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Comparing Teaching Methods for Auditory-Visual Conditional Discrimination

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EDSBA 56000: Master's Thesis – Behavior Analysis

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Abstract

Responding to spoken language is a skill that is typically acquired at a young age. However, responding to spoken language requires discrimination between stimuli. Many individuals with autism spectrum disorder (ASD) have demonstrated difficulty acquiring listener behavior involving conditional discrimination. Thus, the most efficient and effective teaching strategies should continue to be a focus in behavior-analytic research. The purpose of the current study was to compare teaching methods for conditional discrimination for three school-aged children with ASD. The results showed that one participant met criterion for the best practice condition only, one participant met criterion for both best practice and autoclitic frame conditions, and one participant did not meet criterion during either condition. Limitations and areas of future research are discussed.

Keywords: autism, conditional discrimination, listener behavior, compound stimulus, school

Comparing Teaching Methods for Auditory-Visual Conditional Discrimination

Listener behavior can be casually defined as non-verbally responding based on what another person has said. Children typically begin to acquire these skills early in their development (before the age of 2 years) through everyday interactions with a caregiver (Horne & Lowe, 1996). Engaging in effective listener behavior also requires a variety of discrimination skills. Simple discrimination involves a three-term contingency (a discriminative stimulus, a response, and a reinforcer; e.g., responding to one-step instructions, respond to name), whereas conditional discrimination involves a four-term contingency (a conditional stimulus, a discriminative stimulus, a response, and a reinforcer; e.g., responding to auditory-visual conditional discrimination tasks). However, individuals diagnosed with autism spectrum disorder (ASD), or other intellectual disabilities may have delayed acquisition of listener behavior as well as difficulty with acquiring conditional discrimination. For example, Rieth et al. (2015) examined the prevalence of overselectivity of stimuli during discrimination tasks for 42 children ages 3 to 10 years old. Of those 42 children, 29% of participants displayed overselectivity.

Several authors have made best-practice recommendations for teaching listener discrimination skills based on available research (e.g., Green, 2001; Grow and LeBlanc, 2013; Leaf et al., 2020). For example, Green (2001) suggested the use of multiple stimuli during teaching and exposing the learner to the same number of trials for each target stimulus to ensure an equal number of learning opportunities. Further, when presenting stimuli in an array, it was recommended that the target stimuli not be placed in the same location on two or more consecutive trials, as this accounts for potential side biases and/or faulty stimulus control.

Grow and LeBlanc (2013) also provide several similar recommendations for teaching auditory-conditional discrimination. The first recommendation was to use an observing and differential observing response (DOR). Observing responses occur before or during training trials and indicates that the relevant stimuli have been attended to by the learner. For example, Fisher et al. (2019) required a DOR as part of a treatment package to teach auditory-visual conditional discrimination to four children with ASD. The DOR required that the participants echo the auditory conditional stimulus provided by the researcher. The results showed that all participants were successful with acquiring auditory-visual conditional discrimination (Fisher et al., 2019).

Grow and LeBlanc (2013) went on to make various other suggestions including modifications to prompting procedures, introducing multiple targets simultaneously, and the use of differential reinforcement for independent and correct responses. Additionally, the authors suggested that when presenting the instruction to the learner, the researcher must avoid inadvertent instructor cues such as using different vocal volumes (e.g., "Stand UP," increasing the tone of voice on the word "up"), suggestive positioning (e.g., facing your body towards the target stimulus), or only teaching targets based on the positional status of the learner (e.g., the learner is standing, instructor targets "jump," or "turn around").

Other research has examined the use of autoclitic frames for establishing conditional discrimination for speaker behavior. Degli Espinosa et al. (2021) defined the use of autoclitic frames as adding clauses, phrases, and sentence structure with both fixed and variable components that are related to the frame. For example, when presenting a stimulus focusing on a feature, the researcher can change the instruction to "What shape is the block?" and require the learner to repeat a portion of the instruction back in their response. For example, the response may be, "The shape of the block is square." In this scenario, the fixed component of the sentence structure would be *shape*, whereas the variable component would be the response *square.* Degli

Espinosa et al. (2021) examined teaching intraverbal discrimination skills to four children with ASD with and without the use of autoclitic frames as an intervention. The results showed that two of the four participants met mastery criteria in both conditions, whereas the other two participants met mastery criteria in the frame condition only. Although these results were successful for establishing speaker behavior, no previous research has attempted to use autoclitic frames as a teaching method to teach listener discrimination.

Further, although previous research is encouraging and best practice recommendations provide a guide for practitioners, continued research on the most effective and efficient teaching strategies for auditory-visual conditional discrimination is warranted. Thus, the purpose of the current study is to compare two different teaching methods to teach conditional auditory-visual discrimination to three children with ASD.

Method

Participants and Setting

Three participants with diagnoses of autism spectrum disorder (ASD) were recruited from a center-based clinic. The participants included two girls and one boy with an average age of 7.6 years (range, 7-8 years). At the time of the study, all participants were receiving applied behavior analysis (ABA) services at 35 hr per week. Participants were selected based on “Verbal Behavior – Milestones and Assessment Placement Program” (VB-MAPP; Sundberg, 2008) scores (see Table 1).

Participant A was an 8-year-old girl diagnosed with ASD. Her VB-MAPP scores placed her skills in the 18-30 month age range in which deficits were observed across all 16 categories. Participant A primarily communicated using an augmentative alternative communication (AAC) device. She scored a 10 on the Early Echoic Skill Assessment (EESA) in which she could imitate and echo some vowel-consonant and consonant-vowel combinations. Participant A could conditionally discriminate between common objects. However, Participant A demonstrated deficits with more complex conditional discrimination of stimuli (i.e., colors, shapes, function, etc.). For example, if presented with three objects of different shapes and colors and was asked to, “Find square” versus “Find red”, Participant A could not consistently respond correctly.

Participant B was an 8-year-old boy with an ASD diagnosis. His VB-MAPP scores placed his skill set within the age range of 18-30 months. He communicated using an augmentative alternative communication (AAC) device. Participant B scored a 25.5 on the EESA portion of the VB-MAPP. Participant B could imitate whole word sounds but had difficulty forming some consonant and vowel sounds in the middle of words. Participant B demonstrated progress faster for auditory discrimination than visual discrimination targets. Auditory discrimination targets were conducted in a field of three using buttons to play animal sounds. The participant pushed each button before hearing a short 5 s clip of a corresponding animal sound. He then selected the sound that matched. Participant B reached mastery criterion for this skill but skill acquisition for auditory-visual discrimination for Participant B was more difficult. Since beginning services in 2020, Participant B continued to work on a listener behavior target to identify his mother in a field of three stimuli. This target had recently moved into generalization but continued to shift between generalization and intervention for several months.

Participant C was a 7-year-old girl diagnosed with ASD. This participant’s VB-MAPP scores placed her skill set within the age range of 18-30 months. Participant C communicated vocally and could echo and imitate full words and phrases. Her history with auditory and visual discrimination varied from target to target. When working with picture stimuli in the form of index cards, she could scan and identify stimuli by feature, function, and class in a larger field size of 8-10 stimuli. However, she had a difficult time scanning and selecting 3D stimuli. For instance, when working on auditory-visual conditional discrimination such as size or color, Participant C required more prompting to attend to the stimuli.

Consent was obtained from the parents of each participant in which an overview of the procedures and potential benefits and risks of the study were discussed. No compensation was given for participation and the parents and/or participants were informed that they could exit the study at any point without penalty. Each parent had an unlimited amount of time to either consent or deny. Assent was gained with each participant prior to the beginning of each session. The researcher gained assent by first spending several minutes building rapport with the participant. At the start of a session, the researcher asked the participant to come over to the table using friendly and playful language (e.g., "Come sit with me" or "Look! Come here!"). The participant's willingness to engage with the researcher provided assent to begin trials. If the participants engaged in non-compliant behavior (e.g., moving away from the experimenter and/or instructional area), assent was not considered as obtained and the trial was immediately terminated. All procedures were reviewed and approved through Lindenwood University's institutional review board (IRB) prior to implementation and data collection.

All trials took place in the participants' classroom in the clinic-based setting in which they received ABA services. The setting included two tables, four chairs, and data collection materials (i.e., clipboard with data sheets, dry-erase markers, pens, pencils, erasers.). Participants sat adjacent to the primary researcher at the table and a secondary researcher stood approximately 1 ft (0.3 m) behind the primary researcher to collect interobserver agreement (IOA) and treatment integrity (TI) data.

Materials

Materials included 18 blocks/shapes (approximately 3 in. by 3 in.) of different colors, shapes, and sizes (see Table 2). Each condition included 3 different sets of stimuli and the stimuli (three objects per set) were rotated during each trial. Sets were arranged in groups numbered 1-3. On the paper data sheet, the researcher wrote down the randomized order number assigned to each trial (see Appendix). Data were collected using paper data sheets on a clipboard. Each data sheet included 10-trial columns for each condition for each day of the week that data were collected.

Dependent Variables and Response Definitions

The primary dependent variable was the percentage of correct responses across conditions. Correct responses were defined as independently selecting the stimulus corresponding to the conditional stimulus provided on each trial. An incorrect response included selecting a stimulus from the array that did not correspond with the conditional stimulus provided, selecting multiple stimuli from the array, engaging in unrelated behavior, and not providing a response. Prompts included gesture, positional, and physical. Gesture prompting was defined as pointing at the correct stimulus. Positional prompting was defined as moving the correct stimulus closer to the participant. Physical prompts were defined as physically guiding the participant's hand to the correct response. Prompts were faded from most-to-least (physical to positional to gesture) across conditions. For example, once the participant correctly responded for three consecutive trials using physical prompts, the researcher then faded to positional prompting. Once the participant responded independently for three consecutive trials with the positional prompts, prompts were faded to less invasive prompts such as gesture prompts. Prompting was then faded until the participant independently responded to the instruction.

Procedure

General Procedure

One session was run per day which included three trials and each trial included both conditions with a brief 2-min break in between conditions. Sessions were run 3 days per week and the presentation of the conditions were rotated each session. Stimuli were presented in a randomized order across trials to ensure the participant was being exposed to multiple conditional discrimination targets simultaneously (Grow & LeBlanc, 2013).

Pre-experimental Conditions

Preference Assessment. The primary researcher conducted a multiple stimulus without replacement (MSWO) preference assessment (DeLeon & Iwata, 1996) at the start of each session. The participant was presented with five different activities/tangibles and was asked to pick one. Once the participant selected an item out of the array, they were allowed 5 s to engage with the item before it was removed. The remaining four items were then represented, and the participant was asked to select one again. This continued until each item was ranked on a scale of most-to-least preferred. The highest preferred item was provided contingent on correct responses (independent or prompted) during intervention.

Experimental Conditions

Baseline. During baseline, the researcher presented an array of three stimuli in front of the participant. The researcher then delivered the instruction, “Touch color/shape/size.” No prompts or reinforcement was delivered, and the participant was given 5 s to emit a response in which regardless of the participant’s response, the researcher cleared the field and presented a new array. Because this study utilized a multiple baseline design across participants, the duration of baseline data collection varied across participants.

Autoclitic Frame Condition. The researcher began each trial by presenting an array of three stimuli to the participant and saying, "Touch (color/shape/size)." The researcher then immediately provided an autoclitic frame (e.g., "Color green," "Shape square") at a 0 s delay while pointing to the correct stimulus and providing a full physical prompt. Additionally, the participant was required to echo the autoclitic frame prior to or while selecting the stimulus. The researcher prompted the participant to echo the autoclitic frame by having the participant imitate either the full phrase (if applicable to the participant) or an approximation of the autoclitic frame. If the learner responded correctly (either prompted or independently), they were given brief access to the highest preferred item that was determined from the participant's preference assessment. For incorrect responses, error correction was implemented utilizing most-to-least prompting. If error correction and prompting procedures continued to result in incorrect responding after three consecutive incorrect responses, the trial was terminated. Once prompting was faded to an independent response, the delivery of the autoclitic frame (e.g., "Color green") was removed.

Best Practice Condition. The researcher began each trial by requiring a DOR from the participant (Grow & LeBlanc, 2013). For Participants A and C, the researcher implemented the DOR by using physical prompts to attend to the stimuli while saying, "(Participant's name), look!" The researcher implemented the DOR with Participant B by engaging in brief physical play (e.g., tickles) before saying "(Participant's name), look!" Once the participant engaged in the DOR, the researcher then delivered the instruction, (i.e., "Touch [color/shape/size"]) using a neutral tone of voice to avoid inadvertent instructor cues (Grow & LeBlanc, 2013). If the learner responded correctly (either prompted or independently), they were given brief access to the highest preferred item that was determined from the participant's preference assessment. If the participant did not respond correctly, error correction was implemented as described previously.

Experimental Design

This study utilized an adapted alternating treatments design within a multiple baseline design across participants. This design allowed researchers to compare skill acquisition across participants while also comparing skill acquisition across treatments.

Interobserver Agreement and Treatment Integrity

Interobserver agreement (IOA) data were collected for 33% of all trials by a secondary observer. IOA was calculated by dividing the number of agreements by the sum of agreements and disagreements and multiplying by 100. IOA was 100% across all sessions. Treatment integrity (TI) data were collected for 33% of trials on correct implementation of the intervention (e.g., prompting procedures, error correction, reinforcement delivery, etc.). TI was calculated by dividing the number of correctly implemented trials by the total number of trials and multiplying by 100. TI was 100%.

Results

Figure 1 shows the percentage of correct responses across both baseline and intervention phases across participants. None of the participants responded correctly during the baseline phase. Following intervention, Participant A met mastery criterion in the best practice condition but was unable to meet mastery criteria within the autoclitic frame condition. Participant A averaged 73% (range, 50%-100%) correct responding in the best practice condition and 65% (range, 50%-70%) in the autoclitic frame condition. However, Participant A continued an upward trend in independent responses prior to the conclusion of the study (range, 50%-70%). Participant B did not reach mastery criterion in either condition. Participant B averaged 30%

correct responding (range, 20%-40%) during the best practice condition and averaged 50% correct responding during the autoclitic frame condition across all three sessions. In both conditions, Participant B engaged in frequent errors in responding by engaging in inappropriate behaviors such as stacking and playing with the stimuli. When these behaviors were redirected, self-injurious behaviors were observed resulting in the termination of the condition. Participant B was ultimately removed from the study due to maladaptive behaviors after 15 total sessions. Participant C met mastery criterion during both conditions with an average of 90% (range, 60%-100%) correct responding in the best practice condition and an average of 86% (range, 60%-100%) in the autoclitic frame condition.

Discussion

The purpose of the current study was to compare two different interventions (best practice recommendations and autoclitic frame condition) on the acquisition of auditory-conditional discrimination for three children with ASD. The results showed that one participant met mastery criterion during the best practice condition only, one participant did not reach mastery criterion during either intervention, and one participant met mastery criterion during both conditions. Overall, the best practice condition resulted in faster skill acquisition across two participants. This may have been due to the requirement of the DOR during this condition, as the participants were required to look or engage with the stimuli prior to being given an instruction. Additionally, the autoclitic frame condition was only successful with Participant C. This may be because Participant C demonstrated the strongest verbal skills prior to the current study and was more successful with echoing the experimenter during this phase.

The results of this study indicate that best practice teaching recommendations (Grow & LeBlanc, 2013) is an effective method for teaching auditory-visual conditional discrimination.

However, the results also showed that teaching auditory-visual conditional discrimination may be achieved using an autoclitic frame for clients who have more developed language skills.

Although the results are encouraging, this study faced several limitations. First, data were only collected for 4 weeks. Due to this time restriction, only one participant was able to meet mastery criteria in both conditions during this time frame. Participant A continued an upward trend in both conditions and may have been able to meet mastery criteria if this study had been continued. Further, because Participant A had lower verbal skills upon entry to the study, additional time in the autoclitic frame condition may have been needed. Future research should collect data for longer durations to address this issue. Second, because of the small number of participants, it is unknown if the results would generalize to other ages, populations, and individuals with varying skill sets. Future research should examine these factors and determine its influence on the results. In conclusion, listener discrimination skill acquisition may differ from client to client. The results of this study stress the importance of accessing the client's repertoire prior to implementing intervention services. Although best practice methods may be beneficial for some clients, exploring teaching methods to increase skill acquisition may assist with future skill progression.

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Table 1

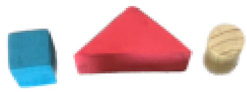
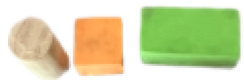
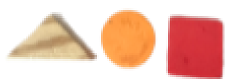
Participant VB-MAPP Scores

Participant	Milestones score	Barriers score	Transitions score
A	83.5	43	48
B	84.5	53	51
C	116.5	48	50

Table 2

Stimuli Across Conditions

Baseline Set	Assigned Stimuli
1	
2	
3	

Best Practice	
1	
2	
3	

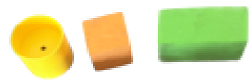
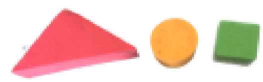
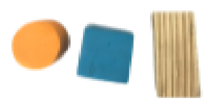
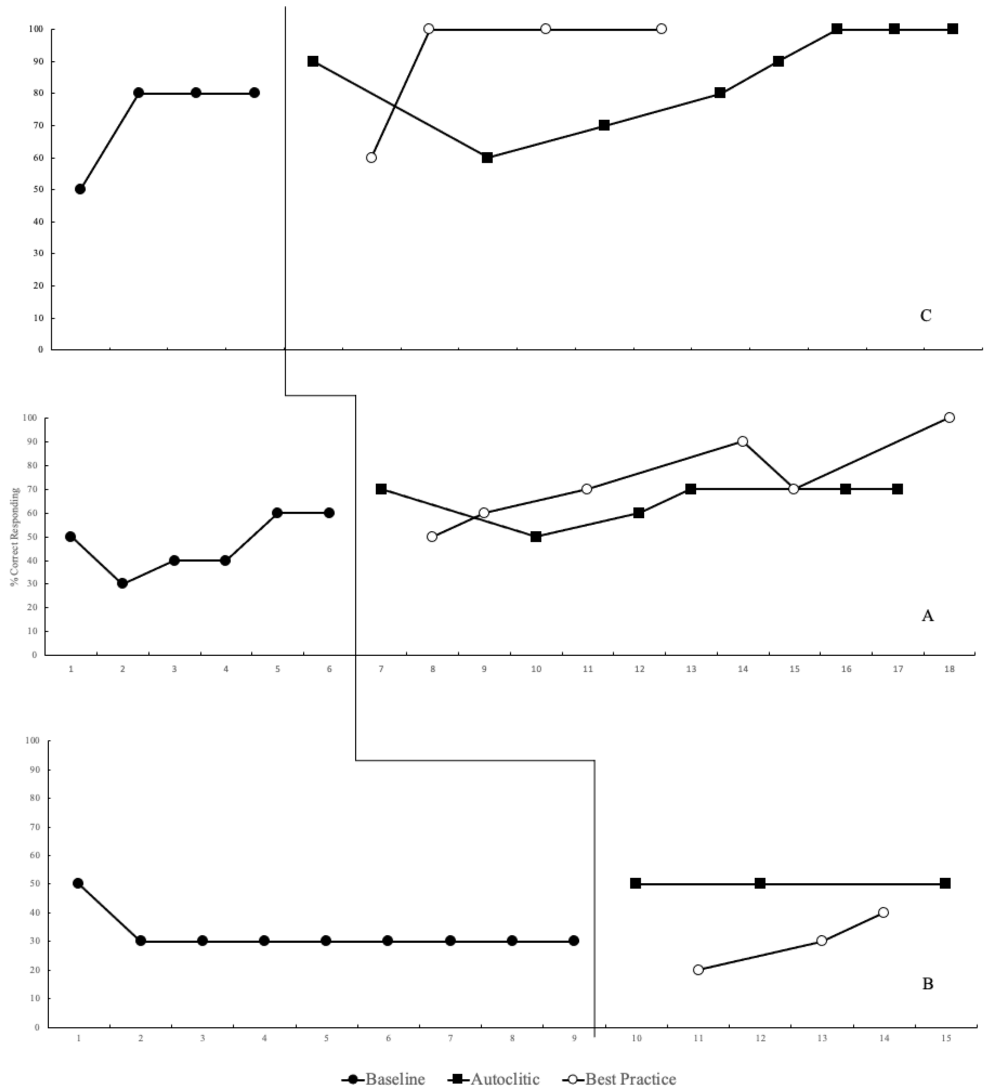
Autoclitic Frame	
1	
2	
3	

Figure 1

Percentage of Correct Responding Across Conditions and Participants



Appendix

Monday Date:			
Set #	Autoclitic Frame	Set #	Best Practice