

Acquisition of Mands, Tacts, and Intraverbals Through Sign Exposure in an Individual With Autism

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Many children with autism communicate through the use of alternative communication systems, such as sign language. Limited research has been conducted on the situations under which sign language will be acquired across verbal operants without direct teaching. The purpose of the current study was to evaluate exposure to sign language on the acquisition of signed mands, tacts, and intraverbals in a male child with autism. Results indicated fast acquisition of mands, tacts, and intraverbals without direct teaching. Results are discussed in the context of future research investigating exposure without direct teaching in individuals who communicate with alternative communication systems.

Key words: Sign language, verbal behavior, mands, tacts, intraverbal language, alternative communication systems, topography-based verbal behavior, naming

Children with autism may not develop vocal language and may require specific teaching with alternative communication systems. Some of these alternative communication systems include sign language and picture systems (Sundberg, 1993). Sign language is a topography-based system (Michael, 1985) and may be effective in establishing pure verbal operants, a suggested disadvantage of selection-based systems (Sundberg, 1993). In the absence of vocal verbal behavior, sign language may serve as a main form of communication. Therefore, when teaching sign language, it is important to examine the situations under which sign language can be acquired without direct instruction. A common practical problem exists in teaching verbal behavior if each individual word must be directly taught. However, if language can be acquired through incidental observation, verbal behavior may grow quickly. Children who communicate with vocal responses have the opportunity to observe verbal behavior outside of the teaching environment. However, children who communicate with alternative systems are at a distinct disadvantage because it is unlikely that others in the environment consistently communicate with

those same systems outside of direct teaching situations.

Given the high reliance on alternative communication systems in children with autism, additional research is needed to investigate teaching procedures that result in the emergence of responses without direct teaching. Ziomek and Rehfeldt (2008) observed the emergence of untrained verbal operants with adults with severe disabilities after successful mand training for preferred items using the Picture Exchange Communication System (PECS). In the Ziomek and Rehfeldt study, the mand relation was directly taught and the tact and intraverbal emerged in some participants. The purpose of the current study was to assess the effects of sign exposure without direct teaching on the emergence of mands, tacts, and intraverbals in a child with autism.

METHOD

Participant, Setting, and Materials

Jethro, a 7-year-old male with autism, attended a behavioral intervention program and had received daily instruction for approximately 2 years. Jethro easily completed tasks such as identity matching and sorting. His listener repertoire consisted of following one step instructions, identification of at least 100 objects and 100 pictures, and items by feature, function, and class. Jethro imitated

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most motor movements, emitted signed mands for 30 items, and emitted signed tacts for approximately 10 items. Jethro completed 6 intraverbal phrases with signed responses. Jethro did not emit any echoic behavior. All sessions were conducted by an instructor in a classroom shared with 3 to 5 other children and instructors. Sessions lasted, on average, 15 min. Jethro's area contained a table, 2 chairs, and other teaching materials typically found in a classroom.

Response Measurement and Interobserver Agreement

The dependent variable was a correct independent response, which was recorded if Jethro emitted the corresponding sign or an acceptable approximation for the targeted item when the opportunity was presented. Correct topographies and acceptable approximations were identified prior to sessions. For example, the sign for shaving cream was defined as the right thumb and pointer finger making "c" shape on right cheek and moving down. Acceptable approximations included the same movement only with variation in hand (left or right). Similar definitions were created for all targets. A correct mand was recorded if Jethro emitted the sign within 5 s of the presentation of the stimulus, which was presented in sight but out of reach. A correct tact was recorded if Jethro emitted the sign within 5 s of presentation of the nonverbal stimulus and verbal stimulus. During these trials, the item was presented in sight and within reach. A correct intraverbal was recorded if Jethro emitted the sign within 5 s of the verbal stimulus with the item out of sight. The verbal stimuli (for intraverbals) associated with each targeted item included: "tell me something you need to blow bubbles" (bubble wand), "tell me something you play with at a birthday party" (balloon), and "tell me something that's white that you play with" (shaving cream). During sign exposure sessions, an imitated sign was defined as Jethro emitting the sign or approximation within 5 s of the therapist's model.

Interobserver agreement (IOA) was calculated by dividing the number of agreements by the number of agreements and disagreements and multiplying by 100%. An agreement was defined as both data collectors recording an independent correct response. A

disagreement was defined as one data collector recording an independent correct response and the other recording the absence of an independent correct response. Mean IOA was 96% (range 77%–100%) and was collected during 48% of sessions.

Procedural Integrity

During each sign exposure session, a second observer recorded the experimenter's correct modeling of the sign under all conditions. A mark was placed in the corresponding row during 10 interspersed opportunities for each mand, tact, and intraverbal response. Data were summarized as percentage of correct trials per session. The mean procedural integrity score was 99% (range, 93% to 100%) and was assessed during 53% of sessions.

Experimental Design and Experimental Conditions

A multiple baseline design across responses was used. Three preferred activities with corresponding items were chosen and included: playing with bubbles (bubble wand), balloon play (balloon), and playing with shaving cream (shaving cream).

Preference Assessment

Prior to each session, a multiple stimulus without replacement preference assessment (MSWO; DeLeon, & Iwata, 1996) was conducted to ensure preference for the targeted item when mand opportunities were provided. If the item was ranked as one of the top three, the session was initiated. If Jethro did not include the item in his top three choices, sessions were postponed for 1 to 24 hours until preference was indicated in a subsequent MSWO.

Baseline and Post-sign Exposure Probe Sessions

During baseline, the targeted activity was initiated. Natural interaction during the activity included playing with the items and making comments about the activity (e.g., "I made a circle"). Additionally, receptive instructions and motor imitation tasks were

presented throughout the activity to intersperse tasks other than signing and to mimic a teaching session. During the activity, 10 opportunities for Jethro to emit signs of the specified item under mand, tact, and intraverbal conditions were provided (30 total opportunities across three operants). For mands, the activity was briefly interrupted and the item was presented in sight but out of reach and no verbal stimulus was presented. For tacts, the verbal stimulus, "what is this?" and the nonverbal stimulus (i.e., the item) were presented. Jethro had access to the item and the therapist pointed to the item while presenting the verbal stimulus. For intraverbals, the item was temporarily removed from sight and only the verbal stimulus was presented (e.g., "tell me something you need to blow bubbles"). Verbal stimuli for tacts and intraverbals were presented vocally. For all trials, Jethro was allowed 5 s to respond. The activity was briefly interrupted for the mand and intraverbal trials. After the trial, the activity resumed. Contingent on correct responding to tact, mand, and intraverbal trials, general verbal praise was provided. In baseline sessions, the responses never occurred, therefore no consequences were provided.

Sign Exposure Sessions

During sign exposure sessions, the targeted activity was initiated. Natural interaction during the activity included playing with the items and making comments about the activity. Receptive instructions and motor imitation tasks were presented throughout the activity to intersperse tasks other than signs and to mimic a teaching session. During the activity, the therapist presented the modeled sign with the targeted item 10 times for each operant. For mands, Jethro had access to some of the items. The activity was briefly interrupted to model the sign, then the activity resumed. The sign was paired with saying the name of the item and delivery of the item during mand trials. For tacts, Jethro had access to the item. The therapist pointed and presented the verbal stimulus, "This is [e.g., shaving cream]" and modeled the sign. For intraverbal trials, the nonverbal stimulus was hidden from view and the verbal stimulus was presented (e.g., "something you play with at a

birthday party is shaving cream") vocally while modeling the sign. There were no programmed consequences for correct responding. Jethro was not prompted or required to emit the sign, the therapist signed while saying the name of the item under the corresponding antecedent conditions. In order to produce as pure verbal operants as possible, mand trials occurred when the item was briefly restricted. Tact pairings occurred when Jethro had access to the item. Intraverbal pairings occurred in the absence of the targeted item and after the specific verbal stimulus. Trials were interspersed across operants (i.e., did not occur consecutively). One sign exposure session was always conducted prior to a probe session.

RESULTS

Figure 1 shows baseline and post-sign exposure probe conditions for the three targets. During baseline for shaving cream, Jethro did not emit the sign under mand, tact, or intraverbal conditions. During probes that followed sign exposure for shaving cream, Jethro emitted the sign under intraverbal conditions after two sign exposure sessions and under mand and tact conditions after four sign exposure sessions. He continued to emit the correct sign in all three conditions during most opportunities and correct responses increased as sessions continued. During baseline for balloons, Jethro did not emit the sign under mand, tact, or intraverbal conditions. During sign exposure, Jethro emitted the sign in all three operants after six sign exposure sessions. Finally, during baseline for bubble wand, Jethro did not emit the sign under mand, tact, or intraverbal conditions. During sign exposure, responding increased under tact conditions after two sign exposure sessions and under mand and intraverbal conditions after three sign exposure sessions.

During sign exposure sessions, data were collected on the frequency of imitated responses (Figure 2). During the first sign exposure session for shaving cream, Jethro initially did not imitate the modeled sign. However, Jethro imitated the sign for shaving cream in all subsequent sessions and an increase was seen in the post-sign exposure probe sessions in which no model was given as shown in Figure 1. During the sign

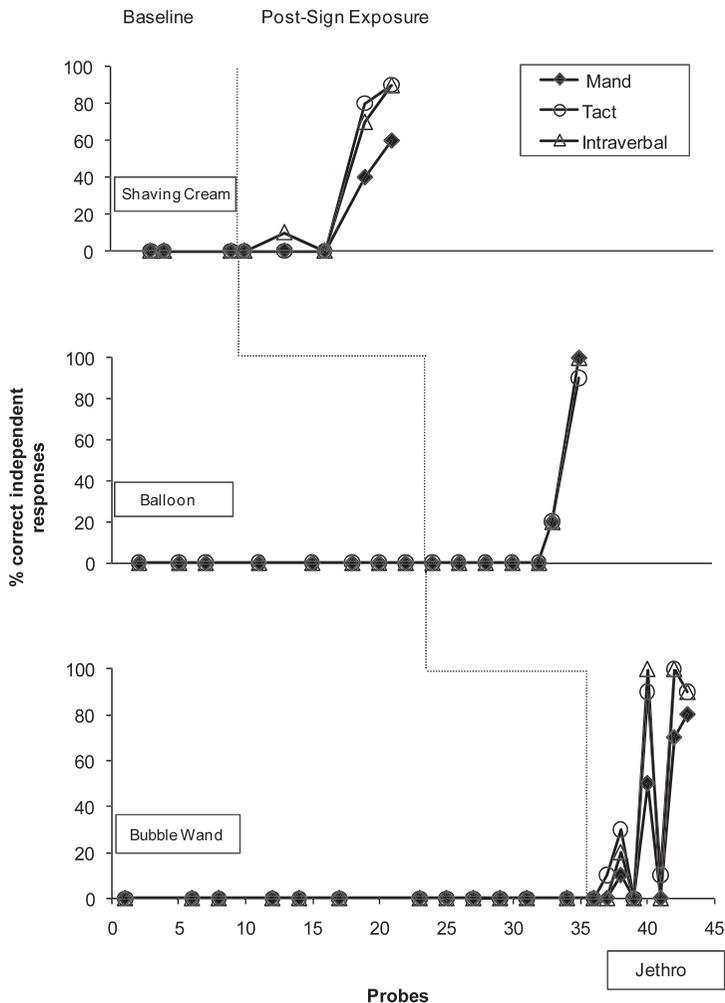


Figure 1. Jethro’s baseline and post-sign exposure probe conditions for the targeted items “shaving cream,” “balloons,” and “bubble wand” are depicted in mand, tact, and intraverbal form.

exposure sessions for balloon, Jethro only imitated the modeled sign in one session, but an increase in signing under all conditions was observed in the subsequent post-sign exposure probe sessions as shown in Figure 1. During the sign exposure sessions for bubble wand, Jethro imitated the modeled sign in the second and third sessions only, yet an increase in signing was observed in the subsequent post-sign exposure probe sessions as shown in Figure 1.

DISCUSSION

Results showed that all three signs were emitted under mand, tact, and intraverbal

conditions during post-sign exposure probes. Jethro demonstrated acquisition of sign language the way many typically developing children acquire vocal-verbal behavior. These results led to specific recommendations regarding the importance of providing sign language modeling. Specifically, caregivers, teachers, and therapists were instructed to learn and use sign language in their daily interactions with Jethro in order to expose him to sign language experiences and promote future emergence of untrained verbal behavior.

The current procedures may be conceptualized as a procedure for assessing naming in children with autism who communicate via sign language. The process of naming, which

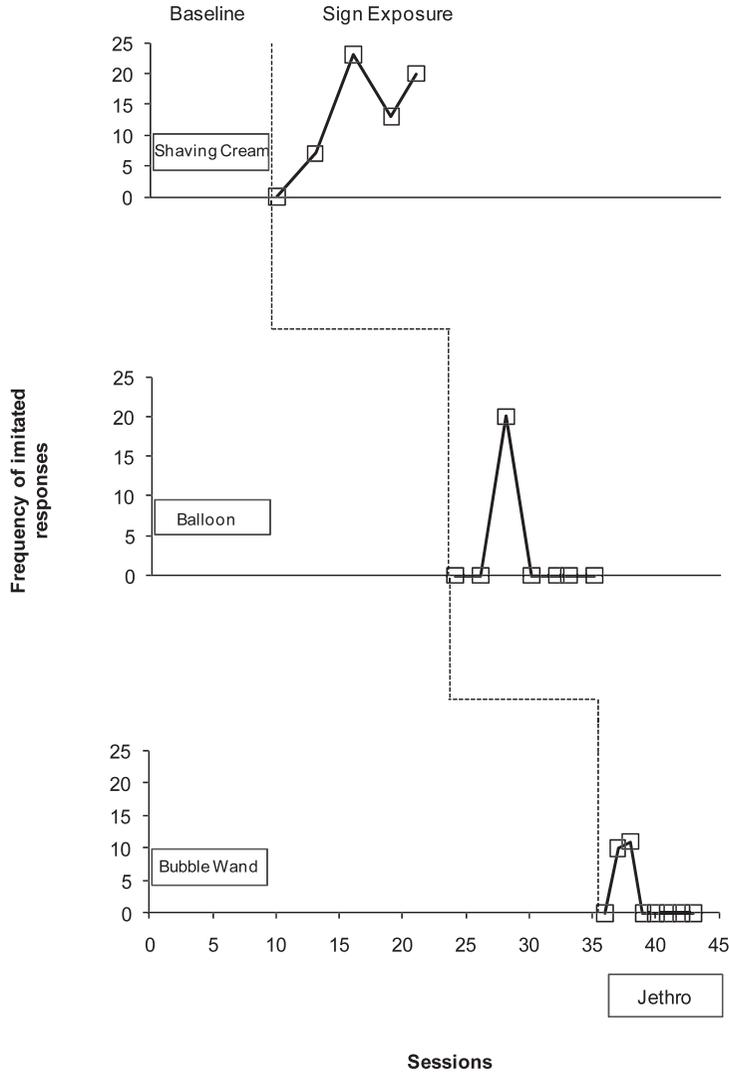


Figure 2. Jethro's frequency of imitated responses during sign exposure sessions for the targeted items "shaving cream," "balloons," and "bubble wand" are depicted.

"occurs when a child hears someone tact, or say the name of an object that is present in the environment, and as a result the child can respond to the item both as a listener and as a speaker" (Fiorile & Greer, 2007, p.71) was first described by Horne and Lowe (1996). Naming is a higher order verbal operant that is crucial in typical language development in that it enables children to acquire a vast amount of language incidentally (Greer & Longano, 2010). However, one limitation of interpreting Jethro's emergent signing as an indicator of naming is that listener responses were not directly probed. Naming is demon-

strated when a listener response emerges after direct training in a speaker response, or vice versa (Miguel & Petursdottir, 2009). In the current study, listener responses were not directly assessed or reinforced.

Jethro's responding during the sign exposure sessions is interesting. Specifically, he engaged in some imitative responses during some sessions. Interestingly, he engaged in the most imitation during sign exposure sessions with the first targeted activity and with subsequent activities his imitation occurred only initially, yet he still acquired the signs. This imitative behavior may

parallel the function of self-echoic responses that occur when vocal children with naming engage in listener behavior that then results in vocal verbal behavior (Miguel & Petursdottir, 2009). Sautter, LeBlanc, Jay, Goldsmith, and Carr (in press) examined self-prompts while teaching problem solving skills to typically developing children. Results indicated that children emitted audible self-prompts initially when responding to intraverbal categorization tasks but that audible self-prompts decreased over time. The authors suggest that this decrease may have been evidence of the self-prompts becoming covert. Correct responding remained high, suggesting evidence of this private event. Similar responding was observed with Jethro. Although initially he imitated the signs during sign exposure sessions, responding decreased to almost zero in subsequent sign exposure sessions for balloons and bubble wand, suggesting that his early imitative behavior may have been an overt self-prompt (modeling during sign exposure sessions), which may have become covert in subsequent sessions. Similar to the participants in the Sautter et al. study, Jethro continued to emit correct responses during probe sessions despite the decrease in imitative behavior during sign exposure sessions.

There were some limitations to the current study that warrant discussion. First, although every attempt was made to produce pure verbal operants, it is likely that the operants were multiply controlled (i.e., impure mands or partial tacts). The mand responses observed during probe trials may have been tacts because the nonverbal stimulus was present, making the source of stimulus control unclear. Although this represents a conceptual limitation, pragmatically this represents most human verbal behavior. Second, providing praise contingent on correct responses during the probes may have increased these responses if praise functioned as a reinforcer. Therefore, only the first occurrence of the behaviors can be attributed to the sign exposure and for the remaining behaviors, it is not possible to separate the effects of sign exposure and reinforcement. Next, during the sign exposure sessions, if Jethro imitated the sign during mand and intra-

verbal trials and the activity was resumed it is possible that these responses were adventitiously reinforced by providing the item. That is, although not specifically programmed, Jethro may have received reinforcement for imitating the modeled sign during sign exposure sessions. Finally, there were no maintenance checks or interspersal of the signs previously acquired through sign exposure to ensure discrimination. However, it should be noted that Jethro continued to emit the signs for other preferred items outside of treatment sessions, particularly in the mand and tact context, suggesting there was some discrimination across each of his signs. In addition, the interspersal of receptive instructions and other imitation skills may have helped to facilitate discrimination. Future research should examine discrimination by interspersing targets and conducting maintenance checks. Jethro did not emit the signs for bubble wand, balloons, or shaving cream outside of mand, tact, or intraverbal trials during probe sessions, with the exception of session 21, during which he emitted the sign 10 additional times. The lack of random emission of the sign outside of the specific trials suggests appropriate stimulus control.

Procedures to observe the effects of sign exposure in individuals with autism who communicate with alternative systems is an exciting avenue for future research and may have significant benefit to this population. Future research may examine student characteristics (e.g., motor imitation, listener skills) that make the emergence of sign language without direct teaching possible. Future research may examine exposure in individuals with autism who communicate with other communication systems such as pictures, typing, or writing.

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