this criterion was met, reinforcement was thinned to a VR-3 schedule.

The two instructional conditions consisted of a future condition and a non-future condition. In the future condition, correct responding resulted in a token, descriptive social praise, plus presentation of future target word, while correct responding in the non-future condition resulted in a token and descriptive social praise only.

Each trial in the future condition began with the instructor providing an attentional cue of "Name, look" and waiting for the students' eye gaze to orient towards the instructor or materials.

Once an attentional response had been secured, the instructor presented the stimulus to the student by holding the flashcard directly in front of the child, with no more than 2 ft between the child's face and the instructional material. Presentation of the target word was followed by the task request, "What word?" The instructor then waited the appropriate delay interval, recorded the response, and presented the appropriate consequent.

For a 0 s delay interval, prompted corrects received descriptive social praise (e.g., "Excellent job! The word is *target word (gym).")* followed by the presentation of the future target stimulus (i.e., "This word is *future target word (art)*."). The instructor held future target words directly in front of and no more than 2 ft from participants for approximately 1 s. Prompted errors and no responses were ignored. Due to the 0 s delay interval, there was no opportunity for a participant to emit an unprompted correct or an unprompted error. The instructor did not reinforce participants for attending to future target stimuli. The participants were not be required to respond to the future target stimuli nor were they prompted to look at the stimuli.

For a 3 s delay interval, unprompted errors resulted in the instructor reminding the student to "Wait, if you don't know." followed by a 3 to 5 s intertrial interval. Prompted corrects and unprompted corrects resulted in a token, descriptive social praise (e.g., "Excellent job! The word is *target word (gym).")* followed by the presentation of the future target stimulus (i.e., "This word is *future target word (art)*."). The instructor ignored all prompted errors and no responses, waited a 3 to 5 s intertrial interval, and then presented the next trial. Future target words were not presented if the participant emited an unprompted error, prompted error, or a no response.

The non-future condition was identical to the future condition with the exception of the consequent event (i.e., presentation of future target stimuli) following correct responses. Prompted and unprompted correct responses resulted in a token and descriptive praise only (i.e., "Nice job! That is *target word (nurse*)."

Once participants reach criterion in the future and non-future condition, constant time delay was used to teach participants to read two additional sets of five words (following probe sessions). One set of words consisted of the words presented in the consequent event during the future condition (future words), while the other set of words were not presented to the participants (non-future words). Procedures during these sessions were identical to previous instructional conditions, with the exception of the presentation of future target stimuli. The trial sequence and instructional criterion remained the same as previous word conditions, with each session consisting of 15 trials (3 trials on each of the five stimuli in a set). If following the second probe condition a participant had acquired a word through presentation in the consequent event, the participant did not receive instruction on that word in order to allow comparisons between conditions.

Experimental Design

An adapted alternating treatments design (Sindelar, Rosenberg, & Wilson, 1985) was used to compare the effectiveness and efficiency of presenting future target stimuli during instruction on current target stimuli, as well as the effects of presenting non-target information in the consequent event on `future learning of non-target stimuli.` The design evaluated experimental control by including a baseline (probe) condition prior to introduction of the intervention. The effectiveness of each condition was demonstrated when performance on target words showed an immediate change in level and trend upon introduction of the CTD procedure.

To control for threats to data variability, intervention was not introduced until a minimum of three probe sessions were conducted, or until data are stable. The efficiency of each condition was evaluated by measuring the number of sessions through criterion and the number and percent of errors through criterion. A pre-test/post-test design was used to assess generalization of information.

The main threat to internal validity for with an adapted alternating treatments design is mulittreatment interference. Sequencing and carry-over effects were controlled by rapidly alternating the two intervention conditions (e.g., Future Word Condition and Non-Future Word Condition) and by applying interventions to different, but functionally equivalent, stimuli (e.g., word sets). To control for threats to internal validity, including history and maturation, all conditions and variables across participants were counterbalanced across days, stimuli were counterbalanced across participants, and target stimuli for one participant were future stimuli for another participant. To control for the inhibitive effect of testing, social reinforcement for desired behaviors were provided on a VR-3 schedule of reinforcement during all generalization and probe sessions. During intervention conditions, schedules of reinforcement were thinned from a CRF to a VR-3, to ensure that the skill maintains when reinforcement is decreased. To control for instrumentation threats, the primary investigator conducted all generalization, probe, and intervention sessions. Furthermore, all definitions and procedures were described in sufficient detail to allow for replication. This study included 4 participants, in order to prevent the threat of attrition. External validity was addressed through direct inter-subject replication of effect with all participants in the study.

Reliability

Inter-observer reliability data was conducted at least once a week and at least once during each experimental condition by independent observers familiar with children with autism. Data was collected for at least 20% of all sessions for all participants and conditions. Dependent variable reliability data was calculated using the point by point method, by dividing the number of agreements by the sum of the number of agreements plus disagreements and multiplying by 100 (Wolery, Bailey, & Sugai, 1988). The percentage agreement was reported for each participant across all experimental conditions. For all sessions in which interobserver reliability is collected, the mean percent agreement and range was reported. The minimal acceptable reliability levels were 90%.

The primary investigator trained all independent observers prior to their involvement in observation sessions. The initial training session took place in the instructional area, in which the probe and experimental conditions occurred, and other settings within the school, in which generalization sessions occurred. The observer engaged in a role-playing game with the primary investigator, in which the primary investigator was the participant. The observer recorded reliability measures on at least 5 responses, to ensure correct usage of the data sheet, as well as correct recording of reliability measures. If the observer did not respond with 100% accuracy, the observer recorded reliability measures on another 5 responses. The training session did not last more than 20 minutes. The primary investigator reviewed all definitions and data collection methods and procedures with the observer during this session, as well as prior to their involvement in every reliability session.

Procedural reliability data was collected at least once a week and at least once during each experimental condition by independent observers familiar with children with autism. Data

was collected for at least 20% of all sessions for all participants and conditions. Independent variable reliability was calculated by dividing the total number of observed teacher behaviors by the total number of observed teacher behaviors and multiplying by 100 (Billingsley, White, & Munson, 1980). The teacher behaviors on which data will be collected included presenting the correct target stimulus, presenting the task direction, waiting the appropriate response interval, presenting the appropriate consequences, providing the future target stimuli, and waiting the correct intertrial interval. Percentage agreement was reported for each teacher behavior. Data on procedural reliability was collected at the same time as interobserver reliability; therefore, an observer will record data for both on one data sheet (see Appendix D).

Social Validity

Before beginning the study, social validity data was collected on the objectives of the study by administering a questionnaire to parents and the classroom teacher. Upon completion of the study, social validity data was collected on the procedures and outcomes of the study by administering a questionnaire to parents and the classroom teacher. A Social Validity Assessment Form (see Table 4) was sent home in each student's daily communication log to be completed and sent back to school by the parents of all participants. Parents were asked to rate their level of agreement to six statements using a 5-point Likert-scale, ranging from "strongly disagree" (1) to "strongly agree" (5).

Table 2

Description of Participants

	Jeff	Alex	Ivan	Lisa
Age	7-4	7-10	8-10	9-6
Grade level	1	2	3	3
Ethnicity	Hispanic	Caucasian	African American	Hispanic
Medication	None	None	None	Concerta 18 mg per day
CARS score	34	36	33	34
Previous instruction using Edmark	No	Yes	Yes	No
Previous CTD Instruction	Yes	Yes	Yes	Yes
Pre-instruction sight word reading (Percent correct: Primer level sight words); BCIBS	26%	68%	74%	6%

CARS, Childhood Autism Rating Scale; Edmark, Edmark Sight Words Program; BCIBS, Brigance Comprehensive Inventory of Basic Skills

Table 3

Word Sets with Generalization Setting in Parentheses

Word Set A	Word Set B	Word Set C	Word Set D
fragile (office)	caution (office)	warning (cafeteria)	entrance (hallway)
principal (hallway)	poisonous (hallway)	counselor (hallway)	hazardous (hallway)
restricted (cafeteria)	gentlemen (hallway)	flammable (hallway)	recycle (cafeteria)
emergency (hallway)	automatic (cafeteria)	education (office)	secretary (office)

CHAPTER 3

RESULTS

Reliability

Inter-observer and procedural reliability was collected during 33% of generalization sessions, 33% of Probe 1 sessions, 25% of CTD sessions, 33% of Probe 2 sessions, and 20% of Probe 3 sessions. For all sessions in which inter-observer reliability was recorded, the percentage of agreement was 100%. The procedural reliability was 100% for all researcher behaviors across all experimental conditions.

Visual Analysis

Figures 1-4 show percentages of unprompted correct responses and prompted correct responses for each participant during probe and CTD conditions. During pre-instruction probe sessions, all participants identified 0% of stimuli. Participants maintained 0% correct responding until introduction of the CTD procedure. All participants reached criterion levels during the first CTD instruction. Visual analysis shows that levels of unprompted correct responses for the future condition words and non-future condition words changed from a stable 0% trend to a therapeutic trend. The therapeutic trend continued for the future and non-future condition words at about the same rate until all participants reached criterion levels. Results from the second probe condition showed that all participants learned to read some or all of the future target stimuli during instruction of current target stimuli, with Ivan and Alex learning to read all of the words, Lisa learning to read three of the words, and Jeff learning to read two of the words. Since Alex and Ivan acquired all future target words and Lisa acquired three future target words

through incidental presentation, they did not receive instruction on the words in CTD2. Jeff was the only participant who received instruction on the future target words, since he acquired two words, allowing two future target words to be targeted for instruction. During the second instructional condition, Jeff's levels of unprompted correct responses for the future target stimuli changed from a stable 0% trend to an accelerating trend and reached criterion level in fewer sessions than the non-future stimuli, making the future condition more efficient. Results of the final probe session showed that Jeff maintained target and future target word sets at or above criterion levels.

Effectiveness

The percentage of correct responding for each participant is shown in Figures 1-4, respectively. When acquiring stimuli in CTD1, participants required 5-8 sessions in the future condition and 7-9 sessions in the non-future condition. An immediate and abrupt change in percentage of correct responding occurred upon introduction of the CTD procedure. All participants reached criterion level responding without any procedural modifications. All participants maintained criterion level responding on all target words during the second Probe condition.

Efficiency

The numbers of sessions, number of trials, number of errors, percentage of errors, and direct instructional time through criterion for each student are presented in Table 4. There were minimal differences across the total numbers on all efficiency measures between the future and non-future condition for CTD1. Overall, the mean number of trials required for participants to reach criterion were similar, with participants requiring 81 in the future condition and 90 in the non-future condition. Participants committed between 0% and 3.8% errors when acquiring

stimuli in the future condition and 0% and 2.7% errors when acquiring stimuli in the non-future condition.

Generalization

Table 5 shows the percentage correct for each participant on the identification of all stimuli during Pre-test and Post-test conditions. During pre-test generalization sessions, no participants correctly identified any stimuli, while during post-test generalization sessions, 2 participants identified 100% of stimuli, 1 participant identified 94%, and 1 participant identified 88%. All participants identified at least 88% of stimuli when presented in their natural environment during the post-test generalization sessions (mean = 96%).

Social Validity

All participants had IEP objectives related to sight word reading, which is an indication of the importance of this skill in the education of all of the participants. In addition, social validity was also assessed using a Likert Scale questionnaire. Three of four parents and the classroom teacher responded to the questionnaire. All responses indicated favorable answers to all questions, with each parent and the classroom teacher answering either "strongly agree" (5) or "agree" (4). The mean response for questions ranged from 5.0 to 4.7, suggesting that parents and the teacher had a positive opinion regarding the objectives, procedures, and outcomes of the research study. Table 6 shows an analysis of the data obtained from the social validity assessment forms.

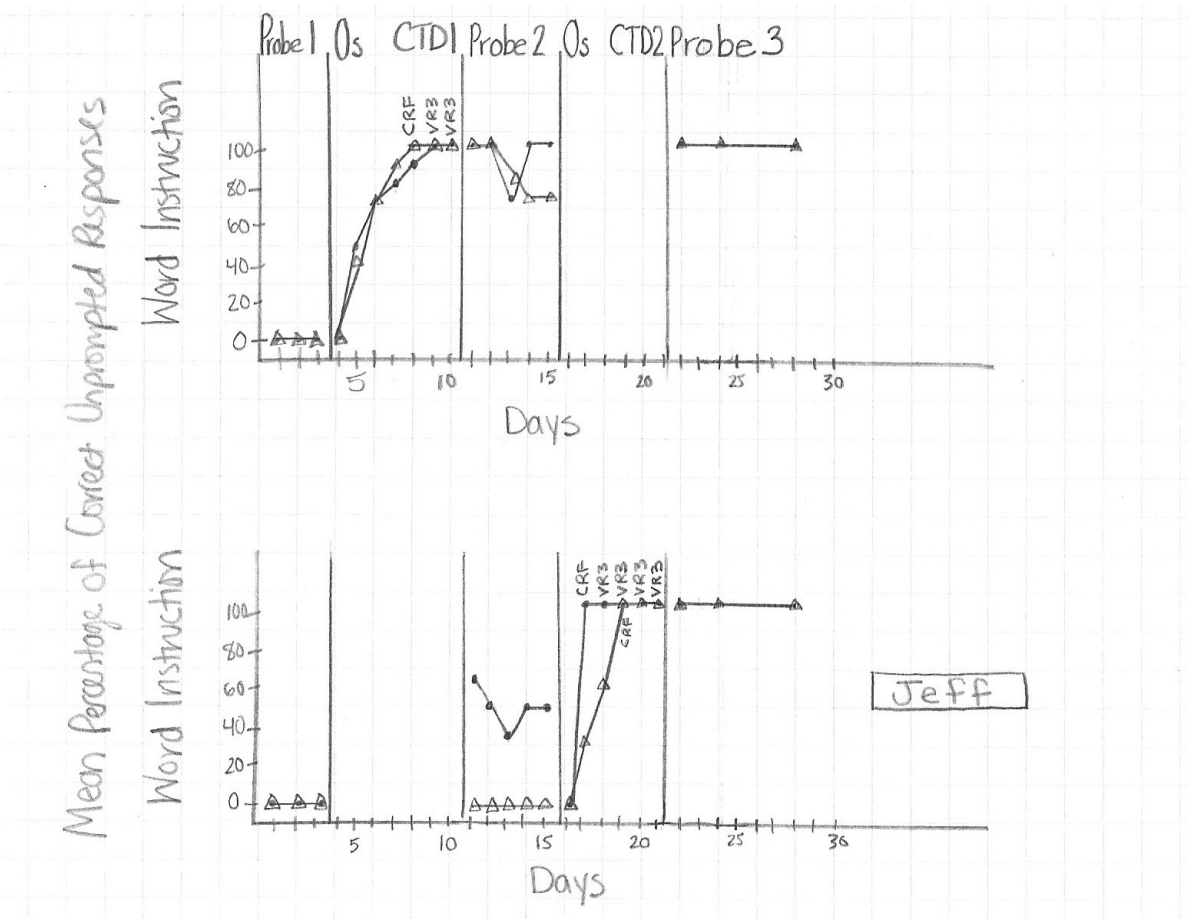

Figure 1. The percentage of correct unprompted responding by Jeff for all sets of words during probe and instructional conditions. The percentage of correct unprompted responses to words assigned to the future condition are represented by closed circles. The percentage of correct unprompted responses to words assigned to the non-future condition are represented by open triangles.

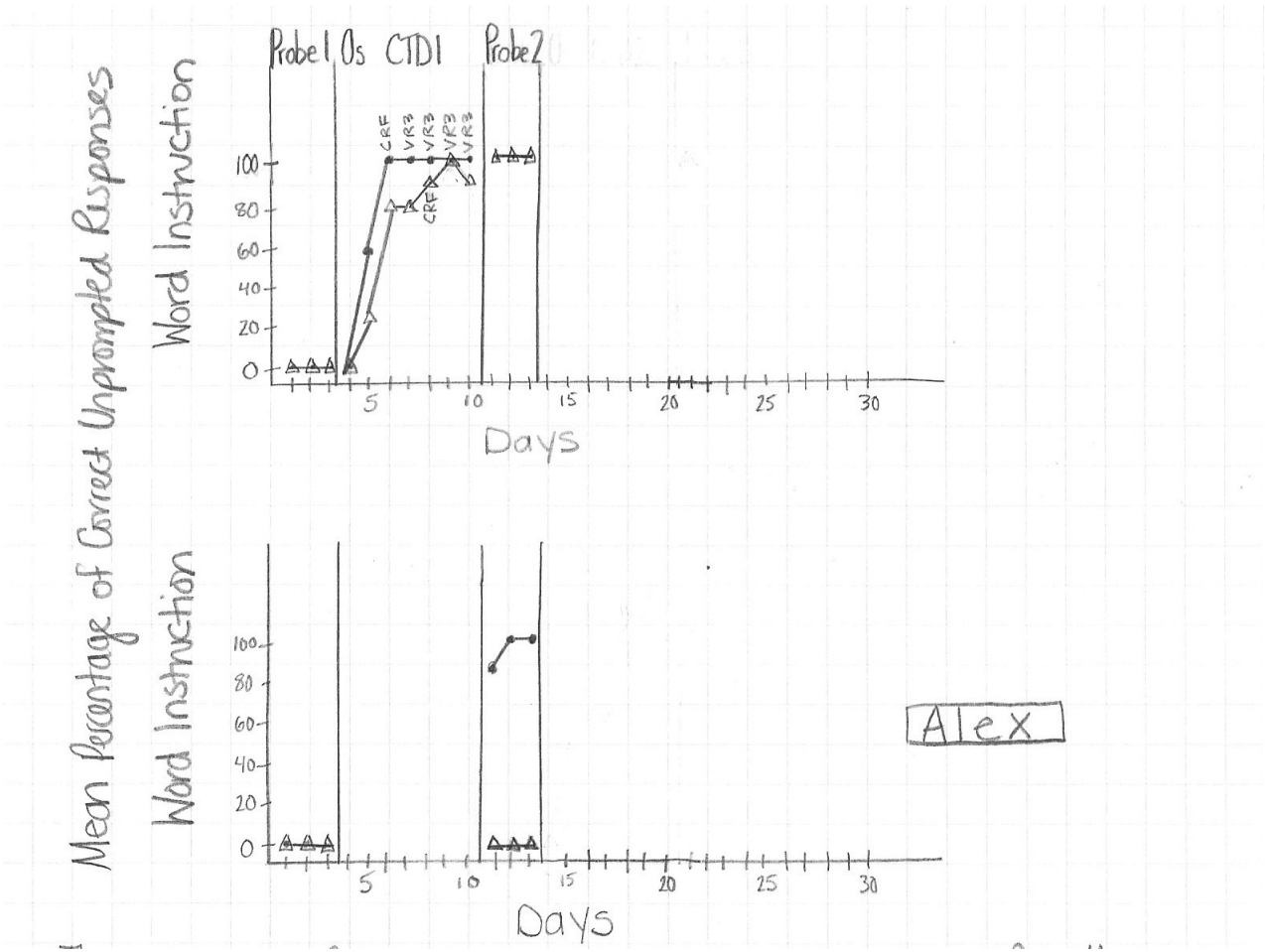

Figure 2. The percentage of correct unprompted responding by Alex for all sets of words during probe and instructional conditions. The percentage of correct unprompted responses to words assigned to the future condition are represented by closed circles. The percentage of correct unprompted responses to words assigned to the non-future condition are represented by open triangles.

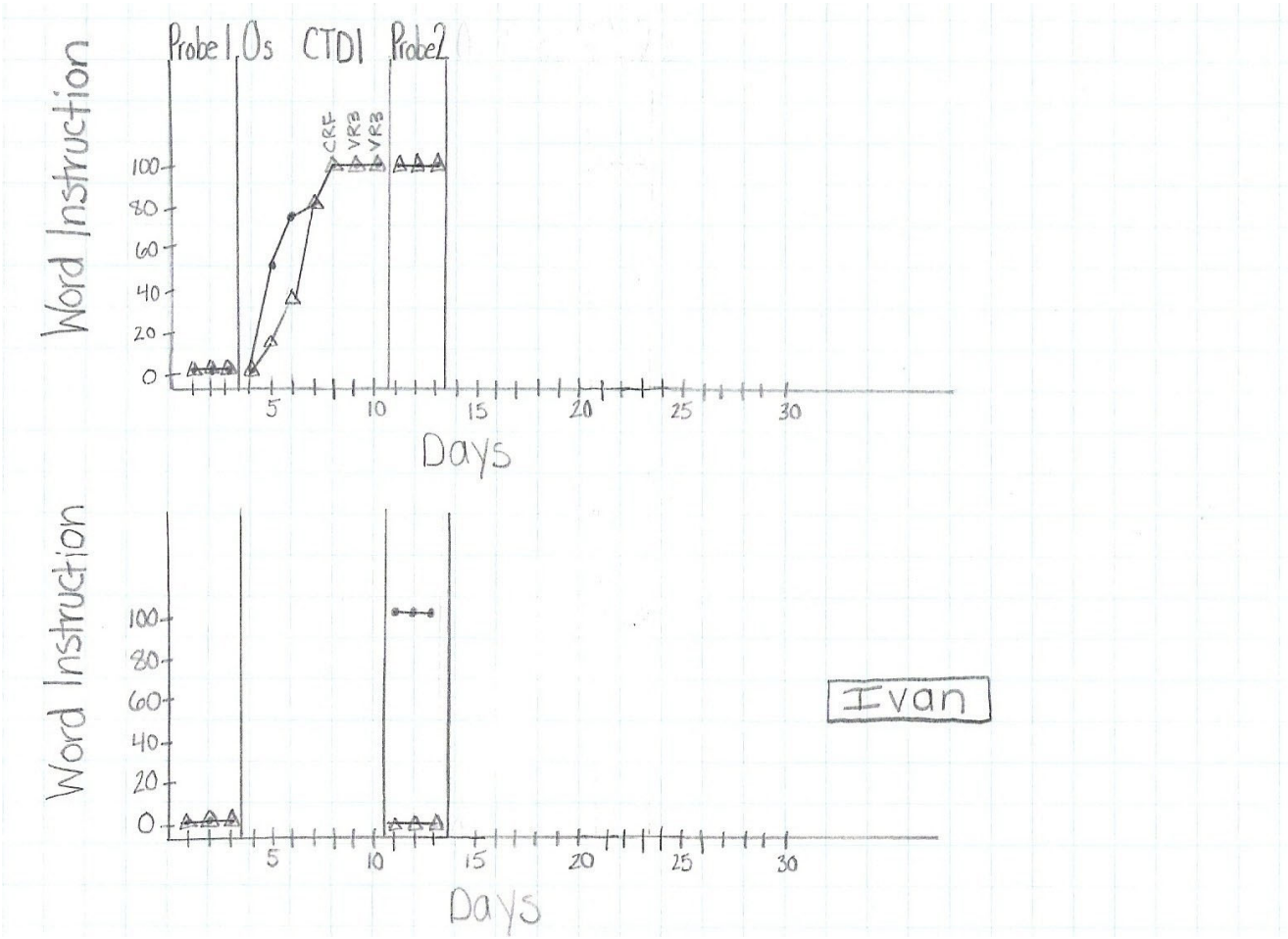

Figure 3. The percentage of correct unprompted responding by Ivan for all sets of words during probe and instructional conditions. The percentage of correct unprompted responses to words assigned to the future condition are represented by closed circles. The percentage of correct unprompted responses to words assigned to the non-future condition are represented by open triangles.

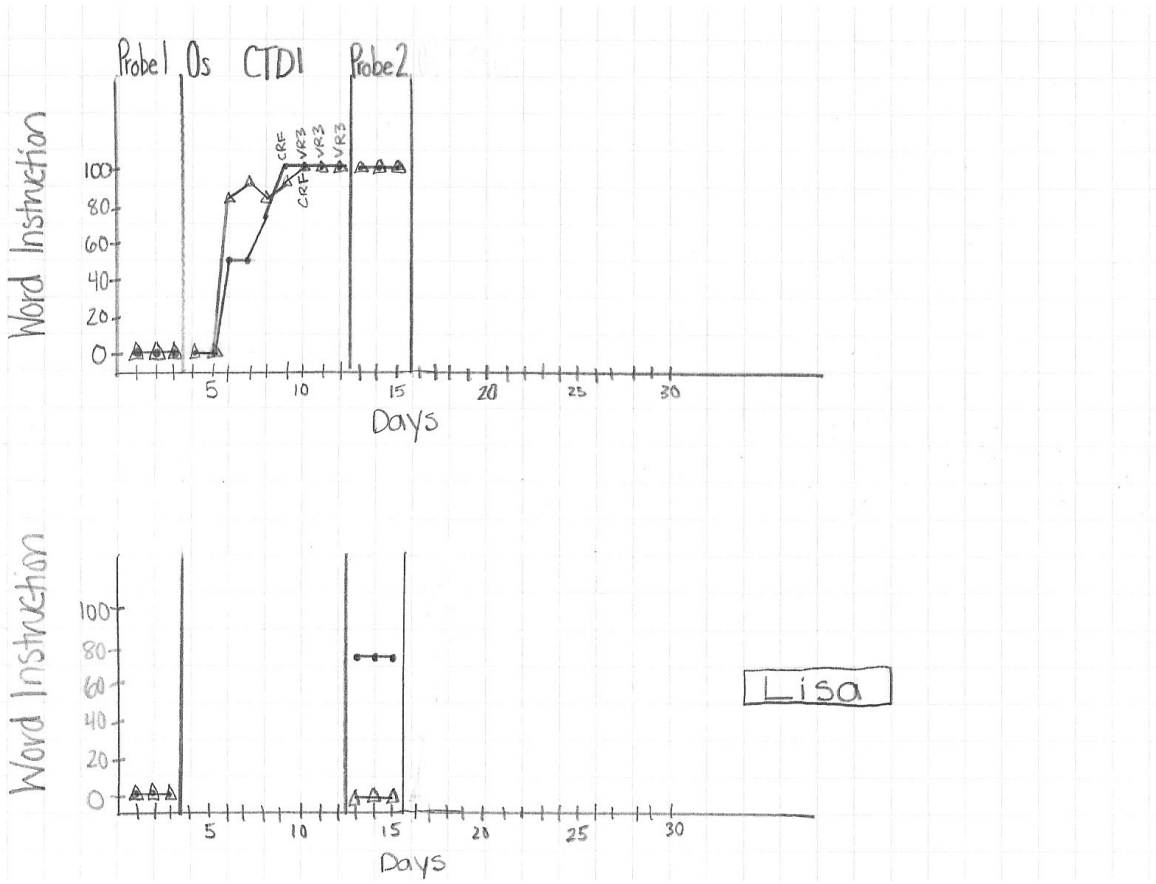

Figure 4. The percentage of correct unprompted responding by Lisa for all sets of words during probe and instructional conditions. The percentage of correct unprompted responses to words assigned to the future condition are represented by closed circles. The percentage of correct unprompted responses to words assigned to the non-future condition are represented by open triangles.

Table 4

Efficiency Measures

	Number of sessions		Number of trials		Numbers of errors		Percent of errors		Minutes of direct instruction	
Student Condition:	Future	Non-future	Future	Non-Future	Future	Non-Future	Future	Non-Future	Future	Non-Future
CTD1: Words										
Jeff	7	7	84	84	3	2	3.6	2.4	15	15
Alex	5	7	60	84	0	1	0	1.2	11	15
Ivan	7	7	84	84	2	0	2.4	0	14	14
Lisa	8	9	96	108	3	3	3.1	2.7	18	21
Mean	6.8	7.5	81	90	2	1.5	2.3	1.6	14.5	16.3
CTD2: Words										
Jeff	4	6	24	36	0	1	0	2.7	4	6
Alex	–	–	–	–	–	–	–	–	–	–
Ivan	–	–	–	–	–	–	–	–	–	–
Lisa	–	–	–	–	–	–	–	–	–	–
Mean	4	6	24	36	0	1	0	2.7	4	6

Table 5

Correct Identification of Stimuli during Pre-test and Post-test Conditions

Participant	Target and Future Target Words	
	Pre-test (%)	Post-test (%)
Jeff	0	100
Alex	0	88
Ivan	0	94
Lisa	0	100
Mean	0	96

Table 6

Analysis of Data Obtained from Social Validity Assessment Forms

	Statements	Adults	Number of Responses per Score						
			Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree	Mean Scores	
Objective	1. The sight words taught were consistent with the student's IEP goals and objectives.	Parents/Guardians	0	0	0	1	2	Strongly Agree	Strongly Agree
		Teachers	0	0	0	0	1	Strongly Agree	
	2. The words taught during instruction will increase the student's independent functioning.	Parents/Guardians	0	0	0	1	2	Strongly Agree	Strongly Agree
		Teachers	0	0	0	0	1	Strongly Agree	
Procedures	3. A 1:1 instructional arrangement is appropriate to teach a student with autism new skills.	Parents/Guardians	0	0	0	1	2	Agree	Strongly Agree
		Teachers	0	0	0	0	1	Strongly Agree	
	4. While teaching a child with autism a new skill, it is important for the teacher to program for generalization.	Parents/Guardians	0	0	0	0	3	Strongly Agree	Strongly Agree
		Teachers	0	0	0	0	1	Strongly Agree	
Outcome	5. Reading functional sight words is an important skill for children with disabilities.	Parents/Guardians	0	0	0	0	3	Strongly Agree	Strongly Agree
		Teachers	0	0	0	0	1	Strongly Agree	
	6. The student may use the information he/she has learned at home, in school, and in the community.	Parents/Guardians	0	0	0	1	2	Strongly Agree	Strongly Agree
		Teachers	0	0	0	0	1	Strongly Agree	

CHAPTER 4

DISCUSSION

The purpose of this study was to evaluate the effects of presenting non-target stimuli in the consequent event on the future learning of non-target stimuli for 5 children with autism using a constant time delay (CTD) procedure to teach students to read sight words. Correct responses to one set of stimuli resulted in a token, verbal praise, and presentation of future target stimuli (future condition), while correct responses to the other set of stimuli resulted in a token and verbal praise only (non-future condition). Future target stimuli consisted of sight words that are unrelated to target stimuli. Following criterion level performance in both conditions, students were taught using a CTD procedure to read the future target words and a new set of target stimuli. Efficiency measures included the number of sessions, number of trials, number of errors, percentage of errors, and direct instructional time through criterion. Additionally, generalization of sight word reading was examined under natural conditions using a pre- and post- test assessment method.

Findings Related to Research Question 1

The first research question, *Will the presentation of future target stimuli during instruction of current target stimuli result in more efficient (fewer number of trials, fewer number of sessions, fewer number and percentage of errors, and fewer minutes of instructional time through criterion) future learning of non-target stimuli for children with autism?*, was not able to be answered, due to three students acquiring all or most of the future target words through the incidental presentation of words during CTD1. Consistent with previous research, the

participants in this study were able to acquire all or some of the future target words when presented in the consequent event. This occurrence prevented the comparison of effectiveness and efficiency measures between the future and non-future conditions for 3 out of 4 participants. Jeff was the only student who received instruction on the future target words, since he acquired 2 out of the 4 future target words. For Jeff, the future condition was more efficient than the non-future condition. When future target stimuli were targeted for instruction, Jeff reached criterion level responding in fewer sessions, with a lower number and percentage of errors, and in less instructional time than initial target stimuli. Future research needs to be conducted to determine if this finding can be replicated across students.

Findings Related to Research Question 2

In response to the second research question: *Will including non-target stimuli in the consequent event during instruction of current target stimuli affect the effectiveness (the percentage of unprompted correct responding) and/or the efficiency (the number of trials, number of sessions, number and percentage of errors, and minutes of instructional time through criterion) of the constant time delay procedure for children with autism?*, including non-target stimuli did not affect the effectiveness or the efficiency of the constant time delay procedure. All participants reached criterion level responding after introduction of the independent variable. The findings of this study support the presentation of future target stimuli during instruction of current stimuli when teaching children with autism. This study supports and expands on the findings of numerous other studies that have demonstrated the benefits of presenting non-target stimuli in the consequent event (Werts, Wolery, Holcombe, & Gast, 1995) by finding results that indicate the presentation of future target stimuli does not interfere with acquisition of current target stimuli, even when using non-target stimuli that is unrelated to the target stimuli.

Findings Related to Research Question 3

In response to the third research question, *Will children with autism be able to generalize acquired sight words from the instructional environment of the classroom to natural conditions throughout the school?,* all four participants were able to generalize words learned through constant time delay instruction to three different locations throughout the school.

Implications of Findings

Based on the results of this study, there are several changes to the methodology used in this study that would greatly benefit future researchers. First, the word sets in this study were too small and did not include enough words to ensure that participants did not learn all future target words during initial target word instruction. An alternative would be to include word sets that are at least twice the size of the word sets used in this study. Second, word sets were counterbalanced across participants and conditions. Due to differences in sight word reading ability, some participants were learning longer, more advanced words, before mastering shorter, easier words. In order to increase the social validity of the words being taught, future researchers may want to individualize the word sets for each participant. Finally, since previous research has shown that presentation of future target stimuli does not affect participants' acquisition of initial target stimuli, future studies may want to examine efficiency measures by creating word sets that inter-mix future and non-future words.

Future Research Questions

This study raises a number of important future research questions, including: (1) Will students with autism acquire future target stimuli that are presented in a different modality less or more efficiently than future target stimuli that are presented in the same modality as the initial target stimuli? (2) Will presenting future target stimuli to students with autism on an intermittent

schedule, rather than after every correct response, affect the efficiency of future learning of non-target stimuli? (3) Can a change in the temporal presentation of the non-target information have an effect on the future learning of the non-target stimuli?

It is important for researchers to identify efficient instructional strategies for children with autism. The findings of this research may provide some implications for how classroom teachers of children with autism can best support and facilitate acquisition of skills, especially as it relates to efficiency of instruction. However, additional studies are needed to determine the best way to manipulate current instruction to influence the efficiency of future instruction.

REFERENCES

Gursel, O., Tekin-Iftar, E., Bozkurt, F. (2006). Effectiveness of simultaneous prompting in small group: The opportunity of acquiring non-target skills through observational learning and instructive feedback. *Education and Training in Developmental Disabilities, 41*(3), 225-243.

Austin, P., & Boeckman, K. (1990). *Signs around us: Edmark functional word series.* Edmond, WA: Edmark Corporation.

Holcombe, A., Wolery, M., Werts, M.G., & Hrenkevich, P. (1993). Effects of instructive feedback on future learning. *Journal of Behavior Education, 3*, 285-359.

Ledford, J., Gast, D.L., Luscre, D. & Ayres, K. (in press). Observational and incidental learning by children with autism during small group instruction: *Journal of Autism and Other Developmental Disabilities.*

Parrott, K.A., Schuster, J.W., Collins, B.C., & Gassaway, L.J. (2000). Simultaneous prompting and instructive feedback when teaching chained tasks. *Journal of Behavioral Education, 10*, 3-19.

Sindelar, P.T., Rosenberg, M.S., & Wilson, R.J. (1985). An adapted alternating treatments design for instructional research. *Education and Treatment of Children, 8*, 67-76.

Stinson, D.M., Gast, D.L., Wolery, M., & Collins, B.C. (1991). Acquisition of nontargeted information during small group instruction. *Exceptionality, 2*, 65-80.

Taylor, P., Collins, B., Schuster, J., & Kleinert, H (2002). Teaching laundry skills to high

school students with disabilities: Generalization of targeted skills and nontargeted information. *Education and Training in Mental Retardation and Developmental Disabilities, 37*, 172-183.

Werts, M.G., Wolery, M., Gast, D.L., & Holcombe, A., & Frederick, C. (1993). Effects of instructive feedback related and unrelated to the target behaviors. *Exceptionality, 4*, 81-95.

Werts, M.G., Wolery, M., Holcombe, A., & Gast, D.L. (1995). Instructive feedback: Review of parameters and effects. *Journal of Behavioral Education, 5,* 55-75.

Wolery, M., Doyle, P.M., Ault, M.J., Gast, D.L., Meyer, S., & Stinson, D. (1991). Effects of presenting incidental information in consequent events on future learning. *Journal of Behavioral Education, 1,* 79-104.

Wolery, M., & Gast, D.L. (1990). *Efficiency of instruction: Conceptual framework and research directions.* Manuscript submitted for publication.

Wolery, M., Werts, M. G., Holcombe, A., Billings, S.S., & Vassilaros, M. A. (1993). Instructive Feedback: A comparison of simultaneous and alternating presentation of non-target stimuli. *Journal of Behavioral Education, 3*, 187-204.

Wolery, T.D., Schuster, J.W., Collins, B.C. (2000). Effects on future learning of presenting non-target stimuli in antecedent and consequent conditions. *Journal of Behavioral Education, 10,* 77-94

APPENDIX A

REINFORCER PREFERENCE TEST ASSESSMENT DATA SHEETS

Participant _____ Date _____ Time _____

Trial	Item or Activity (Circle the column for each choice)									Identified Reinforcers
1	foam ball	markers	flashlight	play doh	shaving cream	mirror	movie	chew tube	fan	
2	foam ball	markers	flashlight	play doh	shaving cream	mirror	movie	chew tube	fan	
3	foam ball	markers	flashlight	play doh	shaving cream	mirror	movie	chew tube	fan	
4	foam ball	markers	flashlight	play doh	shaving cream	mirror	movie	chew tube	fan	
5	foam ball	markers	flashlight	play doh	shaving cream	mirror	movie	chew tube	fan	

Participant _____ Date _____ Time _____

Trial	Item or Activity (Circle the column for each choice)									Identified Reinforcers
1	foam ball	markers	flashlight	play doh	shaving cream	mirror	movie	chew tube	fan	
2	foam ball	markers	flashlight	play doh	shaving cream	mirror	movie	chew tube	fan	
3	foam ball	markers	flashlight	play doh	shaving cream	mirror	movie	chew tube	fan	
4	foam ball	markers	flashlight	play doh	shaving cream	mirror	movie	chew tube	fan	
5	foam ball	markers	flashlight	play doh	shaving cream	mirror	movie	chew tube	fan	

APPENDIX B

CONSTANT TIME DELAY DATA SHEETS

Student _____ Instructor _____

Procedure _____ Condition/Phase _____

Behavior _____ Reliability Observer _____

Date				Date				Date			
Session				Session				Session			
Start Time				Start Time				Start Time			
Stop Time				Stop Time				Stop Time			
Total Time				Total Time				Total Time			
Delay				Delay				Delay			
Trial	Stim.	Before	After	Trial	Stim.	Before	After	Trial	Stim.	Before	After
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
8				8				8			
9				9				9			
10				10				10			
11				11				11			
12				12				12			
13				13				13			
14				14				14			
15				15				15			
Instructor Summary Data				Instructor Summary Data				Instructor Summary Data			
Corrects		N= %	N= %	Corrects		N= %	N= %	Corrects		N= %	N= %
Incorrect		N= %	N= %	Incorrect		N= %	N= %	Incorrect		N= %	N= %
No Response		N= %	N= %	No Response		N= %	N= %	No Response		N= %	N= %
Inter-Observer Summary Data				Inter-Observer Summary Data				Inter-Observer Summary Data			
Corrects		N= %	N= %	Corrects		N= %	N= %	Corrects		N= %	N= %
Incorrect		N= %	N= %	Incorrect		N= %	N= %	Incorrect		N= %	N= %
No Response		N= %	N= %	No Response		N= %	N= %	No Response		N= %	N= %

Inter-Observer Agreement			Inter-Observer Agreement			Inter-Observer Agreement		
Corrects	N= %	N= %	Corrects	N= %	N= %	Corrects	N= %	N= %
Incorrect	N= %	N= %	Incorrect	N= %	N= %	Incorrect	N= %	N= %
No Response	N= %	N= %	No Response	N= %	N= %	No Response	N= %	N= %

KEY: + = CORRECT, - = INCORRECT, 0 = NO RESPONSE

APPENDIX C

TARGET AND FUTURE TARGET STIMULI PER CONDITION

Condition:	Future		Non-future
Student:	Current Target	Future Target	
CTD1: Words			
Jeff	Set A	Set B	Set C
Alex	Set B	Set C	Set D
Ivan	Set C	Set D	Set A
Lisa	Set D	Set A	Set B
CTD2: Words			
Jeff	Set B	None	Set D
Alex	Set C	None	Set A
Ivan	Set D	None	Set B
Lisa	Set A	None	Set C

APPENDIX D

PROCEDURAL FIDELITY DATA SHEETS

Generalization and Probe

Student _____ Instructor _____ Date _____ Session _____

Behavior _____ Start Time ___:___ Stop Time ___:___ Total Time _____

Condition/Phase _____ Pre-Test/Post Test (circle one) Reliability Observer _____

Trial	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Stimulus																				
1. T presents stimulus																				
2. T delivers attending cue																				
3. T ensures attending response																				
4. T delivers task direction																				

5. T waits 3 s response interval																			
6. T records student response (UC, UI, NR)																			
7. T delivers correct consequence																			
Number of steps performed correctly/ total number of steps in trial	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %		/ %	/ %	/ %	/ %	/ %	/ %	/ %
Total number of steps performed correctly/ Total number of steps																				/
Percentage of Steps Performed Correctly																				%

KEY: + = OCCURRENCE, - = NONOCCURENCE

UC = Unprompted Correct UI = Unprompted Incorrect NR = No Response

Procedural Fidelity Data Sheet (CTD1-Future Condition)

Student _____ Instructor _____ Date _____ Session _____

Behavior _____ Start Time ___:___ Stop Time ___:___ Total Time _____

Condition/Phase _____ Reliability Observer _____

Trial	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Stimulus																				
1. T presents stimulus																				
2. T delivers attending cue																				
3. T ensures attending response																				
4. T delivers task direction																				
5. T waits response interval 0 s 3 s																				

6. T records student response (UC, PC, UI, PI, NR)																			
7. T delivers correct consequence																			
8. T presents future target stimulus																			
9. T waits intertrial interval																			
Number of steps performed correctly/ total number of steps in trial	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %		/ %	/ %	/ %	/ %	/ %	/ %	/ %
Total number of steps performed correctly/ Total number of steps																				/
Percentage of Steps Performed Correctly																				%

KEY: + = OCCURRENCE, - = NONOCCURENCE

UC = Unprompted Correct PC = Prompted Correct UI = Unprompted Incorrect PI = Prompted Incorrect NR = No Response

Procedural Fidelity Data Sheet (CTD1-Non-Future Condition)

Student _____ Instructor _____ Date _____ Session _____

Behavior _____ Start Time ___:___ Stop Time ___:___ Total Time _____

Condition/Phase _____ Reliability Observer _____

Trial	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Stimulus																				
1. T presents stimulus																				
2. T delivers attending cue																				
3. T ensures attending response																				
4. T delivers task direction																				
5. T waits response interval 0 s 3 s																				
6. T records student response (UC, PC, UI, PI, NR)																				

7. T delivers correct consequence																			
8. T waits intertrial interval																			
Number of steps performed correctly/ total number of steps in trial	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %
Total number of steps performed correctly/ Total number of steps																				/
Percentage of Steps Performed Correctly																				%

KEY: + = OCCURRENCE, - = NONOCCURENCE

UC = Unprompted Correct PC = Prompted Correct UI = Unprompted Incorrect PI = Prompted Incorrect NR = No Response

Procedural Fidelity Data Sheet (CTD2)

Student _____ Instructor _____ Date _____ Session _____

Behavior _____ Start Time ___:___ Stop Time ___:___ Total Time _____

Condition/Phase _____ Future/Non-Future (circle one) Reliability Observer _____

Trial	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Stimulus																				
1. T presents stimulus																				
2. T delivers attending cue																				
3. T ensures attending response																				
4. T delivers task direction																				
5. T waits response interval 0 s 3 s																				

6. T records student response (UC, PC, UI, PI, NR)																			
7. T delivers correct consequence																			
8. T waits intertrial interval																			
Number of steps performed correctly/ total number of steps in trial	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %	/ %
Total number of steps performed correctly/ Total number of steps																				/
Percentage of Steps Performed Correctly																				%

KEY: + = OCCURRENCE, - = NONOCCURENCE

UC = Unprompted Correct PC = Prompted Correct UI = Unprompted Incorrect PI = Prompted Incorrect NR = No Response