Effects of Speaker Immersion on Independent Speaker Behavior of Preschool Children with Verbal Delays

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Abstract

Speaker immersion is a tactic that uses multiple establishing operations to increase speaker behavior for individuals with limited mand and tact repertoires. The purpose of this paper was to evaluate the effects of speaker immersion on the number of independent mands, tacts, and autoclitics emitted by young children with verbal delays. In the first experiment, two children who emitted autoclitic mands in instructional settings, but not in non-instructional settings, participated in 60-minute speaker immersion sessions for three days. Results showed that speaker immersion was effective in increasing the number of independently emitted autoclitic mands in a non-instructional setting for both participants. In the second experiment, two children with independent mands, tacts, and autoclitics in instructional settings, but not in non-instructional settings, received daily, 10-minute speaker immersion sessions. Results showed that speaker immersion also resulted in increased mands, tacts, and autoclitics for these participants. Outcomes are discussed in terms of establishing operations and the utility of speaker immersion as an instructional tactic.
Keywords: Establishing Operation, Mand, Tact, Speaker Immersion

In verbal behavior, speaker behavior consists of six basic verbal operants or functions defined by their effect on a listener, including echoics, mands, tacts, intraverbals, textual responses, and autoclitics. Mands are verbal operants controlled by conditions of deprivation or aversive stimulus control and reinforced by the item specified in the mand (i.e., saying "Cookie" is reinforced by receiving a cookie). Tacts are verbal operants controlled by the presence of environmental stimuli and maintained by generalized reinforcement (i.e., saying "Bird" is reinforced by affirmation from a listener). Autoclitics are verbal operants that further modify the mand or tact operant (i.e., "I want the chocolate cookie" or "That's a blue bird)"

Independent or "spontaneous" speaker behavior consists of verbal operants such as mands or tacts that are emitted under non-verbal antecedent control, and possibly used in ways not previously reinforced. This unprompted speaker behavior further implies the presence of a generalized reinforcer, such as a response from a listener. Acquisition of independent speaker behavior is significant because some research indicates that it is one component of language development that distinguishes children with delayed verbal repertoires from children with typically-developing verbal repertoires. For instance, Hart and Risley (1995) found that after minimal verbal instruction, typically-developing children not only used more independent speech than their peers with verbal delays, but also applied acquired vocabulary to untrained or novel stimuli and spoke about more topics. In contrast, children with verbal delays tend to use less independent speaker behavior than their typically-developing peers (Hart & Risley, 1995), and may not use trained speaker behavior for untaught stimuli or verbal functions unless direct teaching is provided (Greer, 2002; Nuzzolo-Gomez & Greer, 2004; Twyman, 1996). Thus, a frequent goal of language training programs is to teach children to emit speaker behavior beyond the training setting, or to emit it "independently."

To facilitate independent speaker behavior, verbal behavior training programs incorporate establishing operations (EO), which are contrived or naturally-occurring motivational conditions created by manipulating events or stimuli in a child's environment such that they change the reinforcing effectiveness of other variables and the frequency of responses associated with those variables (Michael, 1988). For example, *deprivation* involves reducing a child's access to a desired item, which consequently may increase the reinforcing effectiveness of the item and the frequency of responses associated with

obtaining it. Other examples of establishing operations include satiation and the removal of aversive stimuli. Establishing operations are commonly used to teach mands, although some research suggests that they can be used to teach tacts (Nuzzolo-Gomez & Greer, 2004; Tsiouri & Greer, 2003).

A common tactic that uses establishing operations to increase speaker behavior is incidental teaching. Incidental teaching begins when a speaker gestures, comments, or otherwise indicates a desire for an item or activity with which they need assistance to manipulate or obtain. The listener provides a prompt (i.e., a verbal question or model, an expectant look) and waits for the speaker to emit a targeted verbal response. The desired item or activity is subsequently delivered contingent upon the speaker's response. McGee, Morrier, and Daly (1999) found that acquisition of mands increased significantly following an incidental teaching procedure for preschool children with autism. They attributed their findings to the motivational conditions or establishing operations. Dunst et al. (2001), who trained parents to implement incidental teaching, found similar results for young children with delays.

A second common tactic that uses establishing operations to increase speaker behavior is the behavior chain interruption strategy (BCIS). The BCIS incorporates planned interruptions of familiar routines as establishing operations for mands or tacts (Stafford, Sundberg, & Braam, 1988). Sigafoos and Littlewood (1999) found that the BCIS increased mands for play by a child with autism when chains of play were interrupted. They attributed their findings to BCIS and time-delay procedures. Grunsell and Carter (2002) found that BCIS increased selection requests for four elementary-school children with language delays, and that responses were emitted in out-of-routine contexts.

A third common procedure that utilizes establishing operations to increase speaker behavior is a brief motivational procedure, during which time delay is incorporated as part of mand training (Schwartz, 1994). During the brief motivational procedure, teachers present an item from which a student has been deprived (i.e., candy), wait a few seconds for a response (time delay), and differentially reinforce correct mands by providing contingent access to the desired item. Williams and Greer (1993) found that adolescents with developmental disabilities emitted more functional vocal speech with a brief motivational procedure than when it was not used. Drash, High, and Tudor (1999) also found that children with autism readily acquired vocal speech when brief motivational procedures were used as part of mand training.

Since BCIS, incidental teaching, and brief motivational procedures all incorporate establishing operations, they are used to teach mands under conditions that resemble the natural setting, thus increasing the likelihood that targeted speaker behavior will be emitted independently. However, research suggests that these tactics may not always facilitate independent speaker behavior. For example, Sundberg and Michael (2002) suggested that incidental teaching produces an insufficient variety and number of establishing operations to successfully teach communication because it relies on naturally-occurring establishing operations. Carter and Grunsell (2001) reported that BCIS had only reliably been shown to create establishing operations in the context of a routine, with most studies using routines that were not naturally-occurring, and consequently training mands only in the context of the interruption. Research on brief motivational procedures suggests that while mands may be the most useful verbal operant to teach initially (Michael, 1988), they do not transfer to tact functions without specific training (Nuzzolo-Gomez & Greer, 2004; Twyman, 1996). Further, since independent speaker behavior is comprised of much more than mand operants, these motivational procedures may not be sufficient for establishing it across mand, tact, and autoclitic functions. Thus, a need exists for strategies that will result in increased independent speaker behavior outside of a teaching session.

Speaker immersion (Greer, 2002; Greer & Ross, 2004; Ross, 1995) is a tactic that could facilitate independent speaker behavior, particularly for students who have limited mand and tact repertoires (i.e., they emit very few mands, tacts, or autoclitics). The speaker immersion tactic uses intensive numbers of

establishing operations, mainly during transitions within a classroom or school, to structure the environment such that rates of mands increase. During speaker immersion, a student is required to mand a number of routine events or desired items in order to engage in or use them; this includes events such as standing, sitting, exiting the classroom, wearing their coat, or receiving a tangible or edible reinforcer. The opportunity to mand such routine events and desired items is presented until the physical response to the speaker immersion procedure requires more effort than the emission of high rates of vocal mands for the same events. In other words, vocal communicative behavior begins to obtain maximum reinforcement with less effort.

To date, there are few experiments testing speaker immersion (i.e., Greer, 2002; Greer & Ross, 2004). Thus, the purpose of this paper was to report the effects of speaker immersion on the frequency of independent speaker behavior by children with verbal delays. Two studies are presented that examined the effects of speaker immersion for four preschoolers with verbal delays who emitted low rates of independent speaker behavior.

Experiment 1

Method

Participants

Two preschool-age children with communication delays were the participants in this study. According to an independent evaluation performed by a special educator using the *Hawaii Early Learning Profile* (HELP; Parks, 1991), both children had expressive language delays of at least one year. Participant 1 was a 33-month old girl who spoke approximately 300 words; independently – though infrequently – used single word mands; and manded about five items in complete sentences (i.e., "I want cookie, please") when prompted to do so during instruction. Participant 2 was a 36-month old boy who spoke approximately 100 words, and independently – though infrequently – used single word mands (i.e., train). Both participants were selected because they primarily used single words to mand and tact common items, and emitted autoclitic mands and tacts (i.e., used more than single words) only when they were receiving direct training for autoclitic responses during instructional sessions. No autoclitic mands and tacts were emitted by these participants during non-instructional periods, even after several weeks of opportunities-to-respond during which establishing operations were incorporated as part of mand instruction.

Setting

This study took place in a classroom located in a small early intervention center for children with communication impairments. The classroom had five children, one teacher, and two teacher's assistants. All sessions took place in both the instructional and non-instructional settings. The non-instructional settings included the playground, play area located in the classroom, the hallways, bathroom, and the school bus loading area. The instructional setting was the classroom area in which one-to-one instruction occurred. In each setting, an additional instructor and at least one other student were always present.

Dependent Variables

The dependent variables for this study were autoclitic mands. Autoclitic mands were defined as instances of vocal verbal behavior that contained three or more words, occurred within the context of known motivational conditions (i.e., deprivation or other antecedent conditions that preceded a targeted mand form) and under non-verbal antecedent control, and were reinforced by the participants' receipt of

the specified item. Autoclitics were required to affect the mand function. An example of an autoclitic mand emitted by the participants might be, "Can I go into the classroom, please?" or "I want the cookie." Incorrect responses occurred if the participants emitted sentences containing only one or two words (i.e., "Classroom, please" or "Cookie"), or if they did not respond at all.

Generalized mands and *captured mands* were recorded. *Generalized mands* occurred in the instructional setting when participants independently requested a reinforcer after a correct response during non-speaker or listener instruction (i.e., asking for a cookie after correctly responding to a direction to touch their nose). *Captured mands* occurred in non-instructional settings when participants independently requested an event or item while in the non-instructional setting (i.e., asking to play on the slide while on the playground). All mands were collapsed into one data point.

Data Collection and Interobserver Agreement

The number of correct responses in both instructional and non-instructional settings was recorded by using a mechanical counter or paper and pencil method. Four observers trained to collect data on each participant recorded correct and incorrect responses emitted by the students when they arrived at school until a 60-minute time period was completed. Only correct, independently emitted mands (those without echoic antecedents) were recorded with a plus; all echoic mands and incorrectly emitted mands were recorded with a minus. Because of the 60-minute duration of sessions, a second observer collected interobserver agreement data with the primary instructor for only 10% of all sessions (at least one session in each condition for each participant). Interobserver agreement was calculated by dividing the number of correct responses reported by each observer by the number of incorrect responses plus the incorrect responses and multiplying this total by 100. Mean interobserver agreement was 99% (range, 98% to 100%) for all sessions in which interobserver agreement data were collected.

Design

A multiple baseline across subjects design (Baer, Wolf, & Risley, 1968) was used to evaluate the effects of speaker immersion on autoclitic mands for both participants. The procedure began by selecting a 60-minute time period during which establishing operations could be implemented for common activities for each participant. The time period that was selected began when the participants exited the school bus to enter the school and ended after 60-minutes were completed. Approximately 15 to 25 minutes of the targeted period were spent in the non-instructional setting and approximately 35 to 45 minutes were spent in the instructional setting. Approximately 60 establishing operations were created per session (number varied depending on the setting), and one session was conducted at the same time daily.

Procedures

Baseline. Baseline data were collected in both non-instructional and instructional settings. During baseline in the instructional setting, an instructor sat facing one participant at a table. The instructor presented an instructional antecedent from the participant's individualized curriculum (i.e., "Touch your nose"), prompted the participant if needed (i.e., modeled the correct response), and waited five seconds for the participant's response. After a correct response to an instructional antecedent, the instructor praised the participant and then gave them an opportunity to emit a generalized mand. During generalized mand opportunities, the instructor first gestured to a tray or set of reinforcers displayed on the table. Then the instructor waited five seconds for the participant to emit an autoclitic mand. If a correct autoclitic mand was emitted, the specified item was immediately given to the participant and a new instructional antecedent was presented. If an incorrect autoclitic mand was emitted or if no mand was

emitted, the response was ignored and the next instructional antecedent was presented. The instructional sequence, including the generalized mand opportunities, was typical of instruction in the school where the study occurred. The instructional sequence took place for 15 to 25 minutes. Experimenters also used participants' responses to target stimuli during baseline as an assessment of events and items that could be potential reinforcers for the participants during the speaker immersion procedure.

During baseline in non-instructional settings (i.e., bus, playground, play area, hallway, and bathroom), data collection began during the targeted 60-minute time period (i.e., exiting the bus to enter the school in the morning or going to the play area after instruction). When a scheduled routine began, an instructor first ensured that setting events associated with the activity were made obvious for the participant. For example, when exiting the school bus before entering the school in the morning, the participant stayed on the bus and could not exit along with other students. While the opportunity to engage in this routine activity was withheld, the instructor waited 10 s for the participant to mand the activity (i.e., "I want to get off of the bus, please"). If the participant emitted a correct autoclitic mand, they were allowed to engage in the routine activity, and the response was recorded as a plus. If the participant did not emit a correct autoclitic mand within the 10 s interreponse time, the instructor enhanced the motivational condition by waving to other students who exited the bus and interjecting phrases to prompt the participant to respond such as "Bye-bye, everyone. They can all leave the bus and go to school." If the participant did not respond, they were allowed to engage in the activity after another 10 s period, but all further vocalizations were ignored, and a minus was recorded.

Speaker Immersion Training. In the immersion procedure, all movement, environmental change, or activity change required the participant to emit a verbal response. During a speaker immersion training session, participants were rotated in instructional and non-instructional settings. As in baseline, the experimenter withheld a targeted event or item and presented the participant with a 10 s opportunity to mand it (5 s for generalized mands). If the student manded the item, it was delivered with no vocal approval, and a plus was recorded on the data collection sheet. If the student did not mand the item, an echoic model of the autoclitic mand was presented (i.e., "I want cracker, please") and the participant was given another opportunity-to-respond. The item was delivered if the participant manded the item; the instructor then presented the next response opportunity for a different item or event. For example, after other students exited the bus in the non-instructional setting, the instructor waited 10 s for the participant to independently say "I want to get off of the bus, please." If the participant did not emit a correct autoclitic mand within the 10 s intraresponse time, the motivational condition was presented again (i.e., other students were more animatedly praised for engaging in the activity), the instructor said, "I want to get off of the bus, please," and the participant was given another 10 s opportunity-to-respond. If the correct response was emitted, they were allowed to engage in the activity. If an incorrect response was emitted, the activity (i.e., exiting the bus) was briefly withheld and then the participant was allowed to engage in it. In the non-instructional setting, each setting event (i.e., entering the school door) set the occasion for the next opportunity to emit an autoclitic mand. Approximately 60 establishing operations were presented across both non-instructional and instructional settings.

In addition to the teacher withholding the item, other motivational conditions were created to increase the student's likelihood to mand non-reinforcing items. For example, coming to the instructional area was not a known reinforcer for Participant 1 because she disliked leaving the play area. Therefore, other students were vocally praised and reinforced with the participant's reinforcers for coming to the instructional area until the participant manded the event within the 10 s intraresponse times. Periodically, the experimenter began the opportunity to mand the event by giving an expectant look to the participant (i.e., raising the eyebrows).

Generalization. After three days of speaker immersion training, the echoic model was removed and speaker immersion procedures occurred as during baseline. Establishing operations for preferred and

non-preferred items and events were maintained. Data were collected on the number of independent (non-echoic) generalized and captured mands emitted by participants in instructional and non-instructional settings. Echoic models were presented as corrections only (i.e., if a participant did not emit a mand response, the teacher would model the mand form, but ignore any participant responses), and the next establishing operation was then presented.

Results

Figure 1 displays the total number of independent autoclitic mands emitted by Participants 1 and 2. Participant 1 emitted a mean of 3.5 mands per session (range, 1to 6) during baseline, a mean of 8 mands per session (range, 4 to 10) during speaker immersion training, and a mean of 48 mands per session (range, 19 to 68) during generalization. During baseline and speaker immersion training, Participant 1 emitted only generalized mands and no captured mands. During generalization, 50% of mands emitted by Participant 1 per session were generalized (mean, 24) and 50% were captured (mean, 24).

Participant 2 emitted a mean of 13.6 mands per session (range, 1 to 22) during baseline, a mean of 12.3 mands per session (range, 6 to 18) during speaker immersion training, and a mean of 43.6 mands per session (range, 18 to 97) during generalization. Participant 2 primarily emitted generalized mands during baseline (mean, 12.4) and speaker immersion training (mean, 12.3). During generalization, Participant 2 emitted more captured mands (mean, 26) than generalized mands (mean, 17.6).

FIGURE 1, NEXT PAGE

Figure 1. Total number of correct autoclitic mands emitted by Participants 1 and 2 for captured and generalized mands.

Discussion

The purpose of Experiment 1 was to evaluate the effects of speaker immersion, a tactic that uses multiple establishing operations for routine events and known reinforcers, on the number of independent autoclitic mands emitted by preschool children who previously emitted autoclitics only during instruction. Baseline measures showed that multiple establishing operations created in non-instructional and instructional settings resulted in the two participants emitting approximately eight autoclitic mands per session, comprised solely of mands for items presented after correct responses to non-vocal verbal behavior instruction (i.e., listener instruction). Speaker immersion was then implemented by first presenting an establishing operation, waiting 10 s for a response, presenting an echoic model for the targeted event or stimulus, and waiting 10 s again for a response. During speaker immersion, participants emitted approximately 10 autoclitic mands per session, also comprised primarily of mands for items presented contingent upon correct responses during instruction. During the generalization phase, establishing operations were presented again but without an echoic model, and participants emitted high numbers of mands per session, with approximately one-half emitted in the non-instructional setting and one-half in the instructional setting.

Results showed that the intervention of pairing an echoic model with an establishing operation increased the number of generalized and captured mands (those emitted in non-instructional contexts) for two preschool children with speech delays. However, there were several limitations to this study. First, the number of sessions during which interobserver agreement data were collected was low, primarily because the duration of sessions was long (60 minutes) within the context of a classroom setting and data collection was intensive. Second, the number of minutes in each setting (instructional and non-instructional) was not standardized (i.e., 30 minutes in each setting), making comparisons difficult across settings.

Third, there may have been sequence effects because of the ABC design that was used across participants. Specifically, the establishing operation without the echoic model during baseline did not result in the children emitting a high number of independent mands. Later, when the echoic was added, mands increased only slightly from baseline. This may suggest that the increase in mands during the final generalization phase was a function of several sessions of receiving establishing operations during the baseline and treatment phases. It is likely that the two prior phases functioned as a treatment package to evoke the high rate of independent autoclitic mands during the final phase. Additionally, the occurrence of mands during the final phase may suggest that participants did not have target responses in their repertoire or did not know when to emit them. Anecdotally, both participants independently emitted mands for untrained items during the generalization phase. It is possible that throughout the day, classroom teachers were presenting additional establishing operations for untrained items.

The purpose of Experiment 2 was to examine the effects of 10-minute speaker immersion sessions on production of tacts as well as mands and autoclitics. In Experiment 2, similar procedures were used with replicated pre-post designs during sessions of much shorter durations. Further, mands, tacts, and autoclitics were measured instead of measuring only autoclitic mands as in Experiment 1.

Experiment 2

Participants

Two preschool-age boys were the participants in this study. Before the study, Participant 3 (5-years old) and Participant 4 (4-years old) were diagnosed with developmental disabilities by an independent evaluator based on state criteria. According to the *Preschool Inventory of Repertoires for Kindergarten* (PIRK; Greer, 2002), a criterion-referenced test administered by a special educator, both

participants followed directions fluently, and used multiple-word autoclitics to mand and tact common items, but only during instruction. During instruction, Participant 3 used a variety of autoclitics to mand and tact items during instruction; Participant 4, who had beginning reader/writer skills, used the same autoclitics (i.e., "I want cookie, please") to mand items without varying his responses. Both participants were selected for the study because neither child emitted mands for desired stimuli or tacted common items in non-instructional settings.

Setting

This study took place in the instructional and non-instructional settings of an early childhood school program for 3 to 7-year old children with autism and related developmental delays. Seven students, one teacher, and six teacher's assistants were in the instructional setting which was the participants' classroom. Training took place in the play area of each participant's classroom, and post-sessions occurred in the play area of a neighboring classroom. In both settings, the participant was surrounded by toys, puzzles, books, blocks, articles of clothing, and edibles.

Dependent Variables

The dependent variables in this study included mands, tacts, and autoclitics. A mand was defined as an instance of vocal verbal behavior that occurred under nonverbal antecedent control and a known establishing operation, and was reinforced by receiving the specified stimulus (i.e., saying "Cookie" to receive a cookie was a mand). A tact was defined as an instance of vocal verbal behavior that occurred under nonverbal antecedent control, and was reinforced by a social or generalized reinforcer such as a teacher's approval (i.e., seeing an airplane, saying "Airplane" to a teacher, and being reinforced by "That's right!"). Autoclitics were defined as instances of vocal verbal behavior that modified or specified a mand or tact. For example, in the tact "*the blue car,*" the words *the* and *blue* were recorded as separate autoclitics. When participants correctly emitted autoclitic mands or tacts (i.e., mands or tacts with more than one word), the mand or tact function was recorded first, and then each of the modifiers was recorded as an autoclitic. For example, in the response, "I want the green car, please," a plus was recorded for a mand, and then the words *I, want, the, green,* and *please* were each recorded as separate autoclitics, for a total of five autoclitics. Incorrect responses included emitting inappropriate mands such as screaming or, in the case of a tact, emitting an incorrect tact or omitting a response. Only independent, unprompted mands, tacts, and autoclitics were recorded as correct during pre-sessions, treatment, and post-sessions.

Data Collection and Interobserver Agreement

The number of correct mands, tacts, and autoclitics were recorded using paper and pencil. Data were recorded by an experimenter or a teacher during 10-minute pre and post sessions before and after daily treatment sessions. A second observer collected interobserver agreement data for approximately 23% of all sessions. Agreement was collected by the school's behavior analyst supervisor for the entire duration of the session. Interobserver agreement was calculated by dividing the number of correct responses reported by each observer and multiplying by 100. Interobserver agreement was 100% for all observed sessions.

Design

The effects of speaker immersion on speaker behavior were evaluated by using a replicated pre-post design consisting of daily pre-sessions, treatment sessions, and post-sessions. For Participant 3, all sessions were 10 minutes each and occurred between latent time periods in the following manner: 1) 10-minute pre-session followed by a 10-minute latent time period, 2) 10-minute speaker immersion session followed by a 10-minute latent time period, 3) 10-minute post-session 1 followed by a 30-minute latent time period, and 4) 10-minute post-session 2. For Participant 4, all pre- and post-sessions were 5 minutes each and also occurred between latent time periods in the following manner: 1) 5-minute pre-session

followed by a 10-minute latent time period, 2) 10-minute speaker immersion session followed by a 10-minute latent time period, 3) 5-minute post-session 1 followed by a 30-minute latent time period, and 4) post-session 2 which also lasted 5-minutes.

Procedures

Pre-Sessions. Pre-sessions were conducted for Participant 3 by placing him in the play area for 10 minutes and observing him without any interactions from the instructor. Pre-sessions were conducted for Participant 4 by placing him in the play area for 5 minutes, and the instructor continuously creating establishing operations (approximately one every 10 seconds) by interrupting his chain of events (i.e., removing a toy, blocking him from walking to another part of the play area, or tickling and stopping). For both participants, if they emitted appropriate mands, the instructor reinforced the behavior by giving them the item or event that was specified in the mand (i.e., a toy). Several times during this session, the instructor would also point to an object in the environment with no vocal antecedent in order to give an opportunity for the student to emit a tact response. If the student did emit a tact, the instructor reinforced the response with a vocal response such as, "Yes, you're right. That is a (item)." No echoic models for target responses were presented.

Speaker Immersion Training Sessions. Speaker immersion training sessions were conducted 10 minutes after the presession ended. During speaker immersion training sessions, participants were placed in the play area as described above. The instructor created establishing operations by blocking the participants' access to an event or item (as described in the pre-session section above), and then provided echoic models for the participant to gain access to the activity or item. If the participant echoed the instructor, they received the target item as a reinforcer. If the participant did not emit an echoic response, the instructor continued to present echoics. If an echoic was not emitted following multiple opportunities to echo, a different event or item was selected and the speaker immersion procedure began again. Echoic responses were recorded as minuses.

Immediately after the participant echoed the instructor, the same establishing operation was presented again, but without an echoic model. If the participant emitted a correct mand, they received the targeted item as a reinforcer, and another establishing operation (typically for a different item or event) was presented. Approximately 50 establishing operations were presented during each session, and one session was conducted each day. This speaker immersion instructional sequence was repeated until the10-minute period was complete.

Post sessions

Two post-sessions were conducted after each speaker immersion procedure: Post-session 1 was conducted 10 minutes after the speaker immersion session and Post-session 2 was conducted 30 minutes after the speaker immersion training session. The procedure and duration for each of the post-sessions was the same as pre-session procedures.

Results

Figure 2 displays the total number of verbal operants (mands, tacts, and autoclitics) emitted by both participants during pre-sessions, treatment, and post-sessions. Participant 3 emitted a mean of 15 verbal operants during pre-sessions (mean range, 0 to 65), a mean of 291 verbal operants during speaker immersion (mean range, 234 to 361), a mean of 337 verbal operants during the 10-minute post-session (mean range, 207 to 495), and a mean of 324 verbal operants during the 30-minute post-sessions (mean range, 153 to 442). Participant 4 emitted a mean of 37.8 verbal operants during pre-sessions (mean range, 5 to 81), a mean of 165 verbal operants during speaker immersion (mean range, 137 to 204), a mean of 73

verbal operants during 10-minute post-sessions (mean range, 44 to 92), and a mean of 39 verbal operants during 30-minute post sessions (mean range, 17 to 53).

The number of verbal operants by type emitted was also measured across all conditions for Participant 3 and during speaker immersion sessions for Participant 4. During the pre-sessions, Participant 3 emitted a mean of 2 mands per session (mean range, 0 to 6), a mean of 10 tacts per session (mean range, 0 to 40), and a mean of 4 autoclitics per session (mean range, 0 to 19). During speaker immersion training, Participant 3 emitted a mean of 46 mands per session (mean range, 27 to 55), 126 tacts per session (mean range, 58 to 217), and a mean of 119 autoclitics per session (mean range, 106 to 131). During Post-session 1, Participant 3 emitted a mean of 64 mands per session (mean range, 50 to 85), a mean of 135 tacts per session (mean range, 46 to 257), and a mean of 139 autoclitics per session (mean range, 76 to 188). During Post-Session 2, Participant 3 emitted a mean of 55 mands per session (mean range, 31 to 83), a mean of 149 tacts per session (mean range, 33 to 246), and a mean of 122 autoclitics per session (mean range, 47 to 165). During speaker immersion training, Participant 4 emitted a mean of 11 mands per session (mean range, 6 to 16), a mean of 24 tacts per session (mean range, 32 to 49), and a mean of 113 autoclitics per session (mean range, 91 to 146).

FIGURE 2, NEXT PAGE

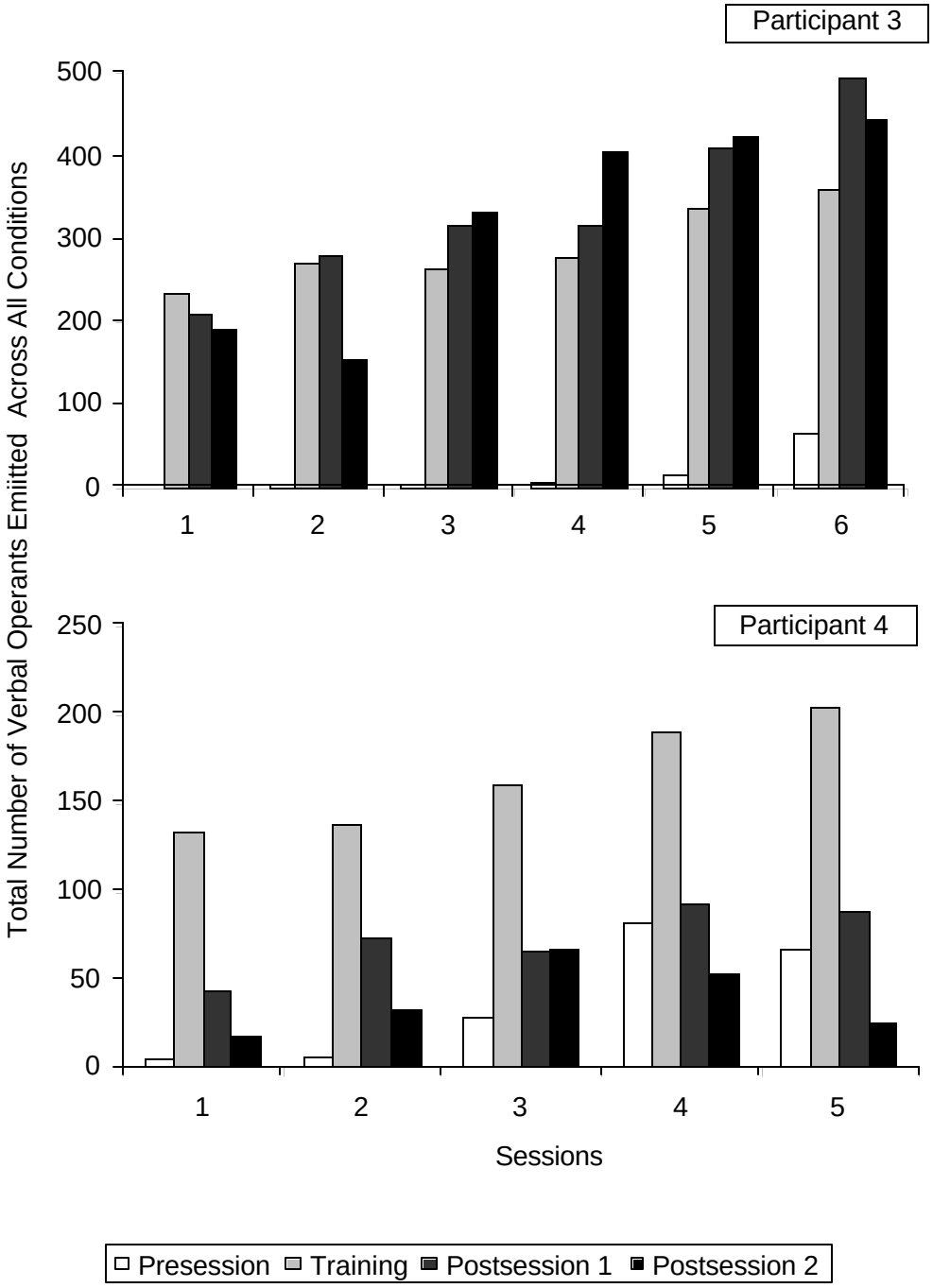

Figure 2. Total number of verbal operants (mands, tacts, and autoclitics) emitted by both participants during pre-sessions, treatment, and post-sessions.

Discussion

The purpose of Experiment 2 was to evaluate the effects of shorter durations of speaker immersion on the number of mands, tacts, and autoclitics emitted by two preschool children with developmental disabilities and communication delays. Pre-session measures were followed by speaker immersion training sessions and two post-sessions presented at 10 minutes and 30 minutes after training. Results showed that the number of mands, tacts, and autoclitics emitted by participants during speaker immersion when compared to pre-session measures for both participants increased. These increased verbal operants were maintained for Participant 3 and maintained only minimally for Participant 4 during post-sessions.

The differences between responses to the treatment for participants may be attributed to several variables. First, Participant 3 entered the study with a variety of autoclitics that he emitted during instruction but not in non-instructional contexts. Thus, it is possible that participants had instructional histories or repertoires that affected their responses. Second, Participant 3 received sessions of 10-minutes and Participant 4 received sessions of 5-minutes. The difference in time between the sessions may have resulted in more opportunities to respond and contact with the establishing operations for Participant 3. Further, collecting data for 50% of the time that data were collected for Participant 3 may make comparisons difficult because with longer sessions, it is possible that Participant 4 may have emitted more verbal operants.

Interestingly, more tacts than mands were emitted by Participant 3 during all conditions and by Participant 4 during speaker immersion. Establishing operations are typically associated with mands in research, but in this study a collateral effect of increasing mands was a greater increase in tacts. It is probable that instructor approval, or generalized reinforcement (which is a reinforcer for tacts) may have been the cause for tacts to increase significantly.

One limitation of this study was that each word associated with a primary verbal function was measured as an autoclitic, making analyses of the autoclitic data difficult. While the data show an increase in the number of autoclitics for each participant, it is unknown from this study how many of those were different from those the participants had prior to the study or how many autoclitics were emitted with each operant. To address this issue, another experiment with Participant 4 was conducted later to establish different forms of autoclitics. A future study would record separate data on the types of autoclitics emitted by participants during and after treatment.

General Discussion

Two experiments were conducted to examine the effects of a tactic called speaker immersion on the number of verbal operants emitted by four preschoolers with low rates of independent speaker behavior, or mands, tacts, and autoclitics emitted outside of instruction. Following baseline sessions (Experiment 1) or daily pre-sessions (Experiment 2), participants were exposed to multiple establishing operations and an echoic model of a targeted form to mand objects or events. Results from post-treatment data suggest that the speaker immersion procedure resulted in increases in autoclitic mands for two participants in Experiment 1, greater increases in tacts than mands for one participant in Experiment 2, but little increase in mean number of verbal operants for a fourth participant. It should be noted that Participant 4 received echoic mands and tacts during pre-treatment probes, whereas Participant 3 did not, possibly resulting in differences in responding.

The design of Experiment 1 precludes attributing increases in autoclitic mands to the establishing

operation alone; increases in mands were more likely attributed to the pairing of echoic models with establishing operations or to a treatment package consisting of exposure to establishing operations during both baseline and speaker immersion measures. The design of Experiment 2 allowed for comparisons between pre-treatment, treatment, and post-treatment sessions, with results showing that speaker immersion did result in increased verbal operants. However, limitations included recording each modifier as a separate autoclitic, and using different amounts of time for each participant (Participant 3 was exposed to speaker immersion for only 50% of Participant 4's time).

When speaker immersion was removed, ascending trends were clear for all participants except for Participant 4. This may be because not all participants received establishing operations during their baseline sessions, suggesting that speaker immersion may be more effective if children are not exposed to establishing operations before the treatment procedure. To test this possibility, future studies would use establishing operations only during treatment procedures and not during baseline. Additionally, although data were not collected on non-target verbal responses, experimenters observed that Participant 3 emitted less palilalia during speaker immersion than during baseline. It was also noted that the number of different forms independently emitted by Participant 4 did not vary significantly when speaker immersion was removed, although several different forms were presented during speaker immersion sessions.

The results of this study may be potentially attributed to the use of the establishing operation. Michael (1988) noted that the presence of an establishing operation is not enough to evoke a response, but it must be mediated by the presence of an appropriate audience or other circumstances in which the behavior has been likely to be reinforced. The training period may have established this relationship with the participants. The type of establishing operation that was used in this study may be a *blocked-response* conditioned establishing operation, defined by Michael (1988) as "a stimulus event that functions as an Sd for a type of behavior which is in some sense blocked – cannot occur – until some other object or event becomes available. The stimulus event then also functions as a CEO with respect to the behavior that has been reinforced by obtaining this other object or event (p. 5)." In the current study, behaviors were blocked in natural routines and consequent events that did not previously function as reinforcers.

It is also possible that the effects of multiple exemplars resulted in the outcomes. In some ways, presenting establishing operations and echoic models across different settings and with varying stimuli may have produced the instructional history needed to obtain the desired response. Thus, it is possible that presenting participants with mand training across various settings before using speaker immersion would have produced similar outcomes.

Further, it is possible that before the study, participants simply did not have the target responses in their repertoire or did not emit them under relevant conditions. For instance, only a small number of verbal operants were produced when establishing operations were used without echoics for most participants. However, when echoic models were presented, verbal operants increased. This suggests that participants did not respond to relevant establishing operations during baseline because they did not have the responses in their repertoires; however, upon learning to emit the response in the presence of establishing operations, the outcomes were produced. In other words, speaker immersion may present multiple exemplars to the degree that the relevant antecedent conditions become salient to the participant and, once the targeted response is modeled, they gain the repertoire of "spontaneous" or independent speaker behavior.

One methodological concern in this study was related to the low numbers of sessions with interobserver agreement reported for Study 1. Future studies using the same design would obtain not only more interobserver agreement, but procedural reliability as well. Further, in both studies, using establishing operations during treatment instead of during baseline or pre/post sessions may have

provided a better comparison for the treatment condition. Finally, probes conducted several days after the experiments could have shown if speaker immersion resulted in long-term gains.

In summary, the two studies described here examined the effects of the speaker immersion tactic, which involves presenting multiple establishing operations to *immerse* speakers with low rates of independent mands and tacts Results of post-treatment sessions showed that speaker immersion resulted in increased independent verbal operants for three participants, but not for a fourth participant.

References

Billeaud, F. P. (1998). Communication impairment in infants and toddlers: A frame of reference. In F. P. Billeaud (Ed.), *Communication disorders in infants and toddlers* (pp. 1-30). Massachusetts: Butterworth-Heinemann.

Billeaud, F. P. (1998). Causes of developmental delays and disorders: Implications for communication competence. In F. P. Billeaud (Ed.), *Communication disorders in infants and toddlers* (pp. 31-48). Massachusetts: Butterworth-Heinemann.

Billeaud, F. P. (1998). Assessment: Examination, interpretation, and reporting. In F. P. Billeaud (Ed.), *Communication disorders in infants and toddlers* (pp. 123-152). Massachusetts: Butterworth-Heinemann.

Brady, N. C., Saunders, K. J., & Spradlin, J. E. (1994). A conceptual analysis of request teaching procedures for individuals with severely limited verbal repertoires. *The Analysis of Verbal Behavior, 12*, 43-52.

Carroll, R. J., & Hesse, B. E. (1987). The effects of alternating mand and tact training on the acquisition of tacts. *The Analysis of Verbal Behavior, 5*, 55-65.

Carter, M. & Grunsell, J. (2001). The behavior chain interruption strategy: A review of research and discussion of future directions. *The Journal of the Association for Persons with Severe Handicaps, 26(1),* 37-49.

Drash, P. W., High. R. L., & Tudor, R. M. (1999). Using mand training to establish an echoic repertoire in young children with autism. *The Analysis of Verbal Behavior, 16*, 29-44.

Grunsell, J., & Carter, M. (2002). The behavior chain interruption strategy: Generalization to out-of-routine contexts. *Education and Training in Mental Retardation and Developmental Disabilities, 37(4),* 378-390.

Hall, G., & Sundberg, M. L. (1987). Teaching mands by manipulating conditioned establishing operations. *The Analysis of Verbal Behavior, 5,* 41-53.

Howard, V. F., Williams, B. F., Port, P. D., & Lepper, C. (Eds.). (2001). *Very young children with special needs*. Upper Saddle River, NJ: Prentice-Hall, Inc.

McGee, C., Morrier, M. J., & Daly, T. (1999). An incidental teaching approach to early intervention for toddlers with autism. *The Journal of the Association for Persons with Severe Handicaps, 24(3),* 133-146.

Michael, J. (1988). Establishing operations and the mand. *The Analysis of Verbal Behavior, 6*, 3-9.

Oah, S., & Dickinson, A. M. (1989). A review of empirical studies of verbal behavior. *The Analysis of Verbal Behavior, 7*, 53-68.

Rapin, I., Allen, D.A., Aram, D. M., Dunn, M. A., Fein, D., Morris, R., et al (1996). Classification Issues. In I. Rapin (Ed.), *Preschool children with inadequate communication* (pp. 190-213). London: Mac Keith Press.

Shafer, E. (1999). A review of Sundberg and Partington's *Teaching language to children with autism or other developmental disabilities*. *The Analysis of Verbal Behavior, 16*, 45-48.

Shafer, E. (1994). A review of interventions to teach mand repertoire. *The Analysis of Verbal Behavior, 12*, 53-66.

Sigafoos, J. & Littlewood, R. (1999). Communication intervention on the playground: A case study on teaching requesting to a young child with autism. *International Journal of Disability, Development and Education, 46(3)*, 421-429.

Sundberg, M., & Michael, J. (2001). The benefits of Skinner's analysis of verbal behavior for children with autism. *Behavior Modification, 25(5)*, 698-724.

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