The Effects of a Stimulus-Stimulus Pairing Procedure on the Acquisition of Conditioned Reinforcement for Attending to Faces in Children with Language and Developmental Delays in Home-Based ABA Programs

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ABSTRACT

A delayed pre- and post-probe design across participants was utilized in this study to assess the effectiveness of a stimulus-stimulus pairing procedure on the acquisition of adult faces as conditioned reinforcers in four students diagnosed with language and developmental delays. The study was conducted in each participant's home environment within a major metropolitan area. Participants were selected after pre-intervention probes indicated low levels of attending to the faces of speakers. The dependent variable in this experiment was the total duration of appropriate observation of an adult face in seconds. The independent variable in this study was the delivery of a continuous stimulus-stimulus pairing procedure in the form of vocal praise, songs, and tactile touch. The results for Participant A, B, C, & D indicate the the stimulus-stimulus pairing procedure was effective in increasing attending to the faces of speakers.

PARTICIPANT

The participants in this study were 4 students 2-6 years old. They were each enrolled in an ABA home program receiving one-on-one instruction 2-5 days per week. Procedural data was collected as part of each student's ABA home program. Two students were not enrolled in a preschool setting during this study. Two students were enrolled in Special Day programs in addition to home services.

Participant	Age	Diagnosis
A	6 years, 5 months	ASD
B	2 years, 5 months	Developmental Delays
C	2 years, 6 months	Developmental Delays
D	3 years, 0 months	Developmental Delays

SETTING

Each child received instruction within their home environment. Space in each home was set aside for working with their interventionists in the living room or bedroom. Parents participated in some, but not all instructional sessions.

LITERATURE REVIEW

- Amongst young children, the conjugate pairing procedure has been demonstrated to increase exploratory behaviors in infants (Rovee and Rovee, 1969).
- In a study of 24 infants ages 3-5, 7, and 9-11 weeks old, Haith, Bergman & Moore (1977) demonstrated that infants visually fixated on adult faces, specifically the eyes, increased when talking occurred versus when the face was still or moving. This finding supports previous studies that demonstrated that eye fixations are not determined by visual stimuli alone, but are also affected by lip movement and vocalizations. Researchers theorize that scanning of the eye area during speech, indicates to the mother that the infant is actively engaged with her, thus encouraging continued speech. Furthermore, this simple act provides the foundation of social interaction mother and infant, as well as provides a foundation for the acquisition of more complex verbal behaviors.
- Massaro and Bosseler (2006), tested the effects of the human face on the rate of learning in 5 children with autism. It was determined that although it was possible for students to acquire the vocabulary without the presence of a face during instruction, observation of lip, tongue, face and jaw movements appear to facilitate a more rapid acquisition of vocabulary and speech production. Additionally, the results indicated that observation of a face during instruction also increased the rate of retention.
- In her 2011 dissertation, Maffei-Lewis tested the effects of the stimulus-stimulus pairing procedure for the acquisition of adult faces and adult voices as conditioned reinforcers on listener behaviors in 6 developmentally delayed children. Researchers found conditioning adult faces and voices resulted in significant reduction in the number of learn units to criterion in speaker and listener programs, which indicate rapid acquisition of listener and speaker behaviors.

REFERENCES

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- Massaro, D. W., & Bosseler, A. (2006). Read my lips. *Autism, 10*(5), 495-510.
- Rovee, C.K., & Rovee, D.T. (1969). Conjugate reinforcement of infant exploratory behavior. *Journal of Experimental Child Psychology, 8,* 33-39.

VARIABLES

Dependent Variable: The dependent variable for this study was the duration of total attending to the faces of speakers.
Independent Variable: The independent variable in this study was the delivery of reinforcement in the form of vocal praise, songs, and tactile touch.

PROCEDURE

PRE-INTERVENTION PROBE

Each child was evaluated using a curriculum based assessment at the onset of services. During the initial assessment, assessors contrived a series of probes targeting observing responses including responding to name, attending to faces of speakers during play, and orienting towards individuals entering and leaving the room. To specifically assess for conditioned reinforcement for faces, instructors sat face-to-face with the participants while emitting nonsense vocal behavior to elicit participant gaze. A 5-minute timer was started at the onset of each intervention session. Once instructors obtained participant gaze, tactile and vocal verbal reinforcement were delivered in the form of songs, praise, silly facial expressions for the duration of the participant gaze. Instructors started a stop watch once participant gaze was obtained and stopped when the participant averted his or her gaze. Data are reported as total duration of attending during each 5-minute intervention session. None of the four participants demonstrated conditioned reinforcement for faces.

CONDITIONED REINFORCMENT FOR FACES INSTRUCTION

The conditioning procedure consists of a stimulus-stimulus pairing procedure in which the direct observation of an adult face, acting as the neutral stimulus, is paired with tactile touch reinforcement and vocal verbal reinforcement. During this procedure, instructors sat face-to-face with the participants while emitting nonsense vocal behavior to elicit participant gaze. Once instructors obtained participant gaze, tactile and vocal verbal reinforcement were delivered in the form of songs, praise, silly facial expressions, tickling, bubbles and soft touching for the duration of the participant gaze. Reinforcement stopped as soon as the participant looked away. In addition, digital timers were set to 5 minutes and started upon participant initiated gaze and were stopped when the participant looked away. In addition, a 5 minute stopwatch was started and stopped contingent on participant gaze. If participants glanced away and then back within one second, the timer was not stopped.

POST-INTEVENTION PROBE

Once each child met the instructional criteria for the program (scored 240/300 total seconds of attending across two adults), the instructor conducted a post-intervention probe. During the post-intervention probe, non-preferred instructors sat face-to-face with the participants while emitting nonsense vocal behavior to elicit participant gaze. Once instructors obtained participant gaze, tactile and vocal verbal reinforcement were delivered in the form of songs, praise, silly facial expressions for the duration of the participant gaze. Data are reported as total duration of attending over total session duration. Once participants met the post-intervention criteria, an additional post-intervention probe was conducted targeting observing responses.

DISCUSSION

The results of this study demonstrate a functional relationship between the implementation of a stimulus-stimulus pairing procedure and an increase in attention to faces across all participants with two participants acquiring faces as conditioned reinforcers within the home environment. The instructors evaluated and adjusted reinforcement during each session, by utilizing varying types of reinforcement including vocal praise, preferred songs, tickling, gentle touch, silly facial expressions, and light squeezing. Participants A & B were able to meet the instructional criterion; however neither was able to meet the post-intervention criterion. Participant A experienced a disruption in the intervention due to a staffing change. Instruction resumed once instructional control was established. Intervention will be re-implemented in order to facilitate acquisition of faces as conditioned reinforcers. Attempts to re-implement the intervention with Participant B were hampered when the student left the program after becoming ineligible for continued serviced due to age. Participants C and D met the post-intervention criterion. Participant D, a Japanese language student, achieved criterion with an instructor who did not speak his native language. Additionally, instructors noted an increase in English echoic behaviors following the acquisition of faces as conditioned reinforcers. Furthermore, both Participants C and D demonstrated significant increases in their observing responses. The results of this study demonstrate a functional relationship between the stimulus-stimulus pairing procedure and increased attention to faces in children with language and developmental delays and indicate the effects may be generalized across languages.

RESULTS

During pre-intervention probes, all participants exhibited low levels of observing responses, including attending to faces and did not have faces as conditioned reinforcers in repertoire. Following the implementation of the stimulus-stimulus pairing procedure, which paired attention to faces with preferred stimuli including vocal praise and tactile reinforcement, all participants demonstrated increased attending to the faces of speakers.

Participant A met the intervention criterion of 240 total seconds of attending across two individuals; however, Participant A failed to meet the post-intervention criterion of 240 total seconds with an additional individual. During the implementation of the intervention procedure, there was a staffing change in Participant A's instructional team. Instruction was temporarily placed on hold until the new staff member had gained instructional control.

Participant B also met the intervention criterion, but failed to meet the post-intervention criterion. Both Participants A & B demonstrated a significant increase in the total duration of attending to faces.

Participants C & D met the intervention and post-intervention probe criterion. In addition, Participant D received instruction in Japanese throughout the intervention and met the post-intervention criterion with an English-speaking instructor, demonstrating generalization across languages.

	Participant A		Participant B		Participant C		Participant D	
	Pre-Intervention	Post-Intervention	Pre-Intervention	Post-Intervention	Pre-Intervention	Post-Intervention	Pre-Intervention	Post-Intervention
Orients towards and attends to the faces of speakers when engaged in play	No	No	No	No	No	Yes	No	No
Orients towards the speaker when vocal interactions are initiated and/or the learner's name is spoken	Yes	Yes	No	No	No	Yes	No	Yes
Orients towards another individual entering the room	Yes	Yes	No	No	No	Yes	No	Yes
Orients towards the instructor at the table	Yes	Yes	No	NO	No	Yes	No	Yes

Figure 1: Pre- and Post-Intervention Probes

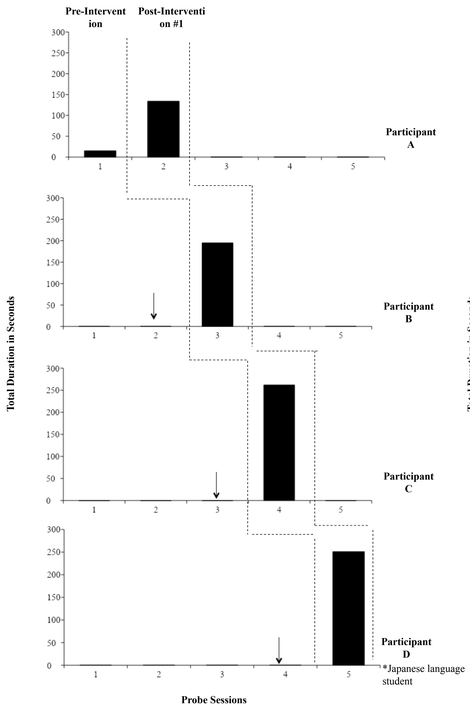
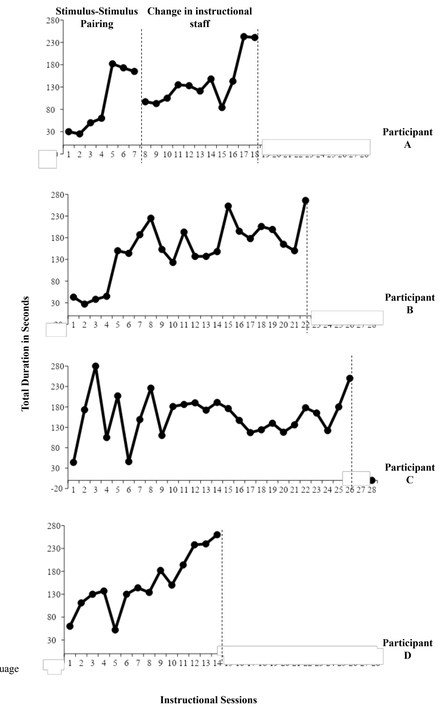


Figure 2: Stimulus-stimulus pairing intervention



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