

The Effects of Daily Intensive Tact Instruction on Preschool Students' Emission of Pure Tacts and Mands in Non-Instructional Setting

Nirvana Pistoljevic and R. Douglas Greer
Teachers College, Columbia University

Abstract

We tested the effects of an intensive tact instruction procedure on numbers of tacts emitted in non-instructional settings (NIS) using a multiple probe design across 3 participants (3 and 4-year old boys with autism). The dependent variable was tacts emitted in NIS before/after the mastery of sets of 5 different stimuli. The non-instructional settings included the toy area of the classroom, lunchtime, and the school hallway during transition. All probe sessions were conducted daily for a cumulative 15 minutes, 5 minutes in each NIS. Intensive instruction involved increasing the tact instructions to 100-tact learn units above the daily learn units students were receiving daily. The intervention increased vocal verbal operants (tacts and mands) emitted by the target students in NIS.

One of, if not the, strongest predictors of school success is language (Weikart, 1966). Children with native intellectual disabilities and children from impoverished backgrounds frequently lack functional verbal repertoires when they enter schools. Hart and Risley (1995) found that limited exposure to rich language experiences early on in life is a predictor of language deficits in children from low socioeconomic backgrounds. They found that children from low socioeconomic (SES) backgrounds added an average of "168 words in the 6 months from 30-36 months [while] the children in professional families added an average of 350 or twice as many" (Hart & Risley, 1995, p. 164). From early on, these children develop language and expand their vocabulary at the much slower rate than their peers from the middle class families and over time this gap widens exponentially (Greenwood, Hart, Walker, & Risely, 1994). Woods (1984) found that children with similar low SES backgrounds also emit fewer verbal interactions than their same-age peers from middle class families. When children with native disabilities lack certain verbal capabilities, they inadvertently have infrequent language experiences. Even when children with deficits in language experiences receive behavioral language interventions, their prior lack of language experiences call for the provision of intensive language learning instruction (Greer, Chavez-Brown, Nirgudkar, Stolfi, & Rivera-Valdes, 2005; Greer & Keohane, 2005; Greer, Stolfi, Chavez-Brown, & Rivera-Valdes, 2005). For both types of children intensive language experiences are needed to compensate for deficits in experiences. According to Woods, when the verbal antecedents from the parents were absent, children with native disabilities were usually silent, whereas typically developing children were more likely to have nonverbal antecedents. That is these children were less likely to emit "spontaneous" speech. It appears that typically developing children were more likely to respond to nonverbal antecedents or initiate verbal interactions-- that is they responded to the natural establishing operations that control this type of verbal functions. Skinner (1957) characterized these spontaneous verbal initiations as pure mand and pure tact verbal operants. While pure mands are important, building the tact repertoire is most critical to the expansion of verbal repertoires. One reason children with disabilities are often observed not to emit pure tacts apart from instructional setting is that the tact that they are taught is often under the partial antecedent of the verbalizations control of others; that is, impure rather than pure tacts are taught. One may teach the pure tact repertoire by avoiding verbal antecedents and bringing the tact responses of the student under natural establishing operations. Indeed, Williams and Greer (1993) found that when the establishing operations for pure mands and tacts were incorporated in teaching tacts

and verbal antecedents were avoided, their participants emitted more of what is typically characterized as spontaneous speech or the initiation of language interactions. These findings were replicated in Ross & Greer (2003) and Tsiouri & Greer (2003).

Skinner (1957) characterized verbal behavior as behavior that is mediated by a listener, and he identified six primary verbal operants according to their function--echoics, mands, tacts, autoclitics, intraverbals, and textual responses. Tacts are defined as verbal operants emitted as responses to the nonverbal antecedents and are reinforced by generalized reinforcers (Skinner, 1957; Becker 1989; Greer, 2002; Greer & Ross, in press). Tacts are also affected by deprivation of generalized reinforcers (Gewirtz & Baer, 1958; Gewirtz, Baer, & Roth, 1958; Tsiouri & Greer, 2003). Tacts are under the control of the generalized reinforcers, and "pure tacts" are under the control of nonverbal antecedents (Weinrich, 1964; Greer, 2002; Ross & Greer, 2003).

Correspondingly, mands are verbal operants emitted under state of deprivation and they specify their own reinforcer (Skinner, 1957; Becker, 1989; Greer, 2002; Greer & Ross, in press). Pure mands like pure tacts also have nonverbal antecedents.

Some current evidence suggests that the tact repertoire is especially critical to verbal development and, as a result, deserves extensive attention of professionals who are concerned with advancing children's verbal development. Expansion of the tact repertoire appears, at presents, to be the foundation of subsequent verbal development stages associated with complex communication functions including naming (Greer, Stolfi, et al., 2005; Lowe, Horne, Harris, & Randle, 2002), conversational units (Lodhi & Greer, 1989) and reading (Greer & Ross, in press).

The purpose of the present study was to test the effects of an intensive tact instruction on the frequency of pure tacts and mands emitted by students in non-instructional settings. The intensive tact protocol prescribed teachers to increase the numbers of pure tacts taught to students, while at the same time insuring that other instruction continued at the same level.

Method

Participants

Three 4-year old male students participated in this study and they were chosen because they emitted low numbers of pure tacts in non-instructional settings, including transition time, lunch, and free play. Table 1 contains a detailed description of each student. They all attended a preschool for children with and without developmental delays that provided a comprehensive behavior analytic approach to all instruction. All standardized tests, Vineland Adaptive Behavior Scales –Interview and Classroom Edition (1984), reported in Table 1 were done by the students' school districts, and therefore, the standardized test information provided varies across students. The students' actual repertoires were assessed maintained in inventory form using *The CABAS® International Curriculum and Inventory of Repertoires For Children from Pre-School through Kindergarten* (Greer & McCorkle, 2003). This is a criterion referenced assessment tool that identifies and assess the repertoires needed from preschool through kindergarten and first grade.

Table 1.

Description of Participants

Participants	Age	Diagnosis/Level of Verbal Capability	Standardized Test Scores	CABAS® Repertoires
A	3.6	-Autism -Listener/Speaker Emergent Reader	-Vineland Adaptive Behavior Scales: Interview Ed.(1984) -Socialization Domain: 67	-Mands/Tacts with autoclitic frames -Following vocal verbal directions -Vocal and physical

			-Communication Domain: 77	stereotypy -Looking at books appropriately -Occasional assaultive behaviors -Textually responded to 200 Dolch Words -Matching and Pointing repertoires
B	4.1	-Pervasive Developmental Disorder - Listener/Speaker	-Vineland Adaptive Behavior Scales: Classroom Ed.(1984) -Socialization Domain: 71 -Communication Domain: 75 -Composite: 73	-Mands/Tacts with autoclitic frames -Following vocal verbal directions -Vocal and physical stereotypy -Occasional assaultive behaviors -Matching and Pointing repertoires
C	4.0	-Autism -Listener/Speaker Emergent Reader	-Vineland Adaptive Behavior Scales: Classroom Ed.(1984) -Socialization Domain: 68 -Communication Domain: 70	-Mands/Tacts with autoclitic frames -Following vocal verbal directions -Vocal and physical stereotypy -Looking at books appropriately -Matching and Pointing repertoires

Setting

The study was conducted in a publicly funded privately-run preschool for children with and without developmental delays. The school employed a comprehensive behavior analytic approach to teaching, curriculum, and behavior management, and was located in a suburban area outside of a large metropolitan city. All three students attended a full day classroom with six students, one teacher and two teaching assistants. All long term and short term objectives for the students in the school were based on the *CABAS® International Curriculum and Inventory of Repertoires for Children from Pre-School through Kindergarten* (Greer & McCorkle, 2003) and New York State K-1 Educational Standards.

During the probes for pure tacts and mands, data were collected in three non-instructional settings; the free play area of the classroom, at the lunch table during lunchtime, and in the hallways during the transition to and from the school buses. The free play area of the classroom (a 2x3 feet area) was located in the corner of the classroom, sectioned off by shelves holding books and toys. Lunch was taken at the large oval table at the center of the classroom. All the students sat at the table for 30 minutes during lunch. The classroom was located at the end of the 30 feet long hallway. The both sides of the hallway walls were decorated with bulletin boards, each being a different theme (i.e. holidays, weather and seasons, animals, each student individual pictures,

letters, numbers, shapes). During the tact instruction, students set at the small table located in the classroom, facing the experimenter.

Definition of Behavior: The Dependent Variable

The dependent variable in this study was the numbers of pure tacts and mands emitted during the 5-minute probes across three non-instructional settings; 1) the transition from and to the school bus, 2) during lunch, and 3) in the free play area of the classroom. A tact was defined according to Skinner (1957) as a “verbal operant in which a response of given form is evoked by a particular object or event or property of an object or event, . . . , [and] a response of that form is characteristically reinforced in a given verbal community” (p.82). In this study, we targeted “pure tacts” which were defined as vocal verbal operants that are under the control of nonverbal antecedents that were reinforced by generalized reinforcement (Greer, 2002). For example, a student in the study says “violin” in the presence of a toy violin or a picture of a violin, and reinforcement from a listener (i.e. “That’s right, it’s a violin”) would comprise generalized reinforcement of the pure tact emitted. Some of the pure tacts emitted by the participants in this study were: “Hi Ms. P”, “It’s snowman”, “Mike’s sandwich”, “Bus is here”, “It’s snow”. Also we recorded the numbers of pure mands emitted during the 5-minute probes in the non-instructional settings. A mand was defined as “a verbal operant in which the response is reinforced by characteristic consequence, . . . , [and] a mand ‘specifies’ its reinforcement” (Skinner, 1957, pp.35-36). For example, a student says “juice” and the delivery of the item (i.e. teacher giving the student juice) would comprise reinforcement of the mand emitted. Some of the mands emitted by the participants in this study were: “I want to read Shrek book”, “Open please”, “I want Bob the Builder please”, “Want blocks please”, “Banana please”. No impure tacts and mands were recorded. Impure tacts and mands defined as vocal verbal operants under verbal antecedents. For example, an impure tact would be tact of an item “violin” under the verbal antecedent “What is that?” while holding a picture of a violin. An example of the impure mand would be a vocal antecedent “Do you want juice” and an impure mand “Yes, I want juice please”.

Independent variable The Intensive Tact Procedure

The independent variable in this study was the increased daily presentation of tacts; additional 100 tact learn units were delivered throughout the day. Students tact learn units throughout the day were increased without decreasing other types of learn units, and they were interspersed between learn units for other curricular programs. We used learn units (Albers & Greer, 1991) to teach tact responses. “The learn unit includes an opportunity to respond, a student’s response, the teacher’s antecedent-consequence, and the student’s antecedent-consequence. It is an interlocking three-term contingency between the teacher and the student, and it is an immediate outcome measure” (Greer, 1996, p.141). The teacher or experimenter presents an unambiguous antecedent while the student is attending, the student is provided with an opportunity to respond (in this case an intraverbal response opportunity of 3-secs.), followed by the appropriate consequence. Accurate learn unit consequences to a correct response are the immediate presentation of a generalized reinforcer known to reinforce accurate tact responding. Accurate learn unit consequences to incorrect student responses involves a correction procedure in which the student must repeat the accurate vocal tact provided as a correction for the student’s incorrect or missing response and the corrected response is not reinforced. We used four different sets of 3” x 5” pictures of stimuli to occasion tact responses to 2-dimensional stimuli that were pictures of objects. Each set consisted of five categories with four target stimuli in each category. The categories were consistent throughout each set and across all participants. The five categories targeted were musical instruments, transportation, food, animals,

and community helpers. For each of four target stimuli within the category (i.e. for an instrument category: piano, flute, violin, tuba), similar stimuli with irrelevant characteristics were used (i.e. for a tact of a piano, pictures used were: grand piano, upright piano, black piano, white piano, brown piano). Each set of stimuli is listed in Table 2.

Table 2.
Description of Tact Sets

Categories	Set 1	Set 2	Set 3	Set 4
Instruments	guitar	tuba	drums	triangle
	harp	harmonica	violin	accordion
	organ	flute	saxophone	clarinet
	xylophone	cello	piano	trombone
Transportation	bulldozer	sled	tractor	bicycle
	Sail boat	tricycle	escalator	dump truck
	motorcycle	crane	airplane	helicopter
	forklift	ferry	train	speed boat
Community	photographer	rower	painter	baseball player
Helpers	taxi driver	stewardess	ballerina	fisherman
	surgeon	basketball player	garbage man	lifeguard
	crossing guard	referee	florist	scientist
Food	cashews	sushi	pasta	bagel
	asparagus	donut	beans	potatoes
	watermelon	coffee	bacon	pie
	cotton candy	salad	waffle	grapes
Animals	crab	dragonfly	penguin	octopus
	starfish	squirrel	ants	guinea pig
	bumble bee	shark	lizard	turtle
	mouse	alligator	fox	goat

During the tact intervention, which was mastery training of each set (4-stimuli for each of 5 categories), a correct response was defined as the student tacting the item in the picture presented. For example, when presented with a picture of a watermelon, a response was considered as correct if a student vocally emitted “watermelon” within 3 seconds of the presentation of the stimulus. Any other responses or no response within 3 seconds were recorded as incorrect responses and teacher represented the stimuli and provided a correction for the student. All of the sets were taught by presenting learn units. At the outset of instructions the experimenter showed the child a picture of the four stimuli, and for each of the stimuli, said the name of the stimulus and had the child echo the spoken word for the stimuli and then immediately transitioned to independent tact instruction. For example, prior to teaching Set 1, tacts of animals, experimenter provided a single echoic presentation for each of the target stimuli (i.e. experimenter “crab”, and students echoes “crab”). Subsequently the child received reinforcement or corrections for independent pure tact responses. Students’ vocal point-to-point correspondence with the teacher’s vocal model was achieved for the echoic trial before proceeding with tact response learn units.

Each day at least 20-learn units were run for each of the 5 categories in a particular set. The sets were rotated until the experimenter had presented 100 tact learn units for the stimuli. For example after teaching sessions for musical instruments, transportation, community helpers, and animals the child received 100 learn units. Once the student mastered a category, learn units were

devoted only to the remaining categories not yet mastered; this one or more sets were repeated daily until mastered or until the child received the target 100 learn units.

Student A mastered 4-sets of 20 stimuli across the 5 categories, Student B mastered 2-sets of 20 stimuli across the 5 categories, and Student C mastered 1-set of 20 stimuli across the 5 categories.

Data Collection

During the initial probe, and following the mastery of each set, data were collected during 5-minute observation probes conducted across 3 different non-instructional settings; the school bus transition, the lunch table, and the play area of the classroom. We used event recording to record the numbers of tacts and mands emitted by the students during the probes. We counted each tact and mand emitted in the three non-instructional settings, by writing all the utterances students emitted during the designated time period. During the transitioning 5-minute probes, we started a timer as the student left the bus or the classroom, and made sure that the target students always walked in pairs with other students or in line. During the lunch 5-minute probes, we started the timer after the students finished eating their main course and were eating their deserts at the table while sitting with other students. All the free play area probes were conducted while at least one other student was in the area with the target student. We blocked the data for each 5-minute non-instructional probe into one 15-minute session for the day.

During the training of each set, data were recorded as responses to learn units. A learn unit consists of at least one interlocking three term contingency (antecedent, response, consequence) for a student and two or more three term contingencies for a teacher and is has been shown to predict learning (Albers & Greer, 1991; Greer, 1996; Greer, 2002; Greer & Hogin-McDonough, 1999; Ingham & Greer, 1992). The learn unit includes opportunity to respond, student's response, the teacher antecedent-consequence, and the student antecedent-consequence. The Sd for the teacher to present the Sd to a student is the student attending, so presentation of the Sd by the teacher (i.e. "sit still" or "holding up a picture of target stimuli") is teacher's response and an Sd for the student's response (i.e. sitting still or tacting an item in the picture "a car"). The behavior of the student is the consequence for the teacher's behavior and an Sd for the teacher to reinforce correct response ("good job, nice sitting" or deliver a generalized reinforcer). In the case of incorrect response, the correction procedure involves the teacher or experimenter repeating the antecedent and modeling the correct response (i.e. "sit still" and model sitting still, or presenting a picture and tacting item in the picture "a car" for the student to echo), which is a consequence for the student. The learn unit is complete only when the student repeats/echoes the teachers correction as part of the correction procedure. The intrasession time, time between the presentation of the stimulus and students response, was set at three seconds. Therefore, if the student did not emit the response within three seconds, experimenter provided a correction. We recorded a plus (+) on a data collection sheet when the student emitted a correct response to a learn unit, and a minus (-) was recorded if a student emitted an incorrect response or no response. Each intensive tact instructional session consisted of 20-learn units delivered per category; therefore five learn units were delivered per target stimuli in a single category. Criterion was defined as responding correctly with at least 90% accuracy across 2 consecutive sessions. After achieving criterion on one of the training sets, a new set of tacts was implemented. Students mastered a single set, all five categories, before they were taught the next set.

Interobserver Agreement

Independent Variable and Fidelity of Treatment

The experimenter obtained an interobserver agreement for 24 of the 136 sessions of tact training (18%), with an independent observer in the school. The interobserver agreement was collected using the Teacher Performance Rate Accuracy Protocol (Ingham & Greer, 1992) which assesses both the accuracy of the measurement of the students' responses and fidelity of the implementation of learn units. The data collectors were trained through observations by the supervisor and cooperative teacher. Across all three students, the mean interobserver agreement for learn unit accuracy for the tact training was 100% for all sets.

Dependent Variable: Emission of Tacts in Non-Instructional Settings

During the event recording in non-instructional settings, interobserver agreement was collected by an independent observer recording all of the "spontaneous" verbal operants emitted by the target student. Both the experimenter and an independent observer wrote down all the utterances emitted by the target students during the probes and initiated each with a capital "T" if it was a pure tact, or with a capital "M" if it was a pure mand. Interobserver agreement was each observer recording the student's verbal operants and recording them as tacts or mands. The agreements between two observers were then divided by their word-by-word agreements plus disagreements and multiplied by 100% for a percentage for each session. The interobserver agreement for the student's pure tacts for all observations across all three students was 100%.

Design

A delayed multiple probe design across participants (Horner & Baer, 1978) was used to compare the number of verbal operants emitted before and after the mastery of each set of tacts in non-instructional settings. The sequence of the design was as follows: a) Three sessions of 15 minute probes of tacts and mands in non-instructional were conducted for each student in a between participant delayed fashion (the sum of 5-minute probes in three different non-instructional settings). After the baseline probe session, b) the students were taught sets of tacts to mastery (Student A mastered four sets, Student B mastered two sets, while Student C mastered only 1 set, due to time constraints). c) After each student mastered a single set (all five categories, four different stimuli each), another cumulative 15-minutes session was conducted. The probe sessions were pre and post-treatment tests of the effect of the intensive tact instruction on the children's emission of pure tacts and mands.

Results

Student A emitted a total of 20 tacts, and no mands (Figure 1) across 3-probe sessions (i.e., 8 in the first, 7 in the second, and 5 in the third). Following mastery of Set 1, Student A emitted a total of 23 tacts and 2 mands (Figure 1) in a single session. Following the mastery of Set 2 Student A emitted a total of 24 tacts and 4 mands in a single session (Figure 1). After the mastery of Set 3, Student A emitted 33 tacts and 1 mand in a single session (Figure 1). Following the mastery of Set 4, Student A emitted a total of 32 tacts and 1 mand (Figure 1) across all three probes. During the three baseline 15-minute probes, Student A emitted .53, .47, and .33 tacts per minute, while following the mastery of Sets 1, 2, 3, and 4, he emitted 1.53, 1.6, 2.2, and 2.13 tacts per minute (Table 4).

As shown in the Figure 1, Student B emitted a total of 4 tacts and 2 mands across three 15-minute probes conducted during the baseline. Following the mastery of Set 1, Student B emitted a total of 21 independent tacts and 5 mands in a single session (Figure 1). Following the mastery of Set 2, Student B emitted 17 tacts and 1 mand (Figure 1). As shown in the Table 4, the number of tacts

Student B emitted per minute during the baseline probes was .13, 0, and .13, while following the mastery of Sets 1 and 2, he emitted 1.4 and 1.13 tacts per minute respectively. Across all baseline probes, Student C emitted a total of 4 tacts and 4 mands (Figure 1). Following the mastery of Set 1, Student C emitted a total of 19 tacts, and no mands, across in a single session (Figure 1). As shown in the Table 4, Student C emitted .2, 0, and .07 tacts per minute during the baseline probes and 1.27 tacts per minute following the mastery of Set 1. During the tact instruction, Student A's learn units to criteria for Sets 1, 2, 3, and 4, were 56, 80, 48, and 64 (Table 3). For Student B, the learn units to criteria for Sets 1, and 2 were 116 and 80, while for Student C, learn units to criterion on Set 1 were 80.4 (Table 3). All the data collected during instructional sessions for all three students are represented in the Figures 1, 2, and 3.

*Table 3.
Learn Units to Criteria for Each Set Mastered*

Students	Set 1	Set 2	Set 3	Set 4
Student A	56	80	48	64
Student B	116	80		
Student C	80.4			

*Table 4.
Number of Tacts Emitted per Minute during 15-Minute Sessions*

Probes	Student A	Student B	Student C
Baseline Probe 1	.53	.13	.2
Baseline Probe 2	.47	0	0
Baseline Probe 3	.33	.13	.07
Post Set 1	1.53	1.4	1.27
Post Set 2	1.6	1.13	
Post Set 3	2.2		
Post Set 4	2.13		

*Table 5.
Number of Tacts Emitted in Non-Instructional Settings*

Students		Transition	Lunch	Toy Area
Student A	Baseline	3	2	3
	Baseline	2	5	0
	Baseline	1	1	3
	Post Set 1	4	6	13
	Post Set 2	11	3	10
	Post Set 3	18	2	13
	Post Set 4	6	9	17
Student B	Baseline	1	1	0
	Baseline	0	0	0
	Baseline	0	0	3
	Post Set 1	12	2	7
	Post Set 2	6	5	6
Student C	Baseline	3	0	0
	Baseline	0	0	0
	Baseline	0	1	0

Post Set 1

8

7

4

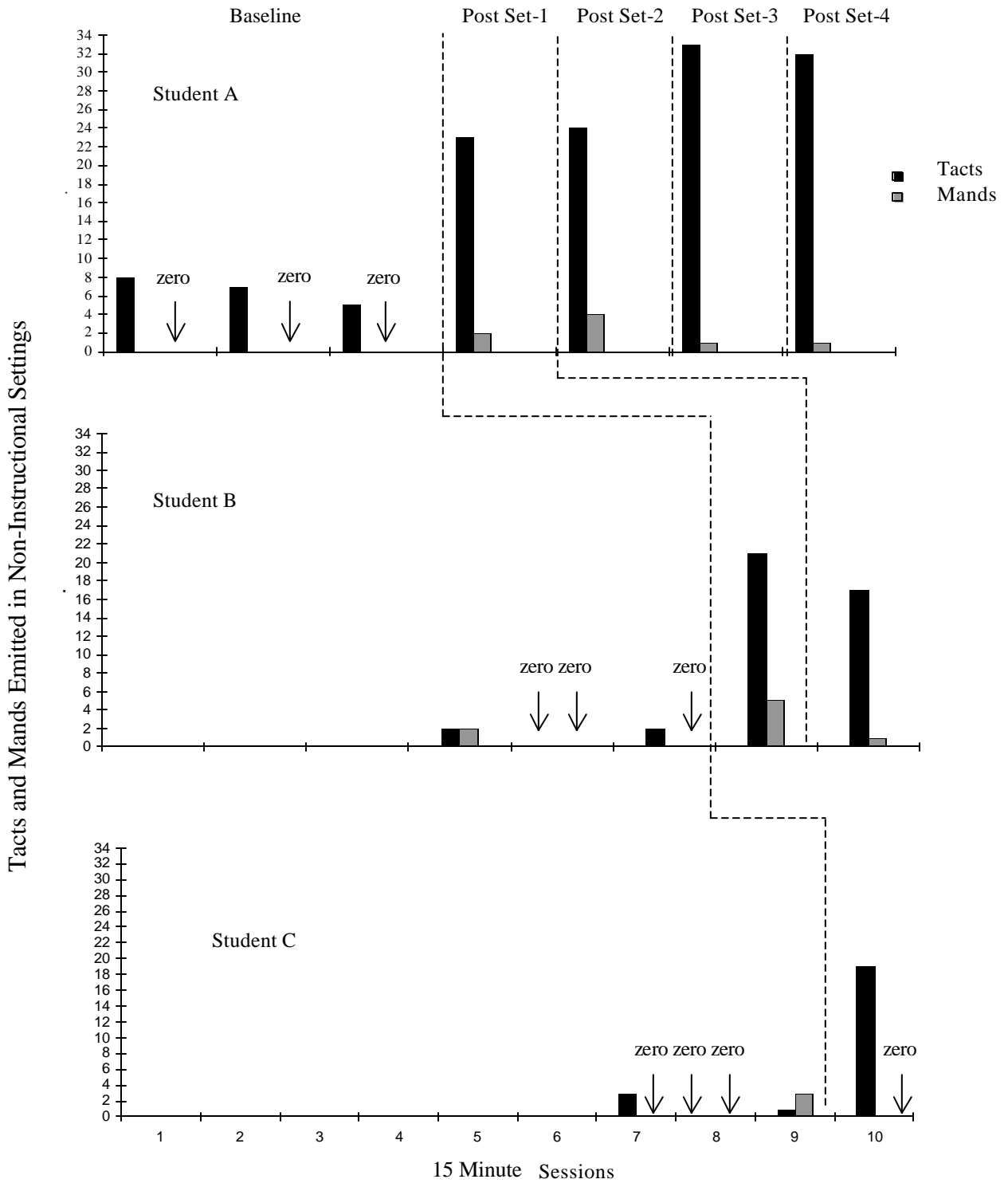


Figure 1. This figure shows Student A, B, and C's numbers of tacts and mands emitted across all non-instructional settings, blocked into 15-minute session.

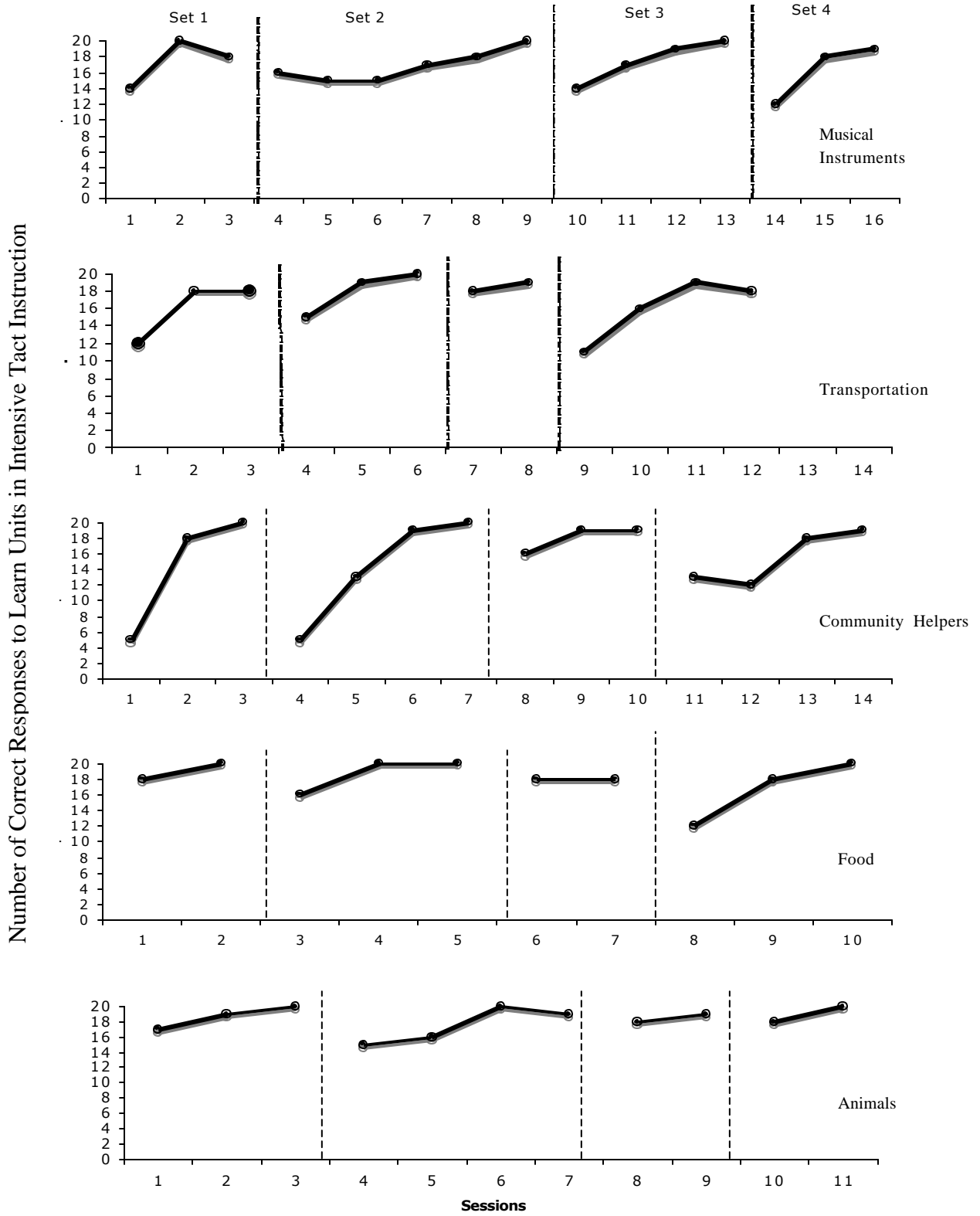


Figure 2. This figure (above) represents Student A's instructional sessions for each category of each set of tacts mastered.

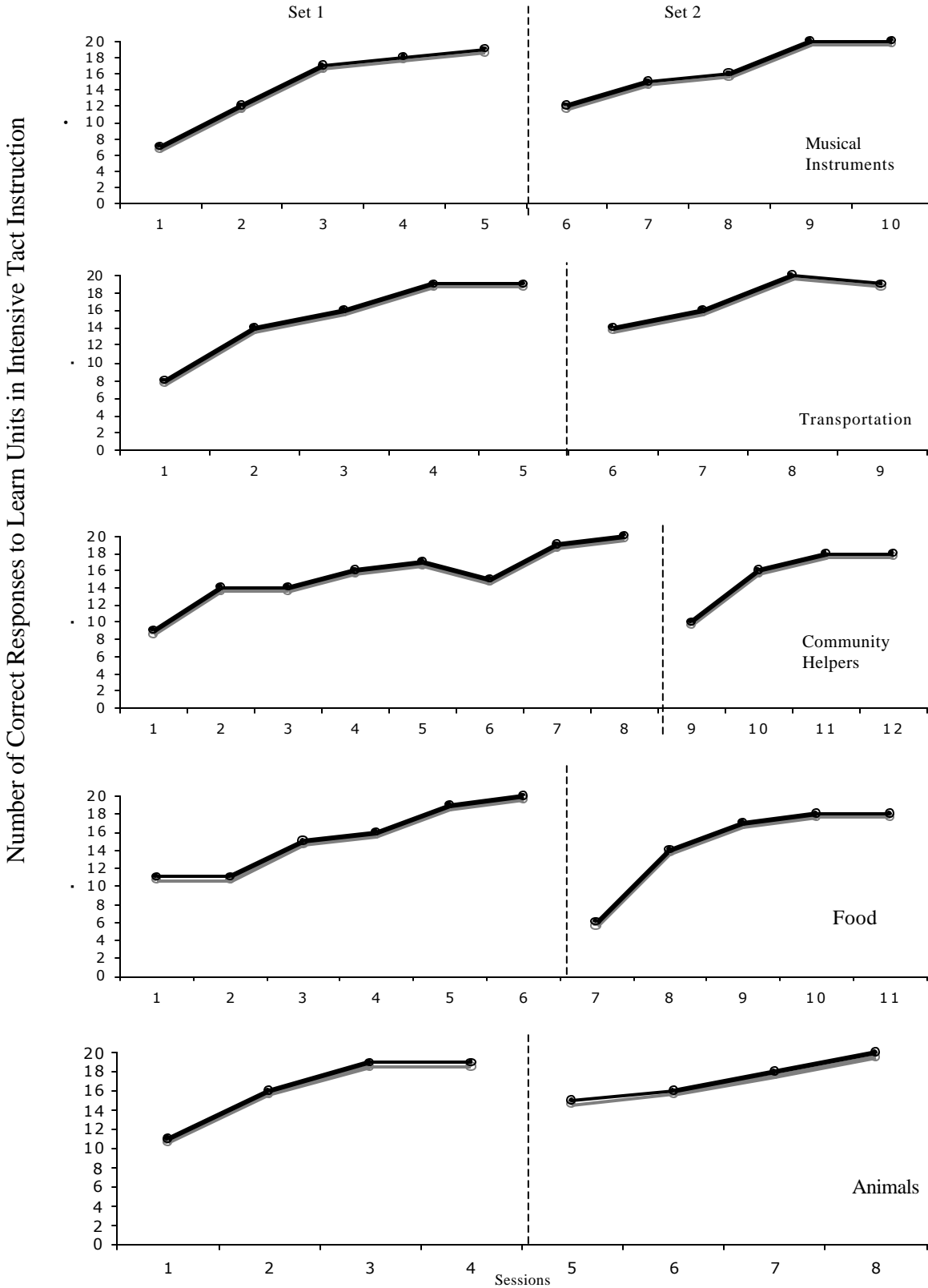


Figure 3. This figure (above) represents Student B's instructional sessions for each category of two sets of tacts mastered.

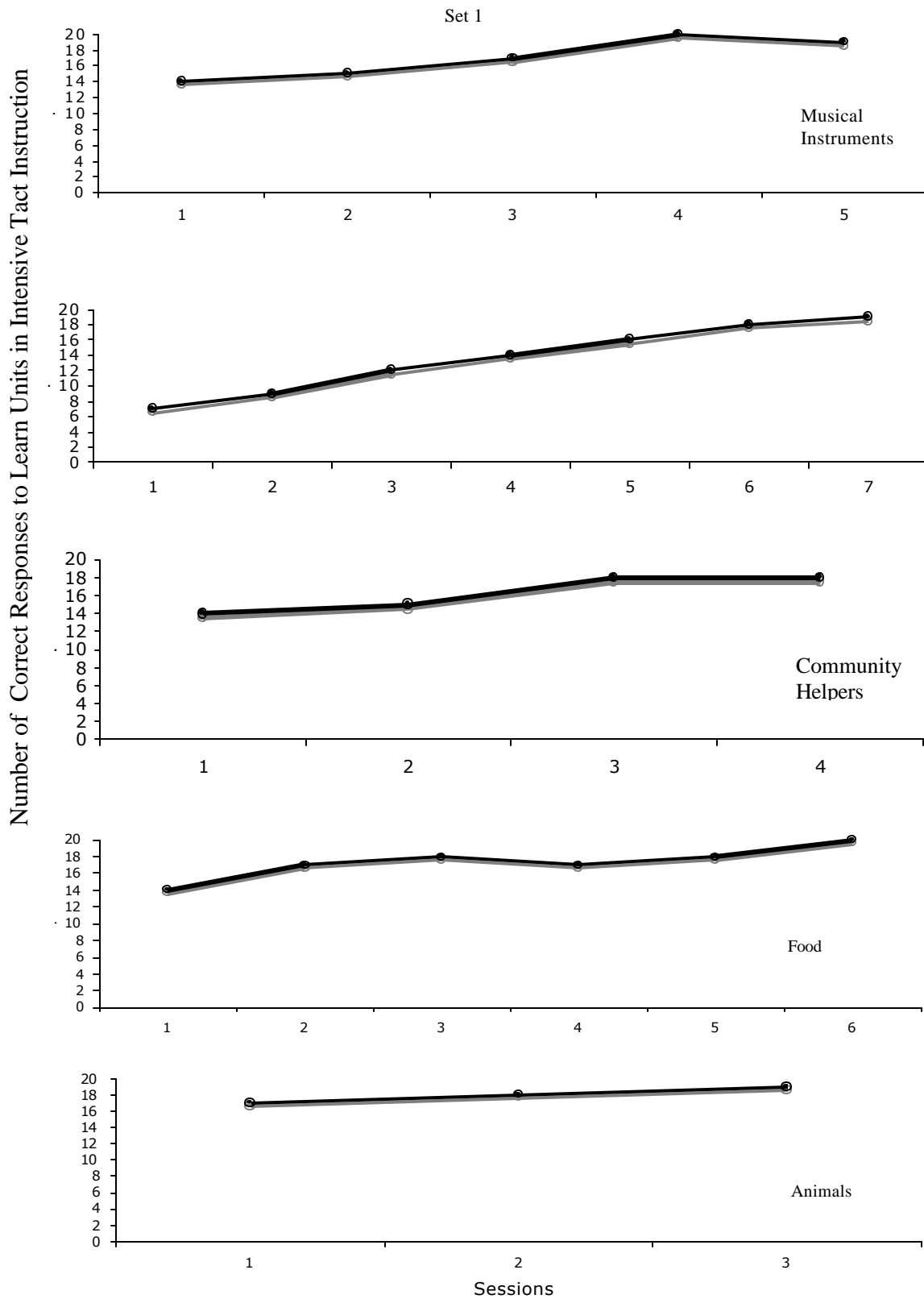


Figure 4. This figure (above) represents Student C's instructional sessions for each category of two sets of tacts mastered.

Figures 2, 3, and 4 show the acquisition of the criterion for mastering the different set for each of the children. Table 3 shows the numbers of learn units required to match each of the sets for each student. These data show no clear trend in decreases in learn units to criterion across the sets. The breakdown of the non-instructional responses by the different settings do not show consistent trends across children, although there appear to be effects of the different settings for different children. Student A had fewer responses at lunchtime, as did Student B but the differences were less convincing for Student B. Student C had fewer responses in the free play area.

The results of this experiment did demonstrate a functional relationship between the intensive daily tact instruction and the numbers of pure tacts and mands emitted by the students in the non-instructional settings. The numbers of independent tacts emitted for Student A progressively increased as he mastered the first three sets, but there was a slight downturn after mastery of the 4th set of the intensive tact treatment. Student B actually had slightly fewer tacts and mands following mastery of the 2nd set, but the post intervention numbers were significantly higher than baseline; in fact, pure tacts and mands were practically nonexistent in the baseline probe sessions for Student B. Student C emitted significantly increased numbers of pure tacts following only a single intervention, with no mands. Student C's tacts and mands were also practically nonexistent in the baseline probe sessions. There was no educationally significant change in numbers or rates of mands. The rate of tact responses following the intervention provided a time dimension for the responses, again showing that the children were initiating interactions with the experimenter such that the pure tacts occurred at faster rates.

Discussion

Student A showed a progressive increase in pure tacts with the mastery of each of the first three sets of 20 different tacts taught, but there was a slight downturn following mastery of the 4th set. Data for Student C also showed an increase in number of tacts following the mastery of a single set, although more data are needed to make clear conclusions. Clearly, more data are needed to determine the degree to which the mastery of more sets will affect the numbers and rates of pure tacts in non-instructional settings. We also need data on the rates of pure tacts that occur with typically developing children under the conditions provided in this experiment. However, it would appear that, until, or unless children have naming, observational learning, and a fairly fluent reading repertoire, the only means that children like those we studied have of obtaining new tacts is through intensive tact instruction. Future research needs to examine the effect of increasing children's pure tacts on the occurrence of conversational units. It does seem that without tacts children would seem to have little to talk about, but this too remains an empirical question.

The procedure that was implemented taught the students to tact stimuli presented in an intensive fashion as an attempt to compensate for prior missing language opportunities. The categories of tacts were selected according curricular objectives specified in *The CABAS® International Curriculum and Inventory of Repertoires for Children from Preschool to Kindergarten* (Greer & McCorkle, 2003). The procedure was also developed in order to ensure that the teachers teach significant numbers of tacts throughout the daily instruction by providing a daily instructional goal for teachers to meet (Greer and Ross, in press).

This procedure may also prove to be an effective means to compensate for the missing language opportunities associated with children like those described in the Hart and Risely study. Hart & Risley (1995) studied 42 families with young children and found that the number of verbal

interactions that occurred in the presence of those young children played a crucial role on the children's later verbal skills, including vocabulary growth rate, vocabulary use, and IQ scores. Children from impoverished families also initiate fewer verbal interactions with others than typically developing children (Woods, 1984). Perhaps, providing such children with intensive pure tact instruction in preschools may serve to reduce the vocabulary gap. The lack of pure tacts place children at a greater disadvantage in terms of their future language development. Our data suggest that increasing the numbers of pure tacts and mands children are taught could lead to a greater number of verbal interactions with others. By learning to emit more pure tacts and mands, young children can recruit more attention from the adults and peers in their environment, thereby creating still more opportunities for verbal exchanges.

Moreover, acquisition of tacts appears critical to the progressive development of verbal capabilities. The tact repertoire is a prerequisite for the development of higher order operants like naming, which is a verbal capability that provides children with an ability to acquire novel vocabulary without direct instruction (Greer, Chavez-Brown et al., 2005; Greer & Keohane, 2005; Greer, Stolfi, et al., 2005; Lowe et al. 2002). According to Horne and Lowe (1996), naming is a relation between the object, speaker behavior, and corresponding listener behavior. Lowe, Horne, Harris, & Randle, (2002) also state that training tact relations to normally developing children, "entails the concomitant training of corresponding listener behavior; that is in training tacting, one is effectively training naming" (p. 529). "Learning to emit tact or speaker responses after learning the listener responses is a key component of naming and naming makes the rapid and incidental expansion of tact responses to novel stimuli possible" (Greer, Stolfi, et al., 2005, p.124). Naming is one of the repertoires crucial for independent learning and acquisition of higher order operants like observational learning. Providing children with the naming capability appears to be a key to providing these children with tools for future success and independence.

Interestingly, most of the tacts that the students emitted in non-instructional settings were not the tacts that they were taught in the intensive tact protocol. Thus the students appear to have learned to emit the tact as a means to recruit generalized reinforcers in the form of attention from the teachers. Using both the tacts that they had in repertoire and those that were taught. Teaching the pure tact resulted in an exponential expansion of emission of pure tacts in non-instructional settings, suggesting that the children were coming progressively more under the control of generalized reinforcement of adult attention. The frequent emission of tacts and recruitment of tacts by typically developing children appears to play a significant role in rapid expansion of vocabulary that characterizes the language development of children subjected to a rich language environment.

There are several limitations to the study. First, it would have been advantageous to teach mastery of more sets of stimuli for Students B and C. Future studies should do so. In addition, collection of data on the numbers of conversational units is needed. Moreover, we need to know more about the mean and ranges of rates of pure tacts and mands by typically developing children. Finally, it is possible that simply increasing the number of learn units received by children, regardless of whether the instruction was devoted to tacts or other types of instruction represents another reason for why the numbers of pure tacts increased significantly. Future research needs to isolate the increase tact instruction from increased instruction of any kind. Clearly these and other questions need to be addressed in verbal behavior analysis. Despite the limitations of this preliminary research, the results are promising and suggest that additional research is warranted. Without an exponential increase in tacts, children are at a disadvantage. This procedure and related procedures may provide means to overcome language experience gaps between children who have not had the advantage of prior language rich

environments, whether or not the source was based on poverty or native disabilities.

References

- Albers, A., & Greer, R. D. (1991). Is the three term contingency trial a predictor of effective instruction? *Journal of Behavioral Education, 1*, 337-354.
- Becker, B. J. (1989). The effects of mands and tacts on conversational units and other verbal operants. Doctoral Dissertation, Columbia University. UMI 8913097.
- Gewirtz, J. L. & Baer, D. M. (1958). The effect of brief social deprivation on behaviors for a social reinforcer. *Journal of Abnormal and Social Psychology, 56*, 49-56.
- Gewirtz, J. L., Baer, D. M., & Roth, C. L. (1958). A note on the similar effects of low social availability of an adult and brief social deprivation on young children's behavior. *Child Development, 29*, 149-152.
- Greenwood, C. R., Hart, B., Walker, D. I., & Risely, T. (1994). The opportunity to respond and academic performance revisited: A behavioral theory of developmental retardation. In R. Gardener 3rd, et al. (Eds.) *Behavior analysis in education: Focus on measurably superior instruction*. Pacific Groves, CA: Brooks Cole.
- Greer, R.D. (1996). The educational crisis. *Finding solutions to social problems* (pp. 113-146). Washington, DC: American Psychological Association.
- Greer, R.D. (2002). *Designing teaching strategies: An applied behavior analysis system approach*. San Diego, CA: Academic Press.
- Greer, R. D., Chavez-Brown, M., Nirgudkar, A. S., Stolfi, L., & Rivera-Valdes, C. (In Press). Acquisition of fluent listener responses and the educational advancement of young children with autism and severe language delays. *European Journal of Behavior Analysis, 6* (2).
- Greer, R. D., & Hogen-McDonough, S. (1999). Is the learn unit the fundamental unit of pedagogy? *The Behavior Analyst, 20*, 5-16.
- Greer, R. D., & Keohane, D. (2005). The evolution of verbal behavior in children. *Behavior Development, 1*, 31-47
- Greer, R. D., & McCorkle, N. P. (2003). *The CABAS® International curriculum and inventory of repertoires for children from preschool to kindergarten*. Yonkers, NY: CABAS® and the Fred S. Keller School.
- Greer, R. D. & Ross, D. E. (in press). *Verbal Behavior Analysis: Inducing and Expanding New Verbal Capabilities in Children with Language Delays*. New York, NY: Allyn and Bacon.
- Greer, R. D., Stolfi, L., Chavez-Brown, M., Rivera-Valdes, C. (2005). The emergence of the listener to speaker component of naming in children as a function of multiple exemplar instruction. *The Analysis of Verbal Behavior, 21*, 123-134.

- Hart, B. & Risley, T.R. (1995). *Meaningful Differences in the Everyday Experiences of Young American Children*. Baltimore, MD: Paul H. Brookes Publishing Co.
- Horne, P. J. & Lowe, C. F. (1996). On the origins of naming and other symbolic behavior. *Journal of Experimental Analysis of Behavior*, 65, 185-241.
- Horner, R. D., & Baer, D. M. (1978). Multiple probe technique: A variation on the multiple baseline. *Journal of Applied Behavior Analysis*, 11, 189-196.
- Ingham, P., & Greer, R.D. (1992). Changes in student and teacher responses in observed and generalized settings as a function of supervisor observations. *Journal of Applied Behavior Analysis*, 25, 153-164.
- Lowe, C. F., Horne, P. J., Harris, D. S., & Randle, V. R.L. (2002). Naming and categorization in young children: Vocal tact training. *Journal of the Experimental Analysis of Behavior*, 78, 527-549
- Ross, D. E. & Greer, R. D. (2003). Generalized imitation and the mand: Inducing first instances of speech in young children with autism. *Research in Developmental Disabilities*, 24, 58-74.
- Skinner, B.F. (1957). *Verbal Behavior*. Acton, MA; Copley Publishing Group.
- Tsiouri, I. & Greer, R. D. (2003). Inducing vocal verbal behavior through rapid motor imitation training in young children with language delays. *Journal of Behavioral Education*, 12, 185-206.
- Vineland Adaptive Behavior Scale (Interview Edition). (1984). Circle Pines, MN: American Guidance Service.
- Vineland Adaptive Behavior Scale (Classroom Edition). (1984). Circle Pines, MN: American Guidance Service.
- Weikart, D.P. (1966). Results of preschool intervention programs. Paper presented at the symposium on the Education of Culturally Disadvantaged Children, University of Kansas.
- Weinrich, W. W. (1964). The tact relation: An experiment in verbal behavior. *Journal of General Psychology*, 71, 71-78.
- Williams, G. & Greer, R. D. (1993). A comparison of verbal-behavior and linguistic-communication curricula for training developmentally delayed adolescents to acquire and maintain vocal speech. *Behaviorology*, 1, 31-46.
- Woods, T.S. (1984). Generality in the verbal tacting of autistic children as a function of "naturalness" in antecedent control. *Journal of Behavioral Therapy & Experimental Psychiatry*, 15(1), 27-32.

Authors Notes

This research was done as part of the first author's doctoral coursework under the supervision of the second author. The authors may be contacted at the following addresses:

Nirvana Pistoljevic
npistol@hotmail.com

or

C/O
R. Douglas Greer
Box 76 Teachers College
Columbia University
New York, NY 10027
dgreer3872@aol.com

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