The Effects of a Modified Time Delay Procedure on Intraverbal Responding

THESIS

Presented in Partial Fulfillment of the Requirements for the Degree Master of Arts in the Graduate School of The Ohio State University

By

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2013

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Abstract

Intraverbals are a particularly important aspect of verbal behavior, which allow people to answer questions, maintain conversations, and complete many academic tasks. This study sought to teach three adolescent students with Autism Spectrum Disorder to respond to questions about activities they had completed. A multiple baseline design was used with a time delay procedure, in which the length of time between an activity and a question about that activity was gradually increased. All participants demonstrated proficiency in tacting the objects that would be used in training activities. Participants did not correctly answer any questions during baseline in which the time delay between activity and question was 30 min. During treatment participants engaged in a 5 min activity with the researcher and then all materials were placed out of sight and the researcher immediately asked the student about the activity that he or she just completed. The time between the activity and question was then gradually increased until the terminal delay of 30 min was reached. One participant did not need any prompts to respond correctly at the 0 s criterion and advanced through the time delays until he was responding correctly at the terminal delay of 30 min. The other two participants required training at the 0-s criterion, and then advanced through the time delays without additional prompting. Multiple examples of activities and responses were also incorporated to promote generalization. Participants were able to generalize across longer time delays, novel activities, and different conversation partners.
This accomplishment is dedicated to my family and my fiancé for their constant support and encouragement. None of my accomplishments would be possible without their love and patience.
Acknowledgments

I would like to thank Dr. Nancy Neef for her tireless guidance and dedication to my growth as a researcher and student of Applied Behavior Analysis. Her confidence in me and encouragement to study the things that interest me most were invaluable.

Additionally, this thesis would not have been possible without Joshua Garner’s assistance and expertise. His time and talents were much appreciated.

Finally, I would like to thank Dr. Linsey Sabielny for her support and encouragement throughout my time at Ohio State.
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Chapter 1: Introduction

The prevalence of autism was reported as 1 in 88 children in March 2012 (The Centers for Disease Control and Prevention [CDC], 2012). Because so many children are diagnosed with autism, educators and clinicians are increasingly concerned with effective treatment for the needs of this population. According to the Diagnostic and Statistical Manual of Mental Disorders, autism is characterized by three core symptoms: deficits in communication, deficits in social skills, and stereotyped or repetitive behaviors (4th ed., text revision, American Psychiatric Association, 2000). All three of these core symptom areas deserve careful research on effective treatment, but communication may be the most important. Communication deficits affect many areas of life, such as academic progress, social interaction, and independence. Baer and Wolf (1970) suggest that deficits in communication skills can prohibit children from contacting natural reinforcement from their parents, teachers, and peers. Communication skills are necessary for everything from conveying needs, to participating in relationships. There are many more opportunities for achievement and independence available to those who can communicate successfully (Baer & Wolf, 1970). Competent communication skills offer an overall better quality of life to our students.

Higher-level communication skills in particular improve quality of life by enabling meaningful social interactions. A child who can request and label items
might have his or her basic needs met, and have some interaction with the environment. However, if a student does not respond to questions, talk about items not currently present in the environment, and maintain back and forth conversations, he or she will be limited in opportunities for relationships and independence.

One particular skill that is important to conversations is answering questions about past events. For example, when a parent picks his or her child up from school the first thing that the parent says is often, “What did you do at school today?” When the student does not respond to this question appropriately the conversation stops abruptly. Much of our interactions, and consequently our relationships, are built on discussing things that happened in the past. Therefore, giving students the tools to answer questions about past activities and events is very important.

These conversation skills are identified by Skinner (1957) as intraverbals. Skinner classifies communication by function rather than topography. Skinner defines intraverbal behavior as verbal behavior evoked by a discriminative stimulus of verbal behavior and lacking point-to-point correspondence. Intraverbal behavior is reinforced by generalized conditioned reinforcers. Examples of intraverbals are answers to questions, responses to a statement, filling in a blank, and listing members of a category. Intraverbals are very important because they are the basis of many academic skills as well as social interactions.
There are a few different approaches to teaching intraverbal behavior that have been examined in research. Transfer of stimulus control from one verbal operant to another (Braam & Poling, 1983; Goldsmith, LeBlanc, & Sautter, 2007; Ingemny & Van, 1991; Ingvarsson & Hollobaugh, 2011; Luciano, 1986; Partington & Bailey, 1993; Vedora, Meunier, & Mackay, 2009) and prompt fading (Finkel & Williams, 2002) have been the main focus of research on methods of teaching intraverbals. Many studies compare transfer of stimulus control to intraverbals from different verbal operants such as tacts and echoics. Tacts are verbal operants under the control of the presence of an object and reinforced by generalized conditioned reinforcers (Skinner, 1957). Labeling or naming items are usually types of tacting behavior. An echoic is verbal behavior under the control of other verbal behavior that is reinforced by generalized conditioned reinforcers. The echoic must have point-to-point correspondence with the preceding verbal behavior (Skinner, 1957). Echoics are commonly referred to as a repetition or echo of something that was said. Most transfer of stimulus control procedures include a fading of the original verbal operant, but there are some studies that focus on this aspect while others do not.

In transfer of stimulus control procedures one verbal operant is used to teach another. For example, in a study by Partington and Bailey (1993) preschool students were taught to tact picture cards but did not emit the same responses under intraverbal conditions when the students were asked to name members of a category such as toys. When the student did not name toys the researcher held up
a picture card with a toy on it. At this time the student would tact the picture card. The researcher then asked the student again to name some toys and did not hold up the picture card. If the student named a toy without the prompt he or she received praise from the researcher. Through this procedure the student’s response came under control of the researcher’s verbal behavior, specifically a request to name some toys, rather than the control of the picture.

There is some overlap with prompt fading procedures and transfer of stimulus control. Often, the prompt used in the beginning of a transfer of stimulus procedure is systematically faded until the response is under the control of the new stimulus. In a study by Finkel and Williams (2002) textual and echoic prompts were faded in order to increase intraverbal responses. The written prompts were faded by removing one word at a time, until the response was made without any textual prompts. The same was done with an echoic prompt. For example, if the question was “What is your favorite color?” and the answer was “My favorite color is red” and textual prompts were used, then the entire answer would be written on a piece of paper and placed in front of the participant. The experimenter would ask the question and then immediately say “read” and point to the textual prompt. If the participant read the full answer, then on the next trial the textual prompt would be only “My favorite color is ________.”

For the one participant in the study, fading textual prompts was more effective than fading echoic prompts, but both prompt fading techniques were successful in producing an increase in responses to the questions, as compared to
baseline. The echoic prompt fading resulted in partial answers to questions after
the echoic prompt was completely removed, but the textual prompts resulted in
complete answers to questions after prompts were completely faded.

Sundberg and Partington (1998) suggest using a time delay procedure to
teach students to answer complex intraverbals, specifically questions about past
activities. They emphasize the importance of talking about an activity while the
child is engaged in that activity. If someone cannot tact an activity and its
components while those items are in the environment it is very unlikely that that
person would be able to tact an activity once the objects are removed from the
environment. Sundberg and Partington suggest asking about the activity
immediately after the child is removed from it, and then increasing the time
between the activity and questions about that activity gradually. They propose that
this should continue until the student can answer questions about an activity a
significant length of time after the stimuli associated with that activity are
removed from the environment.

Research has shown that time-delay procedures are effective for teaching
verbal operants like tacts and mands (Charlop, Schreibman, & Thibodeau, 1985;
Charlop & Walsh, 1986; Ingemney & Van, 1991; Matson, Sevin, Box, Francis, &
Sevin, 1993). Charlop, Schreibman, and Thibodeau (1985) showed that time
delays were effective in increasing spontaneous speech for children with autism.
The researchers first used echoic prompts to teach students to request a presented
preferred object. Once the child was consistently echoing the correct response, a
time-delay was implemented. The researcher would present the item and then wait two seconds to see if the child would request the item. If the child made a correct response by saying the name of the object, (the intention was that this was a mand) he/she immediately received that item as reinforcement. If the child did not request the item in two seconds the experimenter modeled a correct mand. If during three consecutive trials the child either imitated the model or made a request in the two seconds before a model was given, the time delay was increased by two seconds. This continued until the time delay was 10 s (although the child might be consistently responding well before 10 s). All seven participants exhibited increased mands that were not prompted by any verbal behavior.

One study examined the use of time delay to teach intraverbals (Goldsmith, LeBlanc, & Sautter, 2007). Three boys with a diagnosis of autism were taught to list members of a category using transfer of stimulus control from tacts to intraverbals, and a time delay procedure. The researcher would ask a question such as, “What are some things you wear?” and immediately hold up a picture prompt for the first five trials (errorless learning). On the sixth trial the researcher asked the question and then paused for 3 s before showing the picture prompt. If the participant made a correct response before the prompt then the next five trials included a 3 s delay, but if no independent response was made then the researcher returned to the errorless learning procedure. After three trials with one or more independent responses to the intraverbal, differential reinforcement was
incorporated. Independent responses were reinforced with both verbal praise and an edible, while prompted responses were followed with only verbal praise.

Acquisition of intraverbal responses was successful for all three participants, but took more than 40 trials before independent responses were made in some categories. There was also very limited maintenance and generalization to new categories.

The type of time delay in these studies seeks to reduce errors by beginning with no delay between a stimulus and a prompt for a response to that stimulus. The time between the original stimulus and a prompt is then increased in order to allow for a response that is under the control of only the original stimulus and not the prompt. This transfer of stimulus control can be very useful for producing independent verbal behavior.

Time delays may be created between stimuli in other situations. The type purpose of the time delay to be examined in this study differs from previous applications. When responding to a question about stimuli that are no longer present the response must be under the control of both the stimuli that are not in the current environment and the question. When a response is made immediately after exposure to both sets of stimuli, it is likely to be more accurate and complete than when one set of stimuli is temporally remote. Gradually increasing the time delay between the two sets of stimuli may shape a response that would not occur if the two sets of stimuli (activity and question) always had time between them.
Many studies have focused on mands, tacts, and simple intraverbals. Research on intraverbals is limited as compared to research on mands and tacts (Sautter & LeBlanc, 2006). The intraverbal studies available often do not address complex responses under the control of past events. A systematic approach like this modified time delay may be effective for teaching intraverbals under the control of multiple sets of stimuli.

As with most behaviors, it is important to consider generalization and maintenance of trained skills. Response, maintenance, response generalization, and setting/situation generalization are all important to a functional intraverbal repertoire. The students will need to be able to maintain the skill over time, answer questions about new activities, and answer questions asked by different people in novel environments. There are many different strategies for producing generalization of behaviors (Cooper, Heron, & Heward, 2007).

Jahr (2001) used multiple exemplars to teach children with autism to respond as intraverbals, specifically to answer who, what, where, and why questions across environments, people, and time. The children received training on some examples of each type of question and then were able to generalize to novel questions of the same category. They also answered questions correctly in new environments and questions asked by their teachers who were not involved in the training.

Teaching multiple exemplars is a common, and fairly simple approach to promoting generalization. It is a straightforward method that has been effective in
training verbal operants, and should be fairly easy to incorporate into a classroom training protocol.

This study used a time delay procedure to teach children with autism to accurately answer questions about past activities, in the absence of the objects that were a part of that activity. Multiple exemplars were also used to promote the maintenance and generalization of this skill to novel activities, inquirers, and for longer periods of time between the activity and questions.
Chapter 2: Method

Participants

Three adolescents with a diagnosis of Autism Spectrum Disorder participated in the study. All of the students attended a school that served children ages 4-20 with mild to severe developmental disabilities. Teachers were asked to identify students who communicated vocally, tacted objects, and answered some simple questions, but who did not accurately answer questions about activities and experiences they had previously engaged in. All of the eligible students identified by teachers were given a letter explaining the study and a permission form to take home to their parents. If parents gave consent for their child to participate then the child was given the opportunity to provide his/her assent. The assent process for the children included a brief verbal description of the activities they would do and the assurance that they could quit at any time. They were then asked if they would like to take part in the study. Once assent was obtained, a screening test was given to ensure that each participant had the prerequisite skill of tacting the objects used in activities.

The students identified as eligible for this study were all in small classes of 4-6 students. Their curriculum included some group instruction on simple math and reading comprehension, leisure activities, daily living skills, and social skills in small groups. They received one-on-one instruction in self-care and reading. The rest of their time was spent on individual tasks such as sorting, simple math and reading worksheets,
alphabetizing, money tasks, and matching. The students performed well below grade level, with skills in a range typical for pre-school to second grade.

Kelly was a 12-year old Caucasian female. Her communication consisted mostly of two or three word phrases, and occasionally simple sentences. She manded and tacted items spontaneously, and was able to complete some intraverbal exchanges, but did not carry on conversations with more than two exchanges.

Ralph was an 11-year old Caucasian male. His communication consisted mostly of simple sentences. Ralph manded and tacted items spontaneously, but much of his verbal behavior consisted of repeating phrases or conversations he had heard on television shows.

Zeke was a 15-year old Caucasian male. Zeke answered yes and no questions and tacted items, but did not often communicate vocally without prompting.

The intraverbal training in this study was especially relevant for Zeke who had an IEP goal to answer questions about current and past activities. He was not making progress on this IEP goal and his teachers were looking for more effective approaches to increasing Zeke’s intraverbal behavior.

All three of the children engaged in echolalia and scripting (repeating parts of dialogues from television or other conversations that they had heard). Although some of their language was spontaneous, their heavy reliance on repeating others’ verbal behavior made prompt dependence a common concern in teaching new verbal behavior.
Materials

Materials for the intervention included a chair with an attached desktop, two additional chairs, and a large stuffed animal named “Paulie Panda.” Paulie measured 2.5 feet high and was positioned to sit upright in a chair. There were also a variety of materials for the activities.

The items for activities were two puzzles (one with 25 pieces and one with 100), play dough in four different colors, two bottles of bubbles with “no spill” caps and two bubble wands, three simple books, two coloring books, crayons, and building blocks. There was also a set of musical instruments including a small drum, drum stick, tambourine, egg shakers, wooden fish, harmonica, and kazoo, a deck of UNO cards, a small foam football, and a snack consisting of white cheddar popcorn and cheese puff balls. There was a small camera on a tripod for video recording.

Setting

The study was conducted at a school that served children and adolescents ages 4 through 20. All of the children at this school had been diagnosed with some type of developmental disability, mostly autism, with varying degrees of impairment. The activities were conducted in an alcove area off of a large hallway. There were three walls and it was open on one side. Sometimes other students walked by but it was mostly an isolated area. Sessions for each student were conducted separately to avoid modeling effects. When students were asked a question about the activity they did after leaving the alcove area, this was done wherever the student was at the time of testing. Students were
asked questions about activities in their classrooms, in the gym, in the cafeteria, and in the hallway.

**Dependent Variables**

The targeted dependent variable was a vocal intraverbal response following the question. Depending on the phase of the study students were asked, “What did you do with me earlier?” “What did we do with Paulie Panda earlier?” and “What did we just do with Paulie Panda?” A correct response consisted of at least one verb or noun that was specific and descriptive of the activity. For example, if the student and experimenter colored in a coloring book, the response “coloring” would be acceptable. If the student blew bubbles the answer “bubbles” or “Paulie is popping” would be acceptable. The researchers were not concerned with correct grammar and tense or complete sentences, just a response that was specific and accurate.

The dependent variable was measured as a number of correct responses. A trial included a 5 min activity, the experimenter asking a question about that activity, and either an independent or prompted response. Trials were videotaped so that responses could be reviewed.

**Independent Observer Agreement**

Independent observer agreement was calculated for 30% of the trials in each phase for each participant. A second observer was provided with the requirements of a correct answer and then trained with examples and non-examples. The second observer independently viewed video of trials and scored the participants’ responses, while blind to the condition in effect for each trial. Agreement was calculated on a trial-by-trial basis.
using the formula number of trials agreement/ total number of trials x100 (Cooper, Heron, & Heward, 2007, p. 116). Agreement was 100% for all three participants.

**Treatment Integrity**

Treatment integrity was measured using a checklist (see Appendix D). Integrity was assessed for 30% of treatment trials using video recordings. The trials were conducted with integrity if: the activity lasted 5 min, Paulie Panda was included in the activity, the appropriate length of time passed between activity and question, the researcher provided specific verbal praise if the participant answered correctly, a verbal prompt if the participant answered incorrectly, and immediately asked the question again after a prompt was provided. If all of these criteria were met during a trial then the integrity was scored as 100%. If just one item was missing then the integrity was scored as 0% for that trial. This method was chosen in order to ensure a conservative estimate of treatment integrity. Ninety-three percent of the trials assessed were conducted with 100% integrity. Only one of the scored trials was assessed as not meeting criteria. In that trial the latency between activity and question was 23 min instead of 20 min.

**Experimental Design**

A multiple baseline across three participants was implemented. It included three conditions: baseline, treatment, and generalization. In order to demonstrate experimental control the treatment was implemented with the first participant when responding was low and steady in the baseline condition. Treatment was not implemented with the second participant until his responding was low and steady during baseline and the first
participant’s responding had changed from baseline responding. This was continued for
the third participant.

An additional control was added for Zeke. After he exhibited steady responding at
the first criterion there was a probe, which returned to the 30 min interval between
activity and inquiry.

**Pre-test**

Before the trials began a preliminary test was conducted during which each
student was asked to tact all of the objects that would be used in the activities.
Participants were brought, one at a time, to the testing area. They sat in a desk across
from the experimenter and were presented with an object. The researcher then asked the
participant, “What is this?” and pointed to the object. The response made by the
participant was recorded and a new object was presented. Technically, this first response
was not a pure tact, but rather an intraverbal/tact. Once the researcher had presented a
couple of objects the participants began to tact the object when it was presented and it
was unnecessary for the researcher to ask the participant to name each item.

The materials presented in the pre-test were crayons, a coloring book, bubbles, a
small football, a story book, a puzzle, instruments, UNO cards, wooden building blocks,
play dough, cheese balls, and popcorn. Any accurate response was accepted. For
example, if a participant said “ball” when the football was presented, this was considered
correct. Or, if a student tacted “drum” when all of the instruments were presented, this
was considered acceptable. The participants were allowed to examine the items (e.g.,
open the boxes to look at puzzle pieces, open the play dough container) in order to
identify the objects. Kelly and Ralph correctly tacted 100% of the items without prompting and Zeke correctly tacted 83% of the items.

**Experimental Procedures**

Once it was determined that the participants met the minimum requirements to participate, their teachers were asked to refrain from any teaching that related to questions about past activities and events for the duration of the study.

The procedure for each trial began with taking the student to the alcove area and having him or her sit at the desk. Next, one of the researchers sat down across from the student and presented an activity. The researcher and student then engaged in that activity for 5 min while the interaction was filmed. The researcher talked about the activity while she and the student engaged in the activity. An example of an interaction during the play dough activity would include the researcher saying things like “I’m making a snake, what are you making?” “That looks like a cake, should we make candles and sing happy birthday?” “I love to play play dough with you, you make such cool stuff!” In some cases the student replied and participated in the conversation with the researcher and other times the conversation was one sided. Ralph and Kelly participated in more conversation than Zeke, but all of the students engaged in conversation in at least some of the sessions. All comments and questions were ones that would typically be made during a play activity. The researcher tried to engage the students naturally but did not do any direct teaching or require the students to talk about the activity.

After 5 min the researcher collected the materials and put them away out of sight, stopped the timer, and turned off the video recorder. The researcher then escorted the
student back to class, or if that trial was during the 0 s time delay condition, the researcher returned to the student’s desk to ask about the activity they had just completed.

**Baseline.** During the baseline phase the researcher and student participated in the activities as described above. After 5 min the researcher walked the student back to his/her classroom and set a quiet alarm to go off 30 min after the activity had begun (i.e., 25 min after the conclusion of the activity). When the alarm went off the researcher turned on the video camera and asked the student “What did we do together earlier?”

A second part of baseline occurred when Paulie Panda was introduced. Paulie was placed in an additional chair at the desk during activities. He was included in the activity by the researcher. The researcher would say something like “Should we make a hat for Paulie with the play dough?” or “Paulie Panda loves popping bubbles!” while moving Paulie through the air to pop bubbles. Paulie was included as an additional discriminative stimulus to help the participants reference the event. Once Paulie was included in trials the question that the researcher asked after the 30 min interval was, “What did we do with Paulie Panda earlier?”

**Intervention.** After steady responding in baseline was established the students were introduced to the intervention. The activity was introduced in the same way it was during baseline. Paulie was included and the student and researcher engaged in the activity for 5 min. After the activity was complete the researcher moved all materials (including Paulie) out of sight of the student. The camera was set to record again and the researcher sat down across from the student. The researcher asked, “What did we just do with Paulie Panda?” If the student answered correctly the researcher delivered praise and
reiterated the correct answer. The researcher then made a comment or asked something like, “Did you have fun playing UNO with Paulie?” in order to replicate the natural reinforcement that would be delivered in a social interaction.

If the student did not respond to the question about the activity, responded incorrectly, or responded in a way that was not specific enough, the researcher delivered a verbal prompt such as “we played UNO with Paulie,” and asked the question again. If the student answered correctly the researcher delivered praise and engaged in a brief social interaction. The prompting and repeating of the question continued until the student’s correct response occurred as an intraverbal response to the question.

If the participant required any prompting in the initial treatment trial, then trials continued with the question immediately following until the student consistently answered the question without prompting for a block of four trials. For two of the three participants there was then a probe with the time increased to a 2 min delay after the end of the activity. If the participant answered correctly then a probe was conducted at the next interval. If the participant did not answer correctly then a prompt was given. There were probes at 2, 5, 10, and 20 min, and a probe at the terminal criterion of 30 min.

For the third participant, Zeke, there was a probe at the terminal criterion interval, after mastery of the 0 s interval level. This was to control for the possible teaching effects of gradually probing longer and longer intervals.

Generalization and Maintenance

Generalization and maintenance probes occurred after participants were consistently responding correctly to questions 30 min after the activity. Probes at 1 hr and
2 hr after the activity were completed for each participant. There was also a
generalization probe 30 min after a new activity that had not been used during training.
Additionally there were generalization probes during which a teacher asked about what
the student did with the researcher. This was conducted once with the researcher present
in the environment, and once without the researcher present.

All participants in this study were using a token economy in their classrooms to
earn preferred items or activities. At the time of this study Kelly was required to complete
one activity without engaging in inappropriate behavior (yelling, aggression, etc.) in
order to earn a token. She could turn in four tokens to earn 5-10 min with a preferred
activity. Ralph was required to complete one activity staying in the correct work area in
order to earn a token. Ralph could then turn in three tokens to earn 5-10 preferred
activity. Zeke was required to complete one activity to earn a token and could turn in
three token for 10 min of a preferred activity. Throughout this study the participants’
teachers counted one trial with the researcher as one activity. There were no issues with
inappropriate behaviors during the activities, so students always earned a token for
participation. The brief question was not counted as a separate activity and therefore only
reinforced with praise as appropriate.

Social Validity

The three parents and three teachers of students in the study anonymously
completed a brief questionnaire. They were asked if they had noticed any change in their
student’s or child’s conversation skills since the beginning of the study. There were five
possible answers to choose from: (A) No change at all (B) A slight improvement (C) A
slight weakening (D) A significant improvement or (E) A significant weakening. Parents and teachers were also asked if they had specifically noticed a difference in the child’s question answering. There were the same five answers to choose from. Finally, parents and teachers were asked to rate the importance of the goal that their child or student answer questions about his/her activities and experiences. They were asked to choose one of four responses: (A) This is a top priority in our goals, (B) This is important but not a top priority, (C) This is not a priority at this time, or (D) I think that my child/student already does this satisfactorily.

Four of six respondents indicated that they noticed a “significant improvement” in their student/child’s conversation skills since the beginning of the study. The other two respondents indicated a “slight improvement”. Three of six respondents reported a “significant improvement” in their student/child’s question answering since the beginning of the study. Three respondents indicated that improvement in their student/child’s question answering skills was a top priority in his or her goals and the other three respondents indicated that it was important but not currently a top priority.

Because of students’ limited verbal repertoire they did not answer specific questions about their experience with the study. However, all participants were eager to leave their classrooms for study sessions and often seemed excited about the activities. None of the students protested or refused to work with the researcher even though no additional incentives were added beyond the typical tokens the students earned for working on tasks and the praise given by the researcher. This was significant because the students had a history of escape maintained behavior and task avoidance.
Chapter 3: Results

Kelly

Kelly did not respond correctly to any questions during the baseline phase, either with or without Paulie Panda present as a discriminative stimulus. In the first two trials during the treatment condition Kelly did not answer correctly when she was asked about the activity immediately after materials were removed. In both trials the researcher gave one prompt and asked the question again. Each time Kelly answered correctly after one prompt. In all subsequent trials with a 0 s delay Kelly answered correctly without prompting.

Once steady responding was established at the 0 s delay there was a probe with a 2 min delay. Kelly answered correctly without any prompts. The researcher then proceeded to probe at each of the planned delays of 5, 10, 20 min and finally at the terminal delay of 30 min. During each probe, Kelly answered correctly without prompts or further training.

Generalization. Kelly’s first generalization probe occurred 20 days after her last training probe. During the first generalization probe, Kelly was asked a question 30 min after an activity during which the bear was not present. When she did not answer correctly, a booster trial was conducted with the bear present during the activity. Kelly responded correctly to the question 30 min after the booster session. Another trial without the bear present was conducted and Kelly responded correctly after a 30 min time delay. All subsequent generalization probes were conducted when the bear was not present
during the activity. Kelly responded correctly during probes conducted 1 hr and 2 hr after the activity, respectively, and following a novel activity. To test generalization to other conversation partners Kelly’s teacher asked her what she did with the researcher 30 min earlier. Two separate trials were conducted, one with the researcher present in the room, and one without the researcher present. Both times Kelly correctly reported on the activity.

**Ralph**

Ralph did not respond correctly to any questions during the baseline phase, either with or without Paulie Panda present as a discriminative stimulus. Ralph responded correctly to the first question asked with a 0 s time delay. Ralph continued to answer every question correctly on the first probe at 2, 5, 10, and 20 min, and then at the terminal delay of 30 min. He did not receive any prompting or training; there was only a progression through gradually increasing time delays.

**Generalization.** Ralph’s first generalization probe occurred seventeen days after his last treatment probe. In the first generalization probe without the added discriminative stimulus, Ralph answered correctly 30 min after the activity. Ralph answered correctly both 1 hr and 2 hr after the activity. He also answered correctly when asked by his teacher what he did with the researcher, both with the researcher present and absent from the environment. Ralph did not answer correctly when asked about the novel activity. When the researcher led Ralph to the area where they did their activities, Ralph asked to do an activity other than the planned novel activity. He continued to talk about his desired activity of puzzles throughout the novel activity. Later, when Ralph was asked what he
did he said, “puzzle.” Although this answer was incorrect it was interesting that Ralph responded with the activity that he requested and talked about.

**Zeke**

Zeke did not respond correctly to any questions during the baseline phase, either with or without Paulie Panda present as a discriminative stimulus. Zeke did not answer correctly during the first six trials in the 0 s delay condition. He was prompted in each of these trials until he made a correct intraverbal response. During the first few training trials it took four or more prompts before Zeke made an intraverbal response. During the seventh trial Zeke answered correctly without prompts, but it took sixteen trials at a 0 s delay before Zeke was making correct unprompted responses consistently.

After demonstrating steady responding with the 0 s delay, a 30 min probe was conducted. Zeke answered the question correctly and three more 30 min probes were conducted to establish steady correct responding.

**Generalization.** Zeke started the generalization phase just 3 days after the last probe in his treatment phase. Zeke answered correctly when he was asked about an activity 1 hr after it occurred, and when his teacher asked what he did with the researcher while she was present in the environment. Zeke did not answer correctly when asked 2 hr after the activity. This probe was repeated and he did answer correctly the second time. Zeke did not answer correctly when his teacher asked about the activity when the researcher was not in the room. This probe was then repeated with another of Zeke’s teachers. He did answer correctly the second time. Finally, Zeke responded correctly when asked about a novel activity that was not used during any other phase of the study.
Figure 1. Number of Correct Intraverbal Responses
Chapter 4: Discussion

Results from this study add to the research on effective procedures for teaching intraverbals. During baseline the participants engaged in activities and were asked about those activities 30 min later, but none of the participants responded correctly. One participant was able to respond to questions about activities after the time between the activity and a question about it was removed, and then gradually increased to the terminal interval of 30 min. The other two participants required training to master a correct response when there was no delay between the activity and question. After one participant mastered the response with no delay, the delay was gradually increased until she was responding correctly with a 30 min delay. The final participant was able to respond correctly at the terminal level immediately after training to mastery during the no delay condition.

Participants also generalized their new skill to novel activities, people, and longer periods of time. The results were generally positive, and because this method and particular skill are not extensively researched the information gained is a valuable starting point. However, many more studies are needed in order to isolate all relevant variables and provide practitioners with complete information about this method as an intervention for people who do not answer questions about past activities and events.

The change in responding is noteworthy considering the age of the participants and the likely learning history of each. These students had been enrolled in special education programs for most of their lives and had surely been asked similar types of
questions many times before. The correct responses made after treatment as well as the
generalization and maintenance of those responses is significant.

Limitations and Future Research

There were some limitations to the design used and the control shown over the
variables. More time should have been allowed between the introduction of the
intervention for each student, in order to establish more steady responding. Also, it is
unclear whether or not Ralph and Kelly would have responded correctly at the terminal
delay of 30 min immediately following exposure to the 0 s delay. Probes with the
terminal delay after training at each criterion would provide more information about the
exact training necessary to enable success in responding.

This study focused on three adolescents with autism. In the future the effects of
this intervention should be examined with other populations as well as additional
adolescents with autism in order to determine if this is an effective intervention for more
people.

More thorough pre and post intervention assessment of communication,
specifically intraverbal skills, would add to the findings. There was report by the
participants’ teachers and classroom observation by the researcher that indicated these
students had the prerequisite skills to answer questions about past activities but were not
currently answering questions of that nature. However, a more formalized measure of
tacting, manding, echoic, and intraverbal behavior both before and after the intervention
would provide more information about the amount of change.
There is a need to more carefully isolate effective parts of this treatment. One of the participants did not require prompting at any part of the intervention. Simply asking a question about the activity immediately after the stimuli were removed, and then gradually increasing the time between activities and questions was sufficient to see change in the participant’s behavior from baseline. The other two participants required prompting only at the first trained criterion. After that, they were able to answer questions at the terminal interval of 30 min.

It is not clear whether the gradual increase in delay was essential, or if the same results would have been achieved with only direct training of intraverbal responding. It may be that the length of time between an activity and answering questions about that activity does not require special attention. This should be examined by training participants to answer intraverbal questions, and then testing the temporal limits of that training. After participants mastered intraverbal responding about current activities, researchers could probe for answers to questions about those activities at later times. To control for the possible effect of training through gradually increasing the amount of time between activities and questions, the latency period could be randomized. Or, researchers could start by asking about an activity several days after it occurred and gradually decreasing the interval between activities and inquiries until finding the maximum latency between activity and question for a correct response.

There are other aspects of the activities that could have contributed to a change in behavior. Sundberg and Partington (1998) suggested that the conversation about the activity while performing it was important to being able to talk about that activity later.
This was included in the protocol for this study, however it was not examined in the treatment integrity. A more careful examination of the amount and type of verbal behavior during the activity may provide insight into how that effects talking about the activity later.

The nature and duration of the activity also needs to be taken into account. In this study the students engaged in a commonplace leisure activity for 5 min. At least some of the activities seemed to be very enjoyable for students, as evidenced by laughing and smiling, or requesting a particular activity when led to the research area. Because of their brevity, however, these activities may not have been sufficiently salient to control temporally remote responses. For example, Zeke did not correctly answer the question in his first 2 hr probe. However, one morning shortly after the study Zeke went on a community outing to Target and Bob Evans. Approximately 5 hrs later when asked where he had gone on his outing, he correctly responded that he had gone to Target, and even reported on what he had eaten at Bob Evans.

The experimental activities and their duration were based on practical considerations. It would not have been possible to remove students from instruction in the classroom for much longer periods of time or to take them off campus for costly outings during this study. Perhaps if this program were extended, the types of activities, and the amount of time spent on those activities, could be varied. A preference assessment could be conducted to determine which activities were enjoyed most by each participant. Then, the maximum amount of delay between activities and follow-up questions could be measured in relation to the preference rating of those activities or their duration.
Another aspect of the training that should be examined in future research is the role of positive and negative reinforcement. It is unclear whether participants’ behavior was positively reinforced by the verbal praise and social attention that followed correct responses, or negatively reinforced by the escape from continued social interaction during prompting. People with autism sometimes find social interaction aversive, or at least do not find it reinforcing. Future studies could examine this by allowing escape from the task and interaction after a correct answer and keeping the interactions following an incorrect answer brief by only providing one prompt.

The number and types of examples used in training could also be more closely examined. Multiple exemplars were used during training to promote generalization. Each participant was exposed to at least seven different activities during the study. It is unclear whether all seven were necessary, or if more examples would have resulted in more robust generalization. Testing for generalization after the addition of each exemplar could isolate the effect of multiple exemplars. The optimum number of exemplars needed to promote generalization may also vary from student to student.

Another important aspect of this skill to be examined in future research is the role of private events. The stimuli related to the activity were not present when participants were asked about that activity later. It is possible that private events were involved in mediating a response to the intraverbal. This concept might be referred to as memory; the participants had to “remember” the activity in order to answer a question about it. Remembering might be a way of covertly tacting the stimuli that are no longer present.
Private events are difficult to measure and manipulate. Perhaps using some sort of distracter to inhibit covertly tacting aspects of the activity when responding could shed some light on the occurrence of private events. The distracter would be a salient stimulus (e.g. a loud song) that made it difficult to tact the activity while responding. If a student could answer questions about past events when no distracter was present, but could no longer do so when a distracter was present, then it may be necessary to covertly tact the activity when responding.

Another way to assess the importance of tacting objects that are part of the activity (either overtly during the activity or covertly later when asked about the activity) would be to program common stimuli. One item from the activity could be present in the environment when asking about that past activity. Responding to the intraverbal with and without a common stimulus could be compared.

This study showed a change in participants’ responses to intraverbals about activities that they had previously engaged in. It adds valuable information to our understanding of methods for increasing intraverbal responses, particularly about stimuli that are no longer present in the environment. The skill of talking about past activities and events is clearly important to participating in conversations and completing academic tasks, which both have wide ranging implications for success in social and academic endeavors. However, there is much more to learn about the most effective methods for teaching intraverbal responses to questions about past activities. Aspects of the time delay method used in this study should be more closely examined and carefully manipulated in order to learn more about this important type of intraverbal response.
References


Appendix A: Parent Permission Form and Cover Letter

Dear Parent/Guardian,

My name is Jessica Heacock and I am a graduate student in Special Education at Ohio State. I have worked as a consultant at Haugland Learning Center, as part of my training, for the past two years. I have very much enjoyed working with your child, and I am excited to conduct my research thesis at Haugland. I am interested in teaching methods that improve communication skills for children and adolescents with autism. Specifically, I am focusing on teaching students to talk about activities and events in their past. For example, we will do an activity together, and then we will ask the students questions about that activity later.

Your child’s teacher has identified him/her as a possible participant in this study. The study will be conducted at school, and I will work with teachers to make sure your child is not missing instruction. The techniques I will use are common instructional techniques already used in your child’s classroom. The new application will be to use these methods to teach conversation skills. We are excited to gain information about the effectiveness of this method that will inform future practice.
Attached is a permission form with more details about the study. Please feel free to contact me if you have any questions. Thank you for taking the time to consider your child participating in this research!

Sincerely

Jessica Heacock

The Ohio State University Parental Permission For Child’s Participation in Research

What are the effects of a time delay procedure in teaching

Study Title: students to answer questions about past experiences and activities?

Researcher: Dr Nancy Neef, Jessica Heacock

This is a parental permission form for research participation. It contains important information about this study and what to expect if you permit your child to participate.

Your child’s participation is voluntary.

Please consider the information carefully. Feel free to discuss the study with your friends and family and to ask questions before making your decision whether or not to permit your child to participate. If you permit your child to participate, you will be asked to sign this form and will receive a copy of the form.
**Purpose:**

This research study intends to examine the effects of an increasing time-delay procedure on the communication skills of children with autism, specifically their report of past activities or events. Additionally, techniques for generalization of the skill to new events, conversation partners, and environments will be assessed.

**Procedures/Tasks:**

If your child participates in this study he/she will be asked to participate in an activity such as coloring, making a puzzle, looking at a book, or playing a game with the researcher. After participating in the activity for a few minutes the researcher will ask your child questions about the activity. As your child is taught to answer the questions correctly the time between the activity and questions about it will be increased, until your child can answer questions about an activity on the previous day.

**Duration:**

Your child will spend between five and fifteen minutes participating in the study each day that he/she is at school. Participation could last up to two months, but may be less. Your child may leave the study at any time. If you or your child decides to stop participation in the study, there will be no penalty and neither you nor your child will lose any benefits to which you are otherwise entitled. Your decision will not affect your future relationship with The Ohio State University.

**Risks and Benefits:**
The research study’s activities are very similar to those that your child typically participates in at school. There are no anticipated risks. Your child may develop some new communication skills as a result of participating in the study.

Confidentiality:

Efforts will be made to keep your child’s study-related information confidential. However, there may be circumstances where this information must be released. For example, personal information regarding your child’s participation in this study may be disclosed if required by state law. Also, your child’s records may be reviewed by the following groups (as applicable to the research):

- Office for Human Research Protections or other federal, state, or international regulatory agencies;
- The Ohio State University Institutional Review Board or Office of Responsible Research Practices;
- The sponsor, if any, or agency (including the Food and Drug Administration for FDA-regulated research) supporting the study.

Incentives:

Your child will continue to earn the items and privileges that he/she typically earns during the normal school day.

Participant Rights:

You or your child may refuse to participate in this study without penalty or loss of benefits to which you are otherwise entitled. If you or your child is a student or employee at Ohio State, your decision will not affect your grades or employment status.

If you and your child choose to participate in the study, you may discontinue participation at any time without penalty or loss of benefits. By signing this form, you do not give up any personal legal rights your child may have as a participant in this study.
An Institutional Review Board responsible for human subjects research at The Ohio State University reviewed this research project and found it to be acceptable, according to applicable state and federal regulations and University policies designed to protect the rights and welfare of participants in research.

Contacts and Questions:

For questions, concerns, or complaints about the study you may contact Jessica Heacock (386)216-1558 or heacock.313@osu.edu.

For questions about your child’s rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact Ms. Sandra Meadows in the Office of Responsible Research Practices at 1-800-678-6251.

If your child is injured as a result of participating in this study or for questions about a study-related injury, you may contact Jessica Heacock (386)216-1558 or heacock.313@osu.edu.
Signing the parental permission form

I have read (or someone has read to me) this form and I am aware that I am being asked to provide permission for my child to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I voluntarily agree to permit my child to participate in this study.

I am not giving up any legal rights by signing this form. I will be given a copy of this form.

Printed name of subject

Printed name of person authorized to provide permission for subject

Signature of person authorized to provide permission for subject

AM/PM

Relationship to the subject

Date and time

**Investigator/Research Staff**
I have explained the research to the participant or his/her representative before requesting the signature(s) above. There are no blanks in this document. A copy of this form has been given to the participant or his/her representative.

<table>
<thead>
<tr>
<th>Printed name of person obtaining consent</th>
<th>Signature of person obtaining consent</th>
</tr>
</thead>
</table>

AM/PM

Date and time
Appendix B: Participant Verbal Assent Script

Researcher:

“This study is about a way to teach kids to talk about things they did in the past. If you are in the study you will participate in some activities like putting together puzzles, playing with toys, and coloring. You will also answer some questions.

You could be in the study for up to two months.

You may stop being in the study at any time.

The activities in the study will be a lot like what you normally do at school. We do not think anything bad will happen to you.

You might learn something new about answering questions.

You can earn your normal school rewards for spending time with me, and doing the activities.

Do you have any questions?”

(student response)

Researcher; “Do you want to do the study?”

(student response)

note: If the student has a question for the researcher she will answer it in accordance with all of the information already provided in the IRB application. If the student has a question for someone not associated with the research team he/she will be put in contact with the appropriate IRB representative.
## Appendix C: Independent Observer Agreement

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<th>Correct Answer</th>
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<tr>
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</tr>
<tr>
<td>K2</td>
<td>playing band instruments</td>
<td>I</td>
</tr>
<tr>
<td>K3</td>
<td>bubbles</td>
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</tr>
<tr>
<td>K4</td>
<td>playdough</td>
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</tr>
<tr>
<td>K5</td>
<td>bubbles</td>
<td>I</td>
</tr>
<tr>
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<td>playdough</td>
<td>I</td>
</tr>
<tr>
<td>K7</td>
<td>UNO</td>
<td>C</td>
</tr>
<tr>
<td>K8</td>
<td>bubbles</td>
<td>C</td>
</tr>
<tr>
<td>K9</td>
<td>UNO</td>
<td>C</td>
</tr>
<tr>
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<tr>
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<td>I</td>
</tr>
<tr>
<td>R3</td>
<td>UNO</td>
<td>I</td>
</tr>
<tr>
<td>R4</td>
<td>puzzle</td>
<td>I</td>
</tr>
<tr>
<td>R5</td>
<td>UNO</td>
<td>I</td>
</tr>
<tr>
<td>R6</td>
<td>blocks</td>
<td>C</td>
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<td>---</td>
<td>------------------------------</td>
<td>------</td>
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<td>Z2</td>
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<td>Z3</td>
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<td>Z5</td>
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<td>I</td>
</tr>
<tr>
<td>Z7</td>
<td>playdough</td>
<td>I</td>
</tr>
</tbody>
</table>
Appendix D: Treatment Integrity

_____ Engage student in activity for 5 minutes
_____ Paulie Panda present
_____ Correct time delay before asking question
_____ If response is correct provide specific verbal praise
_____ If student makes no response or responds incorrectly then provide verbal prompt
_____ Immediately after prompt repeat the question
Appendix E: Social Validity

Since the beginning of March have you noticed any change in your child/student’s conversation skills?

A. No change at all
B. A slight improvement
C. A slight weakening
D. A significant improvement
E. A significant weakening

Since the beginning of March have you noticed any change in your child/student’s answering questions?

A. No change at all
B. A slight improvement
C. A slight weakening
D. A significant improvement
E. A significant weakening

How important is it to you that your child/student can answer questions about his/her activities and experiences?

A. This is a top priority in our goals
B. This is important but not a top priority
C. This is not a priority at this time
D. I think that my child/student already does this satisfactorily

Thank you so much for your time and participation!