The Effects of Intensive Tact Instruction on Audience-Accurate Tacts and Conversational Units

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Abstract
We examined the effects of intensive tact instruction on emission of audience-accurate verbalizations of 2 middle school students using a delayed multiple baseline design across participants.   Dependent variables were accurate and inaccurate audience controlled tacts and conversational units during non-instructional times. Following baselines, students were taught tact sets of 5-novel stimuli. The instruction consisted of teaching 100 tact learn units daily until students met criterion on 10 sets of 5 tact stimuli. Students significantly increased audience-accurate tacts, conversational units, and inaccurate tacts/conversational units decreased for one student. We discuss the role of tact repertories on audience relevant verbalizations by students with histories of low preschool language interactions with parents.
Key words: Tact instruction for young adolescents, audience control and tact repertoires.

A growing number research studies have examined the effects of instruction derived from Skinner's (1957) theory of verbal behavior on the development of students' social interactions and their acquisition and maintenance of functional vocal speech (Chu, 1998; Greer & Keohane, 2005; Greer & Ross, 2004; Williams & Greer, 1993). Chu (1998) compared the effects of verbal echoic to mand instruction consistent with Skinner's theory in addition to a social skills package they emitted significantly more conversation and verbal operants than they did when they were taught the social skills package alone. Several reports have tested the validity of conversational units as measures of social behavior, audience control, self-talk and verbal competence (Becker, 1989; Donley & Greer, 1993; Greer & Keohane, 2005). Conversational units, extrapolated from Skinner's verbal episode, are comprised of speaker/listener exchanges in which both the participants function as a speaker and a listener in a single episode. Conversational units are a functional measure of social speaker/listener behavior (Greer & Keohane, 2005; Greer & Ross, 2004).

Becker (1989) found that conversational units are a function of other verbal operants emitted by the 2nd member of the conversation. In a conversational unit, the speaker is reinforced by the listener, and the listener is reinforced by the initial speaker, who has then become the listener (Greer, 2002). Greer and Keohane (2005) argued that the presence of conversational units in a student's repertoire is a critical developmental milestone in the evolution of children's verbal behavior. They stated that coming under the contingencies of reinforcement related the exchange of roles between listener and speaker is the basic component of being social. This repertoire appears critical to the development of socially competent verbal interactions. Alternative approaches to teaching conversational units directly by script format involve prompting and the natural control does not necessarily accrue. Becker's findings suggested that conversational units are a function of other verbal operants, so that teaching these components may be necessary if not sufficient to the emergence of conversational units. A key verbal operant in conversational units is the tact operant. In order to converse, individuals need something to talk about— they need tacts. These tacts also need to be under the control of the relevant audiences. That is tacts that function for peer social exchanges in non school settings should be under a different audience control than tacts emitted in school settings. One's tacts of events under the control of a peer are not accurate or

socially appropriate for a school audience. It would be appropriate to say, "I'm having a difficult day," to a teacher but inaccurate or inappropriate to say, "I'm having a bloody bad day."

The students in the present study emitted very few accurate tacts that were effective (i.e., appropriate) for a school audience. Many of their inaccurate tacts are typically described as "language usage that is socially inappropriate in school settings." However, as children of low-income families, their deficits in language are not surprising. Research has shown that language deficits of economically disenfranchised children can likely be attributed to their relatively lower levels of exposure to "rich" language interactions as small children (Hart & Risley, 1996). This body of evidence has demonstrated that children growing up in low-income families are not exposed to the diverse and frequent use of verbal behavior to which the children of higher income families are regularly exposed; moreover the cumulative deficit is multiplicative leading to the eventual designation "developmentally disabled" as reported in Greenwood et al., 1994. These children do not develop the same repertoires of verbal behavior and audience control as students from families with higher education and stable financial circumstances because of a lack of incidental learning opportunities. It is possible that increasing the sophistication of a student's repertoire of verbal behavior may be one of the most socially significant effects a teacher can have on a child's life (Greer, 2002). While the literature has emphasized the importance of verbal interventions in early childhood, little research has attempted to test the effects of verbal interventions in early adolescence.

This study tested the effects of teaching environmentally accurate tacts on young adolescents' emission of accurate tacts and conversational units during the school day. Will significantly increasing the numbers of accurate tact operants taught during the school day affect student's accurate tacts in their non-instructional time, and the number of accurate and inaccurate conversational units emitted by the student?

Method

Participants

The participants in this study were two eight graders--one 13-year-old boy and one 13-year-old girl, both diagnosed with emotional and behavioral disorders. Student A was a male and a beginning reader/writer, functioning at a kindergarten level for reading and a first grade level for writing. He had very poor problem-solving skills and a limited community of reinforcers. He had been at this school site for one year. Student B was a female student who emitted reader/writer levels of verbal behavior at approximately three grade levels below her same age peers. Prior to admission to her current school setting she had an instructional history of emitting escape responses when presented with classroom assignments and/or instruction. She functioned at a 6th grade level for reading and writing, and at a 5th grade level for mathematics. This was her first year at this school site.

These students were chosen for this study due to their low levels of accurate vocal verbal behavior for the school environment with respect to their same age peers. Both students emitted low numbers of accurate tacts and even fewer conversational units with peers or adults. Many of the tacts emitted by the students were inaccurate for the school setting, either because they were inaccurate in terms of standard language usage, or they were not functional for school audiences. These students were identified as those who would significantly benefit from an increase in the number of accurate tacts and conversational units emitted in the school setting during transitional periods and free periods of the day. During these times, the teaching staff had reinforced the students for engaging in appropriate conversations with peers, and while this had been effective for most of the students, the target students still had significant deficits in these areas.

Setting

The study was conducted in an eighth grade classroom at a middle school that had used the Comprehensive Application of Behavior Analysis to Schooling, or CABAS®, model (Greer, 1991) for the past three years. The school was located in a suburban area outside of a large metropolitan city, and it serviced children with both emotional and behavioral disorders from low socio-economic communities. The student to staff ratio for this classroom was 6-1-2. The students' academic functioning ranged from functioning at grade level to seven years below grade level, but all the curriculum and goals for the students in this classroom were aligned with the New York State Educational Standards for 7th and 8th graders recast as behaviorally functional repertoires according to the CABAS Curricula.

The treatment phase of the study was implemented in both the students' classroom and in the school library. The learn units for tacting the 5 sets of stimuli were dispersed throughout the day. The students often completed the learn units for 2 to 3 sets of stimuli early in the day and received learn units on the final 2 to 3 sets later that day.

Dependent Variables

The dependent variables measured in this study were the numbers of accurate tacts and accurate conversational units for the school setting that the student emitted during two transitional times and a free periods. Two transition and the free time sessions were blocked to represent a single or cumulative 15-minute session representing transitional and leisure time for the day.

Tacts. A tact is a category of verbal operants and is controlled by an object, picture, person, or other item in the speaker's environment that is reinforced by a generalized reinforcer such as attention, affirmation, and praise (Skinner, 1957). A "pure" tact is under the control of nonverbal antecedents, and, in this case, an event or condition evokes a form of verbal behavior that has been correlated with the event and a generalized reinforcer in the past. An example of a pure tact is the student stating, "That's President Bush" upon seeing a picture of President Bush. On the other hand, impure tacts have a verbal antecedent in addition to the presence of the stimulus tacted.   An example of an impure tact consists of a situation in which the teacher asks the student, "Who is that?" to which the student replies, "That is President Bush," and the teacher reinforces the student's response (e.g., "You're right, yes").

An accurate tact for the school setting was defined as a tact for the stimuli in the environment using language that was appropriate for a school audience. An appropriate tact is one that would typically receive generalized reinforcement specific to a particular audience. In other words, the tact was recorded as incorrect if the tact emitted by the student was not accurate (i.e. the student called the food "lisha" instead of "delicious") or if the tact emitted by the student included inappropriate language (i.e. "this food tastes like crap"). While the latter tact might be accurate, it was not functionally audience accurate. While the latter tact might function to obtain peer reinforcement in the form of laughter or attention, it is a response that will eventually lead to punitive outcomes in school settings.

Conversational Units. A conversational unit is defined as a category of verbal behavior including one full exchange in which the student emits both a speaker response, reinforced by the verbal behavior of another person responding as a listener, and, in turn, a listener response by the initial speaker (Greer, 2002). A "true conversational unit" occurs when both parties are a part of an interlocking three-term contingency that is verbal, in which the initial speaker's behavior is evoked by the environment and is reinforced by the listener/speaker response of the other person. Similarly, the second speaker's behavior is evoked by the verbal behavior of the initial speaker and reinforced by the listener response of that person. Each of the individuals must complete a three term verbal contingency from the perspective of

both speaker and listener (Donley & Greer, 1993; Lodhi & Greer, 1989). Figure 1 illustrates a conversational unit.
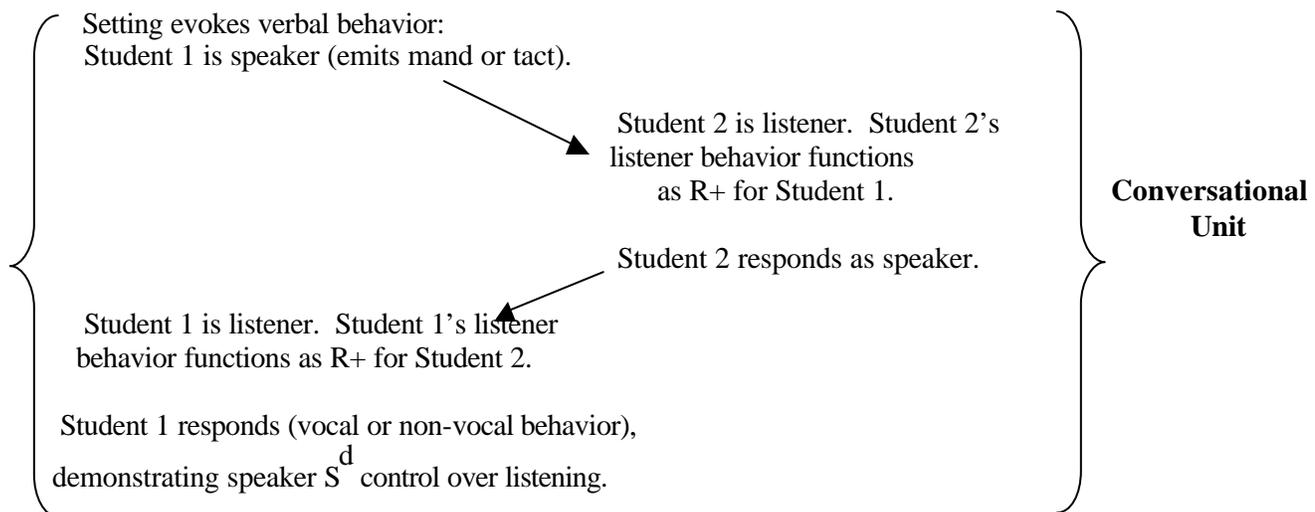
Setting evokes verbal behavior:
Student 1 is speaker (emits mand or tact).

Student 2 is listener. Student 2's
listener behavior functions
as R+ for Student 1.

**Conversational
Unit**

Student 2 responds as speaker.

Student 1 is listener. Student 1's listener
behavior functions as R+ for Student 2.

Student 1 responds (vocal or non-vocal behavior),
demonstrating speaker S^d control over listening.

Figure 1. Diagram of a conversational unit

An accurate conversational unit for the school setting was defined as a "true conversational unit" between two students, during which both students emitted correct/accurate mands, tacts, and autoclitics. During the conversational unit each student also used appropriate language for the school environment throughout the entire verbal exchange, both as a speaker and a listener. The reasons for strict identification of accurate conversational units for the school setting, and the importance of recording their number of occurrences, were consistent with the rationale for conducting the study. If a conversational unit did not fit the definition of being accurate for the school setting (i.e., inappropriate for the audience), it was recorded as an inaccurate conversational unit for both students.

Independent Variable

The independent variable consisted of a procedure that taught the students to emit accurate tacts to novel sets of stimuli and these were measured, too, as an index of treatment fidelity. The stimuli consisted of colored pictures, mounted on 5"x 7" index cards, of 4 different exemplars for each of the 5 novel stimuli in the set, creating a total of 20 cards per set. A correct response to the presentation of each card was the student emitting the correct vocal verbal tact for a picture within 5 seconds of the presentation of that stimulus. An incorrect response was recorded if the student did not respond within 5 seconds, if the student emitted the incorrect tact for the picture, or if the student emitted any inappropriate language. If the student emitted an incorrect response, the teachers used a correction procedure, in which the student was given the correct tact for that stimulus and was then required to repeat the correct tact in the presence of the stimulus, but the student was not reinforced for the correction. The students were reinforced for using any accurate autoclitics as part of their tacts (i.e. "That is the huge redwood tree.") and students were given appropriate autoclitics to use for each stimulus as part of the correction procedure. There were 5 sets, of 5 stimuli per set (4 exemplars of each set), presented in 20-learn units daily totaling 100 total tact learn units per day. The tact learn units were done in addition to the mean number of learn units taught across all curricula during baseline.

Data Collection

Data were collected by counting the numbers of accurate and inaccurate tacts and conversational units emitted by each participant across several different times of the school day. One teacher served as the data recorder and two other teachers served as an independent observer. The teachers recorded the numbers of accurate and inaccurate tacts and conversational units emitted by each student during bus arrivals and departures and during 2 transitional times of the day (i.e. when the students transitioned from lunch to gym), for 5 minutes at lunch, and for 5 minutes during the recreational period at the end of the day.

The teachers used data forms that were divided into sections. Sections of the form were assigned to each of the targeted times in the school day during which event recording was conducted. Each of these sections was also divided in half so that Student A's data was recorded on one side and Student B's data was recorded on the other side. On each side, 2 columns were drawn and labeled "T" and "CU" in which the teacher would indicate whether that student had emitted tact or a conversational unit, respectively. The teacher recorded a "plus" in the designated column when the student emitted an accurate tact or conversational unit and a minus in the appropriate column when the student emitted an inaccurate tact or conversational unit. Because the transitional times of the day and the times that the students spent getting on and off the bus were inconsistent in length, the teachers blocked these times into sessions of five minutes total and graphed the data accordingly on a daily basis.

Data were also collected, using event recording, on the students' correct and incorrect responses to the tacting programs that were performed on a daily basis throughout the treatment phases of the study. Each set of stimuli was presented to the student in blocks of 20 learn units throughout the day, providing the student with 100 additional tact learn units per day in addition to the learn units they received for all other instruction. The student was considered to have met criterion on a set of stimuli when he/she emitted at least 18/20 correct responses within one 20 learn unit session. These data consisted of measures of the implementation of the independent variable—intensive tact instruction.

Interobserver Agreement

Interobserver agreement was calculated throughout the baseline and treatment phases for both participants. Teachers from the participants' classroom, as well as teachers from other classrooms at the middle school took data, using event recording, with one of the authors of this study in order calculate interobserver agreement for measuring the baseline and treatment levels of the dependent variables. All of the teachers had been trained to collect tact and conversational units data as part of the instructional requirements required for this school setting. Point-to-point interobserver agreement was calculated during a 5-minute session as the student's number of tacts and conversational units on which both observers agreed divided by the total number of tacts and conversational units on which the two observers agreed and disagreed. In the baseline phase for Student A, interobserver agreement was taken during 30% of the sessions and was calculated at 94%, with a range of 88-100% agreement. In the baseline phase for Student B, interobserver agreement was taken during 35% of the sessions and was calculated at 92%, with a range of 85-100% agreement. In the treatment phase for Student A, the interobserver agreement was taken during 40% of the sessions and was calculated at 92%, with a range of 84-100%. In the treatment phase for Student B, the interobserver agreement was taken during 30% of the sessions and was calculated at 91% agreement, with a range of 88-98%. All interobserver agreement was conducted on a point-by-point basis.

During the intervention phases, when the authors implemented the independent variable for the study, in which they taught the students to tact multiple sets of stimuli, interobserver agreement was calculated using the teacher performance/ rate accuracy (TPRA) measure of instruction (Ingham & Greer, 1992). The interobserver agreement for the tact procedures used in implementing the independent variable across both participants was calculated at 100% agreement.

Design

A delayed multiple baseline design across participants was used to determine the effects of the independent variable on the students' numbers of accurate tacts and conversational units emitted during the school day (Johnston & Pennypacker, 1993). Student A completed the baseline phase and began the treatment phase one week prior to Student B. Baseline data were continuously recorded for Student B while Student A was in the treatment phase.

Baseline Procedure

In the baseline phase of the study, the researchers observed the students during transitional and free times, in which the teachers permitted the students to talk to one another and no formal instruction was being delivered. During the free times of the day, the students were permitted to engage in activities such as basketball, artwork, board games, card games, computers, etc. Throughout the baseline phase, the teachers corrected students who used inappropriate language by giving them a more appropriate way to express themselves and by stating that "students must use appropriate language at school" as an audience correction."

Treatment Procedure

In the intensive tact phase, after baseline data were collected, the student was provided with 100 additional learn units per school day, in which the teacher presented learn units for 5 sets of novel stimuli (Greer & McDonough, 1999). Immediately after the student met criterion on one set of stimuli, the researchers began recording data for the student's treatment phase on the number of accurate and inaccurate tacts and conversational units emitted by the student throughout the same targeted times of the school day as in the baseline phase. Data were then taken multiple times throughout each of the following school days, just as in baseline, and these data were graphed in the treatment phase of the student's graph.

As the student met criterion on each set of stimuli, another set of stimuli was introduced, such that the student received 100 learn units every day on 5 different sets of 5 stimuli each. The sets were made up of 20 pictures which depicted 4 exemplars of each of the 5 stimuli within the same general category, and each session consisted of 20 learn units, one for each of the pictures in the set. The students were taught to tact multiple exemplars of various stimuli such as 5 different kinds of trees, 5 monuments in Washington, D.C., the artwork of 5 different artists, 5 kinds of brass instruments, the landscapes of 5 different national parks, 5 former presidents, 5 foreign landmarks, etc. Sometimes the students were given a choice of which sets they wanted to learn next, and other times the teachers assigned the sets to them.

All learn unit sessions were conducted such that the student emitted pure tacts. In other words, the antecedent was simply the presentation of the stimulus in the student's environment; no vocal verbal antecedents, such as, "what is this?" were delivered. The students were also taught to emit tacts that included autoclitics. Skinner describes verbal as behavior that functions to quantify, qualify, affirm, negate, specify, or in some way modify the effect of a speaker's behavior on a listener or audience (Skinner, 1957). The students in the study were taught to emit autoclitics such as, "that is a birch tree" or

"he is President Jefferson". In addition, the students often emitted untaught autoclitics when tacting the sets of stimuli, such as "that is the cat with no hair, the sphinx" and "that picture is the one by Ansel Adams".

<div align="center">Results</div>

Baseline Data

The baseline data for Student A show a stable trend and low numbers of accurate and inaccurate tacts emitted across all 16 of the five-minute sessions (Figure 1). Under baseline conditions, Student A emitted a mean of 1.8 accurate tacts per five-minute session (range, 0 to 6) and a mean of 2.0 inaccurate tacts per five-minute session (range, 0 to 7). Student B also emitted a consistently low numbers of accurate and inaccurate tacts across all 24 five-minute sessions in the baseline phase. Student B emitted a mean of 1.8 accurate tacts (range, 0 to 5) and a mean of 2.3 inaccurate tacts (range, 0 to 7) per five-minute session under the baseline conditions.

Treatment Data

Tacts. In the treatment phases, which began immediately after the student had met criterion on one set of novel tacts, both students showed an increase in the number of accurate tacts emitted per five-minute session. Student A emitted a mean of 5.6 accurate tacts per five-minute session in the treatment phase, with a range of 1 to 15. Student B emitted a mean of 10.6 accurate tacts per five-minute session in the treatment phase, with a range of 8 to 17. The data for the treatment phase also show that as both students' numbers of accurate tacts increased, their numbers of inaccurate tacts remained low. Student A emitted a mean of 1.95 inaccurate tacts in the treatment phase (range, 0 to 7). Student B emitted a mean of 2.8 inaccurate tacts in the treatment phase (range 0 to 6).

The data on Student A's accurate tacts per five minute session show overlap across the baseline and treatment conditions, but the data also show that there were 6 sessions within the treatment phase in which Student A emitted more accurate tacts than he had ever emitted under baseline conditions. The data for Student B's number of accurate tacts per session show that there is no overlap between the number of accurate tacts she emitted in the baseline phase and the number of accurate tacts she emitted per session in the treatment phase. The increase in Student B's number of accurate tacts per session during the treatment phase was immediate and stable over time. These data are shown in Figure 1
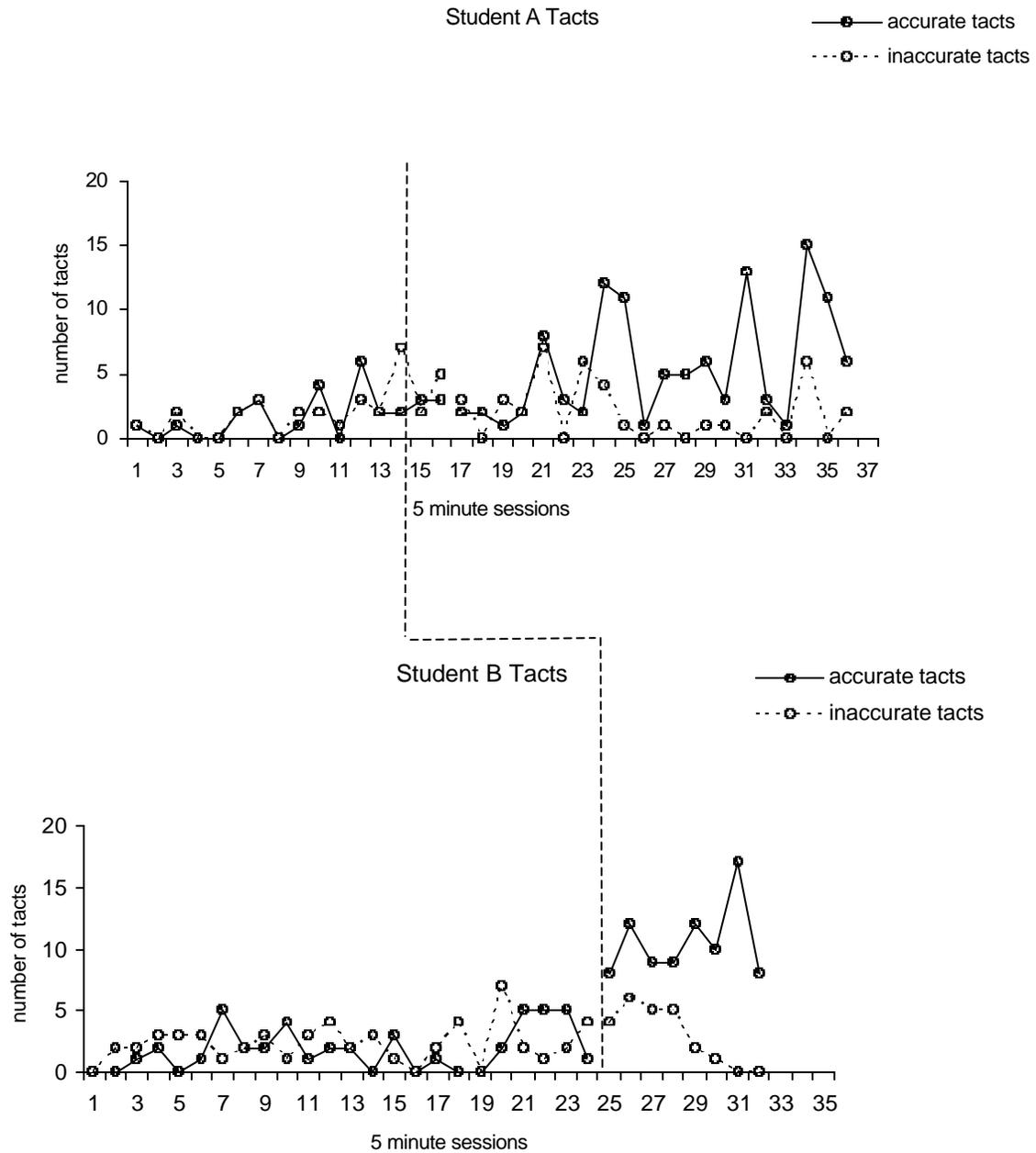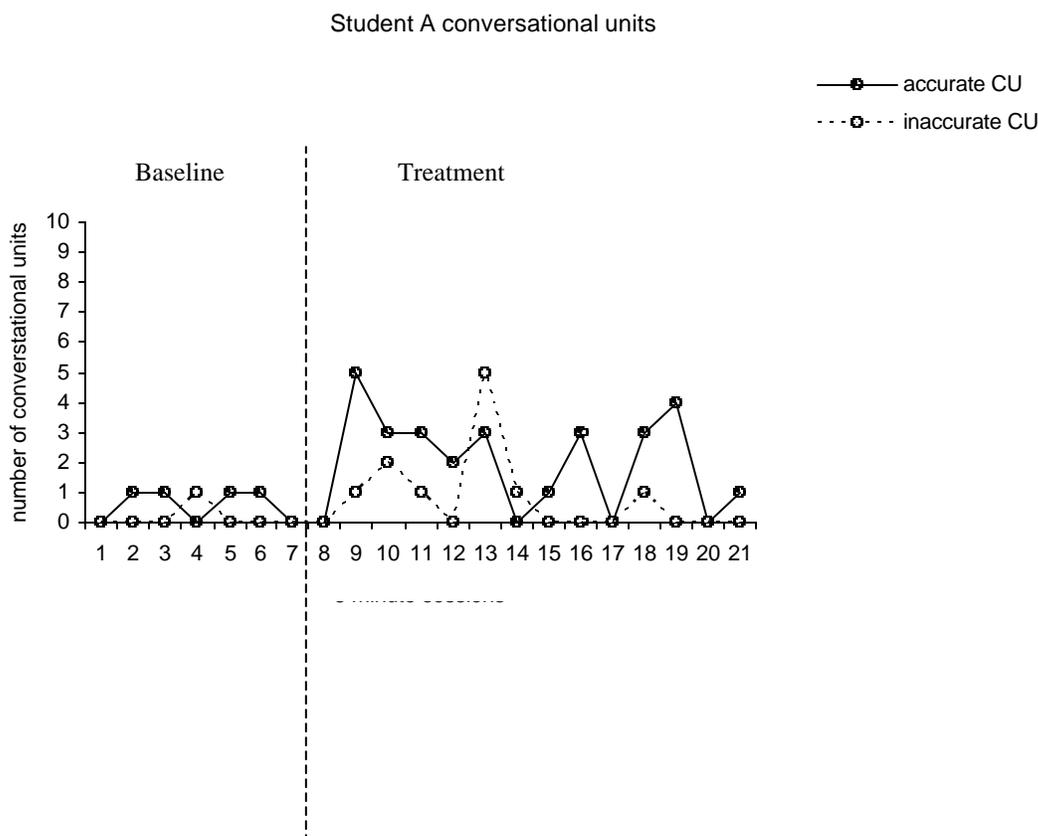
<div align="center">FIGURE 2, NEXT PAGE</div>

Figure 2. The figure shows both Student A and Student B's number of accurate and inaccurate tacts emitted during non-instructional times of the school day, throughout the baseline and treatment phases of the study.

Conversational units. The data on the students' number of conversational units emitted per session show a similar effect across the baseline and treatment conditions and are displayed in Figure 2. In the baseline phase, both students emitted a low number of accurate conversational units. Student A emitted a mean of 0.6 accurate conversational units per five-minute session (range, 0 to 1). Student B emitted a mean of 1.3 accurate conversational units per five-minute session (range, 0 to 4) under baseline conditions. Both students also emitted a low number of inaccurate conversational units under baseline conditions. Student A emitted a mean of 0.14 inaccurate conversational units per five minute session (range, 0 to 1), and Student B emitted a mean of 0.7 inaccurate conversational units per five minute session (range, 0 to 3) in the baseline phase.

Just as was demonstrated in the data for the numbers of accurate tacts emitted by both students across the two phases, the data for Student A and Student B show an increase in the number of accurate conversational units emitted within the treatment phase. Student A emitted a mean of 2.0 accurate conversational units (range, 0 to 5) per session, and Student B emitted a mean of 3.6 accurate conversational units per minute (range, 1 to 7) in the treatment phase. Both students also maintained low numbers of inaccurate conversational units per session in the treatment phase. Student A emitted a mean of 0.7 inaccurate conversational units per session (range, 0 to 5), and Student B emitted a mean of 0.5 inaccurate conversational units per session (range, 0 to 2) in the treatment phase.
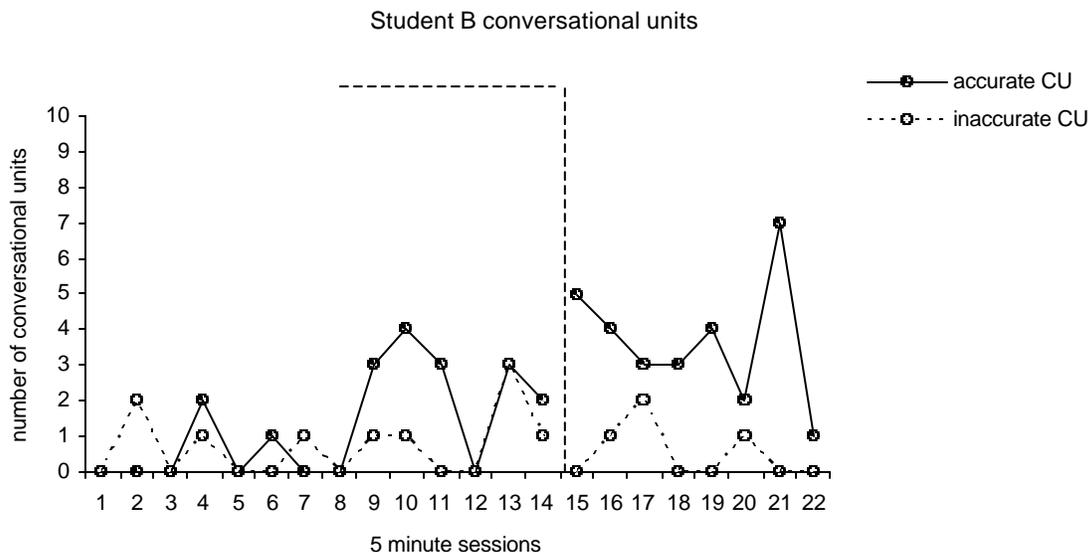
Student B conversational units

Figure 3. The figure shows both Student A and Student B's number of accurate and inaccurate conversational units emitted during non-instructional times of the school day, during the baseline and treatment phases of the study.

Discussion

The results of the study showed an increase in the number of accurate tacts and conversational units emitted by both students, following the implementation of the intensive tacting procedure. The results also showed that as both students' number of accurate tacts and conversational units increased, their number of inaccurate tacts and conversational units did not change from the baseline to the treatment phases. In other words, as the students' numbers of total tacts and conversational units increased, their numbers of inaccurate tacts and conversational units stayed relatively stable, thereby increasing their overall percentage of accurate tacts and conversational units. In examining the reasons why the tacting procedure may have had such an effect on the accurate tacts and conversational units emitted by both students, there are numerous factors to consider. In fact, the implementation of the tacting procedure may have affected several variables related to the students' levels of verbal behavior, which both independently and collectively influenced their numbers of accurate tacts and conversational units within the school environment.

Implications for Teaching

First, it is important to note that the tacting procedure implemented by the researchers functioned to teach the students to emit pure tacts in the presence of multiple exemplars of novel stimuli, for which the students had not previously acquired accurate tacts. In other words, the tacting procedure taught the students to emit novel operants, not simply previously learned responses. We observed that, although the students were often familiar with the category under which the stimuli would be classified (i.e. they knew that the picture showed a tree of some kind), the students did not emit accurate tacts for the specific stimuli themselves.

The researchers also noted that, during the initial probes for the students' responses to the target stimuli, the students often responded by saying the name of the category under which the stimuli could be classified, in addition to an inappropriate autoclitic for the school environment. For example, when first

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presented with a picture of the Washington Monument, Student A said, "That is some stupid pointy building." In addition, when presented with a picture of a pelican, Student B said, "That bird is retarded." In other words, the students' responses in the initial probe further highlighted the significant deficits in these students' tact repertoires, as well as the necessity of teaching the students to emit accurate tacts for their environment.

The tacts that the students emitted under baseline conditions also underscored the social significance of teaching these students to emit accurate tacts for the school environment. Not only did the students emit incorrect tacts for stimuli that were related to the state standards for their grade level, the students emitted tacts that would not be accepted as appropriate responses for the classroom in a regular educational setting. However, such responses are ones that have likely functioned to solicit attention from peers and/or teachers in the past. One of the most important effects of the tacting procedure on the participants' behavior was that it taught the students to emit tacts that functioned for them within the company of a school audience.

Emergence of Untaught Accurate Tacts

When collecting data for the five minute sessions in the treatment phase, the researchers noted that, although the tacts emitted by the students were almost never the specific tacts that had been taught to the students during the implemented tacting procedure, the stimuli that the students tacted during these times were often closely related to the stimuli that were taught during the tacting procedure. For example, during the treatment phase, Student A (who had been taught to tact states in the U.S. and flags of foreign countries) emitted accurate tacts in the classroom during transitional and free times of the day that related to the map on the classroom wall and the flags of the different countries that were at the bottom of that map. In addition, Student B (who had been taught to tact national parks, as well as national and foreign monuments) tacted, during transitional times of the day, that certain pictures in the art room were "from the desert or the valley," reminded her of "a building like a memorial," or looked "like a national park." The students were accurately tacting stimuli in the classroom and in the school environment that they had not previously tacted under baseline conditions.

In terms of the number of conversational units that were emitted by the students in the treatment phase of the study, the researchers noted that many of the conversational units in the treatment phase began with one of the target students emitting an accurate tact in the environment and continued when another student responded to that tact, followed by the target student emitting a response back to the other student. For example, Student A used the name of a foreign country, which was printed under one of the many flags on the classroom map, as the mystery word in the students' game of "Hangman." After doing so, the other students asked Student A where he had obtained that word, and Student A responded by tacting the picture of the flag for that particular country. Unfortunately, a limitation of the study is that the researchers did not collect data on how many of the conversational units emitted between the students were initiated by the target student and how many of the conversational units were initiated by the other students in the environment. Future studies should record data on this information, during both the baseline and treatment conditions of the study.

Suggestions for Future Research

In recording the number of conversational units that were emitted under both baseline and treatment conditions, the researchers only recorded the accurate and inaccurate conversational units emitted by the target student and other students in the environment. The researchers did not record the number of conversational units that were emitted by the target student and the teachers during these times. Anecdotally, the researchers noted that, in the treatment phases of the study, the target students asked the teachers and the researchers an increased number of questions, both during the tacting procedure itself,

and during the 5 minute sessions within the treatment phase; however, not having the data for the number of questions asked by the students and the number of conversational units that were emitted by the students and the teachers during these times is another limitation of this study. Future studies should take data on the students' number of questions, particularly the number of "wh" questions that the students asked, both during the tacting procedure and within the 5-minute sessions of the treatment phase, as well as the number of conversational units emitted by the students and teachers during these times. "Wh" questions are means of recruiting tacts that subsequently obtain generalized reinforcement (Greer & Ross, 2004; Greer, 2005).

Social Significance

        Finally, it is important to discuss the findings of the study in terms of the levels of verbal behavior measured in the dependent variable and their relationship to the tact procedure that was implemented in the treatment phase. Tact operants are part of the speaker level of verbal behavior (Skinner, 1957). Students who emit pure tacts are reinforced by generalized reinforcers in the environment, such as praise or the attention of others. Students in the speaker stage also emit autoclitics, intraverbal responses, and impure tacts (Greer, 2002). For example, a teacher asks the student "What is it?" and the student responds, "It's the White House." Acquiring this level of verbal behavior allows the student to govern consequences in his environment by affecting the listener. The tact procedure implemented in this study taught the students to emit new tact operants, but it also functioned to increase the tacts that they emitted during non-instructional times, other than the ones that were directly taught. The students began to tact more stimuli in their environment and emit more speaker behavior overall.

        These speaker repertoires expand the student's capacity to be part of the social community, but an important prerequisite for being part of the social community is that the student is reinforced as a listener with a speaker response (Greer, 2002). When a student is reinforced as a listener with a speaker response, the student has entered the speaker/listener exchange stage of verbal behavior, in which sequelics and conversational units are emitted.   The data for this study show that the tact procedure also functioned to increase the number of conversational units emitted by the target students during non-instructional times. The question is; what did the students learn from the tact procedure that affected their capacity to emit a higher level of verbal behavior? It is likely that continued research on the development of higher order operants might provide answers to these kinds of questions.

Limitations of the Study

        There are several limitations to the study. The procedures need to be replicated with more participants like those we studied. Future research should also identify how many sets of stimuli need to be taught before significant effects accrue. It is likely that continued implementation for the intensive tact instruction may lead to more dramatic effects. The fact that it was possible to increase the tact and conversational repertoires of children at this late stage suggests that a procedure like this could have even more significant effects on much younger children. Also, further research is needed that control for the numbers of learn units received daily. That is, it is possible that simply increasing the numbers of learn units the students received resulted in the effects we found, regardless of whether the learn units were devoted to tacts or other instructional goals. This is probably the biggest limitation; however much of the daily instruction of students is closely tied to the development of new tacts, although it is possible that increase textual learn units might have similar outcomes. However, the results of our pilot efforts are promising and suggestive.

Conclusions

Given the severity of the lack of verbal repertoires and corresponding inappropriate audience control of children like the ones we studied, the effects of verbal behavior analysis interventions are particularly relevant. In many such cases, the sources of inappropriate verbal behavior and poor social conversational skills may, in fact, be the result of a deficit of verbal behavior. Thus, the problem is likely not simply one of decreasing inappropriate language, the problem is a deficit in tact repertories and verbal capabilities. The importance of teaching children with severe language delays to use mands and tacts instead of assaultive behavior or tantrums is well documented. However, corresponding treatment of children with no native disabilities, but who have environmental deficits, has received little if any attention. Our efforts suggest that expanding verbal repertoires may be a key to the real solution of socially inappropriate behavior in children who have been economically and culturally disenfranchised. Moreover, even at the late stage of middle school, the educationally damaging effects for severe deficits in preschool language interactions may be remediated to some degree.

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