

A Comparison of Two Approaches for Teaching VB Functions: Total Communication vs. Vocal-Alone

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Abstract

Total communication (TC) involves the use of manual signs with their corresponding spoken words simultaneously; and research indicates that TC facilitates vocal responding by children with autism. However, most of this previous research was conducted 20 years ago and did not consider vocal responding in relation to verbal behavior functions (Skinner, 1957). The present study used an alternating treatment design to compare the effects of TC vs. vocal-alone (VA) training on the vocal tact responses of a child with autism. Results indicated that the child produced nearly four times as many vocal tact responses during TC training than during VA training in less than half the number of teaching trials. The use of manual sign training is considered in relation to its advantages for supporting the production of vocal responses.

Keywords: verbal behavior, sign language, tact, autism, total communication.

Introduction

The use of manual sign language as an alternative form of verbal behavior for persons with various language impairments has its roots in the experimental animal research of Gardner and Gardner (1969). They were the first researchers to use sign language to teach effective communication skills to an infant chimpanzee. The success of sign language training with primates prompted researchers in the applied fields to investigate the effects of sign language training on persons with various language impairments (Sundberg, 1996). Specifically, the profound language deficits presented by many children with autism and other developmental disabilities led early researchers to investigate the viability of sign language as an alternative mode of communication for this population and to examine the benefits that this form of verbal behavior could offer (Carr, Binkoff, Kologinsky, & Eddy, 1978). Subsequent research confirmed that children with developmental disabilities could not only be taught to use manual sign language, but that the manual sign acquisition could support the development of various verbal and nonverbal operants including, receptive discrimination, mands, and tacts (Miller & Miller, 1973; Bonvillian & Nelson, 1976; Carr et al., 1978; Carr, 1979; Carr & Kologinsky, 1983).

Total communication (TC), the most commonly used training procedure to teach sign language to children with autism and other developmental disabilities, involves the simultaneous presentation of both a manual sign and an associated spoken word (Carr, 1979). Research has demonstrated that this form of language training may result in superior acquisition of verbal and nonverbal operants for children with autism and other developmental disabilities as compared with vocal-alone or sign-alone training (Brady & Smouse, 1978; Barrera et al., 1980; Barrera & Sulzer-Azaroff, 1983; Konstantareas, 1984; Sisson and Barrett, 1984). For example, Brady and Smouse (1978) compared the effectiveness of three language training methods (vocal-alone, sign-alone, and TC) on the acquisition of correct behavioral responses to an experimenter's vocal request. Compared to baseline levels of responding, the TC training condition produced significant gains in behavioral responses. Vocal-alone training actually produced a significant decrease in behavioral responses, and sign-alone training condition produced no significant difference in responses.

Research has also suggests that a the use of TC for teaching sign language to non-vocal children may not only enhance communicative effectiveness but also facilitate the development of vocal responses (Fulwiler & Fouts, 1976; Schaeffer, Kollinzas, Musil, & MacDowell, 1977; Brady & Smouse, 1978; Casey, 1978; Carr, 1979; Konstantareas, Webster, & Oxman 1979; Barrera et al., 1980; Layton & Baker, 1981; Barrera & Sulzer-Azaroff, 1983; Konstantareas, 1984; Sisson and Barrett, 1984, Clarke, Remington, & Light, 1988; Goodwyn, Acredolo, & Brown, 2000; Tincani, 2004). For example, when Fulwiler and Fouts (1976) used TC for teaching American Sign Language (ASL) to a non-vocal five-year-old boy with autism, they found not only an increase in the child's use of manual signs but also a concomitant increase in the child's vocal responses following the training. These results were considered to illustrate the benefits of using manual sign language to develop an effective communication repertoire in children with autism.

The effect of TC training on the development of vocal responses has also been investigated in studies of typically developing children. This research has demonstrated that the addition of gestural signs to traditional vocal training accelerated the development of vocal responses in infants between the ages of 11 and 36 months (Goodwyn et al., 2000). Goodwyn et al. found a significant advantage in the acquisition of receptive and expressive language by children who were taught to use gestural sign language paired with spoken words as compared to vocal-alone or no-training conditions. The researchers argued that the use of gestural signs and spoken words facilitated rather than hindered language acquisition. They also proposed that the use of TC led to additional advantages such as reducing problem behaviors and clarifying children's needs and wants.

Further research investigating the facilitative effects of TC training on vocal responses has identified a sub-set of non-vocal children most likely to benefit from this approach. For example, several studies have suggested that TC training may be most effective for developing and increasing vocal responses by children who already demonstrate some degree of vocal imitation or echolalia (Schaeffer, et al., 1977; Carr, 1979). Casey (1978) used TC training to teach sign language to four children with autism whose vocal repertoires consisted primarily of echoic responses. He examined the effects of TC on communicative and inappropriate behaviors. Target behaviors included solicited and spontaneous vocal responses. It was found that these behaviors increased for all participants following TC training. In the case of one participant, vocal speech improved to such a degree that manual signs were eventually faded and vocal speech became the primary response form. In a similar study, Konstantareas et al. (1979) investigated the effects of TC training on various language repertoires in four children with autism. They measured reproductive communication (i.e., imitation of modeled signs), receptive communication (i.e., pointing to a named item in a field of distracters), elicited communication (i.e., labeling objects or providing a sign when given an object's name) and spontaneous communication (i.e., requesting access to objects or activities). Two of the four participants had limited vocal imitation repertoires and produced some spontaneous vocalizations prior to TC training. The other two participants did not produce any imitative or spontaneous vocalizations. Following TC training, elicited and spontaneous vocalizations increased for both participants with prior vocal imitation skills, but no gains were found in either type of vocalization by the two participants who lacked prior vocal imitation skills. In another study, Layton and Baker (1981) conducted a year and a half longitudinal study tracking the acquisition of both manual signs and vocal responses in one child with autism. Prior to TC training, the participant occasionally used single vocal words to express his needs and wants and he vocalized upon command. However, his lack of spontaneous language resulted in his being labeled mute. During initial language sampling, he primarily used signs alone to communicate, and he only occasionally used signs and vocal responses simultaneously. A TC approach was then used to teach 50 signs across various grammatical categories. Following TC training, this participant demonstrated a decrease in the use of signs alone and an increase in the use of TC. Additionally, the participant began occasionally to use vocal responses alone.

Some studies have found increases in vocal responses for children with limited echoic repertoires following TC training to teach labels of pictured items (Clarke, et al., 1988) and mands for preferred

items (Tincani, 2004). In one study involving two participants, Tincani (2004) compared the acquisition of vocal manding following two types of TC training. One type involved the use of manual signs together with speech as the response form, and the other type involved the use of Picture Exchange Communication System (PECS) together with speech. The data indicated the acquisition of vocal mands by both participants was greater following TC training with manual signs. In sum, this line of research suggest that for children with autism who have some echoic repertoire, TC training with sign language may produce superior acquisition of various vocal responses than traditional vocal-alone training programs or sign-alone training.

Based on these encouraging findings, researchers have attempted to use manual sign language as a communicative prosthesis (Konstantareas, 1984) to support the development of vocal verbal behavior by persons with autism and developmental disabilities or language impairments for whom traditional vocal-alone training has not been successful. Barrera, et al. (1980) compared the effectiveness of TC, vocal-alone, and sign-alone instruction on expressive word acquisition. One child with autism was taught to name six different objects in each of the three training conditions. The researchers found that TC training produced greater gains in the acquisition of expressive language than the other two treatment conditions. They concluded that TC training may be a more effective for children with autism than either verbal-alone or sign-alone approaches.

Sisson and Barrett (1984) compared the effectiveness of TC to vocal-alone training for increasing the imitative length of utterance in three children with developmental disabilities. Groups of four-word sentences were taught in one of two conditions, TC or vocal-alone. The TC condition included the use of both manual signs and vocal prompts whereas only vocal prompts were used in the vocal-alone condition. For all participants, TC was associated with more rapid acquisition of sentences than vocal-alone training. Therefore, TC training was identified as the most effective intervention for each of the three participants. In a similar study, TC training was found to be effective for supporting the production of complex speech in children with developmental disabilities. Konstantareas (1984) found that TC training resulted in superior acquisition of vocal prepositions and pronouns as compared to vocal-alone training in children with various language impairments. Based on these results, it was suggested that use of sign language may facilitate the development of complex speech by children with language impairments and that TC may be more effective than vocal-alone training.

In another demonstration of the superior effects of TC training, Barrera and Sulzer-Azaroff (1983) compared the effectiveness of TC training to vocal-alone training for teaching vocal labeling to three children with autism. Results showed that the TC condition produced greater gains in vocal labeling responses and required fewer teaching trials than the vocal-alone condition. Vocal-alone training only produced the acquisition of one labeling response for one participant and had no effect on the acquisition of labeling responses by the other two participants. Conversely, following TC training, two of the participants acquired all of the vocal labels targeted, and one participant acquired all but one label before training was discontinued.

Despite the encouraging findings of research published nearly 25 years ago regarding the use of TC with manual sign to facilitate vocal responding in children with autism, no further research has been conducted on this topic. Therefore, the purpose of the present study was to (1) replicate previous research on the benefits of TC (sign plus vocal) compared with vocal alone training, and to (2) determine whether previous findings regarding the effects of TC with sign language could be extended to children who have developed a vocal response repertoire in one operant class (mand relation) but who have failed to acquire vocal responses in another operant class (tact responses). Replication of previous findings would lend additional support to the value of TC with manual for teaching communication skills to children with autism. Moreover, an analysis of TC training relative to verbal behavior functions may enable the results to be interpreted in a more systematic manner. Considerable advances have been made in the past 25

years in the conceptual and empirical analysis of the application of B.F. Skinner's taxonomy of verbal behavior. These advances can support a conceptually systematic analysis of mechanisms that account for the benefits of TC training, and they could support more effective practices by parents and other persons teaching verbal behavior to children with autism.

Methods

Participant and Setting

One individual (Sarah) served as the participant in this study. At the time of data collection, Sarah was a seven-year-old female with autism in the moderate range of disability. She received about 40 hours per week of home-based one-on-one intensive teaching in the form of discrete trial training interspersed with teaching in the natural environment facilitated through play based activities. Sarah demonstrated an echoic repertoire and had acquired a variety of vocal mands that were multiply controlled by both the presence of a desired item and the motivating operation. In addition, she occasionally produced vocal mands for items solely under the control of the motivating operation. Sarah's tact repertoire was limited and prior to the implementation of the independent variables in this study, she had acquired only 57 vocal tacts over an eight month period. Moreover, attempts to increase Sarah's intraverbal repertoire had only resulted in a few responses to specific verbal stimuli. Acquisition data revealed that the rate of acquisition of both tacts and intraverbals had slowed considerably prior to the beginning of this investigation. In the six weeks prior to this study, no tact or intraverbal responses had been acquired despite the presentation of many learning trials.

All observations were conducted in Sarah's home. Three in-home teachers delivered the interventions and recorded the data. During all teaching sessions, Sarah sat at the same instructional table in the same room. A teacher sat across from Sarah. Stimuli and materials were placed in front of the teacher.

Measurement of Dependent Variables

The dependent variable measured in this study was the acquisition of tacts for pictured objects. Prior to implementation of the experimental conditions pictures of objects were displayed to Sarah by holding them at eye level and asking "what is it? If she failed to respond within 10 seconds or responded incorrectly, the picture was chosen for tact training. Twenty pictures of objects from this group were selected and 10 targets were randomly placed in either a vocal alone (VA) or TC experimental condition. As tacts were acquired in either of the conditions, new pictures were added. This resulted in the maintenance of 10 non-acquired targets in each experimental condition. The added targets were selected using the same procedure as described above for the original 20 pictured objects. All targets in each experimental condition were randomly presented during the teaching sessions, and each session lasted about 20 minutes. More than one session per day was sometimes conducted. Examples of the pictured objects in the TC condition included broom, fork, and shovel. Examples of pictured objects in the VA condition included soup, belt and bucket.

Definition of Correct Response: During both experimental conditions, a correct response was defined as Sarah's production of a vocal tact corresponding to a pictured item within three seconds of the picture's display when paired with the question "What is it?" during probe trials interspersed throughout teaching sessions.

Definition of Incorrect Response: An incorrect response was defined as any vocal response that did not correspond to the target picture or a failure to respond within three seconds when a target picture

was presentation and paired with the question, "What is it?" during probe trials interspersed throughout the teaching sessions.

Correct and incorrect responding was assessed through the teaching sessions, but only on probe trials that did not include any type of prompt. In other words, probe trials were implemented during each session to measure mastery of the tact response. Prompts were provided throughout the sessions during the teaching of the tacts in both experimental conditions. The prompting and stimulus control transfer teaching procedures are described below. However, the criterion for mastery in both experimental conditions was 100% correct responses for all presentations of the item across two consecutive sessions and two different instructors. This meant that no teaching trials that included prompting of the response could be presented during the entire session and correct responding had to occur on each presentation to meet mastery criterion.

Vocal-Alone (VA) Training

During the VA training condition, vocal tacts were taught using only a vocal prompt to evoke responses during teaching trials. On average about 267 trials were presented during at each session. An errorless teaching procedure utilizing a zero second time delay and then a constant time delay of three seconds stimulus control transfer procedure was employed. In other words, during each teaching trial, the teacher modeled the correct response immediately following the initial display of the picture paired with the question "what is it?" Immediately following this modeled response, the teacher displayed the picture again and said "what is it?" and paused three seconds in anticipation of the Sarah's response. When Sarah responded correctly, the instructor presented two or three mastered instructional demands and then re-presented the picture and question to support stimulus control transfer of the tact response. This trial was referred to as the test trial. For each correct response in this sequence Sarah received verbal praise. Errors at any point in the teaching trial sequence were corrected by re-presenting the stimulus immediately and returning to the zero second time delay prompt followed by the stimulus control transfer procedures described above. Incorrect responses that required correction did not receive praise from the experimenter. Each target received about 25 trials per session.

The prompting and stimulus control transfer procedures were adjusted by the teacher throughout the session based upon Sarah's responses. In other words, frequent correct responses during the test trials in any session led to more frequent probe trials. This meant that some targets during some sessions did not receive any prompts and instead were just probed since Sarah had displayed a high rate of correct responses during probe trials in the previous session. In fact, the requirement to reach mastery on any target item required 100 percent correct responding on probe trials during two consecutive sessions across two different in home teachers.

Total Communication (TC) Training

During the TC condition, vocal tacts were taught using a vocal prompt plus display of the manual sign by the teacher to evoke correct responses. On average 234 trials were presented per session during this condition. The manual signs were either the precise ASL sign or a simplified modification thereof. Initial trials began with the display of a pictured object plus the question, "What is it?" This was followed immediately by the teacher's production of simultaneous models of the TC forms (sign and vocal) corresponding to the pictured object. An errorless teaching procedure utilizing a zero second time delay and then a constant time delay stimulus control transfer procedure of three seconds was employed. In other words, the teacher modeled the TC forms (sign, vocal) immediately following the display of the picture paired with the question ("what is it?"). Immediately following her modeled response the teacher displayed the pictured object again and said "what is it?" and paused three seconds to anticipate a correct vocal and sign response from Sarah. If Sarah produced an incorrect sign but the correct vocal response

during this trial, her response was treated as an error, and the error correction procedure described below was implemented. Sarah was required to perform the correct sign and vocalization during this phase of stimulus control transfer to receive social reinforcement in the form of praise. When she responded correctly the instructor presented two or three mastered instructional demands and then re-presented only the picture and question to support stimulus control transfer of the tact response. On this test trial, a correct response only required a correct vocal response to receive reinforcement. For each correct response in this sequence Sarah received verbal praise. Errors during any of the teaching trials were corrected by re-presenting the stimuli immediately and returning to the zero second time delay prompt followed by the prompt fade and test for stimulus control transfer as described above. The teacher treated failure to perform the sign during any of the teaching trials except the test trial as an error and therefore immediately presented the error correction procedure. Incorrect responses did not receive praise from the teacher. Instead, they resulted in the error correction procedure. Each target received approximately 23 trials during each session.

Consistent with the vocal alone condition, probe trials were interspersed throughout the sessions. Once again, the criterion for mastery for any target was 100 percent correct on probe trials over two consecutive sessions across two teachers.

Inter-observer Agreement

Data were recorded throughout the experiment by a primary observer whose only responsibility during the sessions was to record the occurrences of correct and incorrect responses during probe trials. A correct response was recorded when Sarah emitted the vocal tact response corresponding to the pictured object. An incorrect response was recorded when no vocal tact response occurred within three seconds of the presentation of the stimulus or when an incorrect vocal response occurred. A second observer's independent ratings were used to calculate inter-observer agreement (IOA) scores during one third of the sessions. During IOA sessions, the teacher and the second observer recorded their ratings for all responses simultaneously but independently throughout the sessions. For purposes of calculating IOA the ratings of the teacher were compared to those of the second observer. An agreement occurred when both observers gave the observed response exactly the same rating (correct or incorrect). A disagreement occurred when the observers rated the same response differently. The IOA was calculated by dividing agreements by agreements plus disagreements and then multiplying by 100. The actual IOA scores ranged from 93% to 100% with an average of 98%.

Design

An alternating treatment design was used to evaluate the relative effectiveness of TC training vs. VA training for teaching tact responses. Both experimental conditions were conducted during each session. The sequence of the two treatment conditions were alternated randomly across the sessions, and the same condition was never presented more than two times consecutively, according to the requirements of an alternating treatment design (Barlow, Hayes, 1979).

Results

The cumulative number of tacts mastered in both the TC and VA training conditions are presented in Figure 1. Sarah received a total of about 7,500 trials in the VA condition and about 6,500 trials in the TC condition. The first tact in the TC condition was mastered by the fifth treatment session and after 89 teaching trials. By the end of 28 treatment sessions, Sarah had mastered 30 tacts in the TC condition. The first tact in the VA condition was not mastered until the seventh treatment sessions and after 148 teaching trials. Moreover, only eight tacts were mastered by the end of 28 treatment sessions.

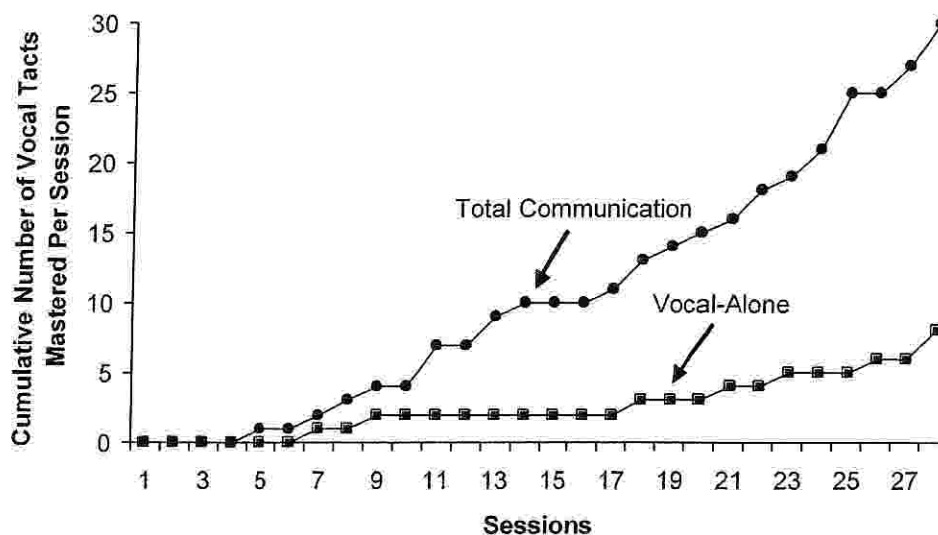


Figure 1. Cumulative number of vocal tacts mastered in the total communication condition and vocal-alone condition per session.

Figure 2 presents the mean trials to criterion for tact acquisition in the TC and VA conditions. In the TC condition tact responses were mastered in an average of 155 trials (compared with 357 trials in the VA condition). Overall, the TC treatment produced almost four times as many mastered tacts as the VA condition, and it accomplished this in less than one-half the average number of trials.

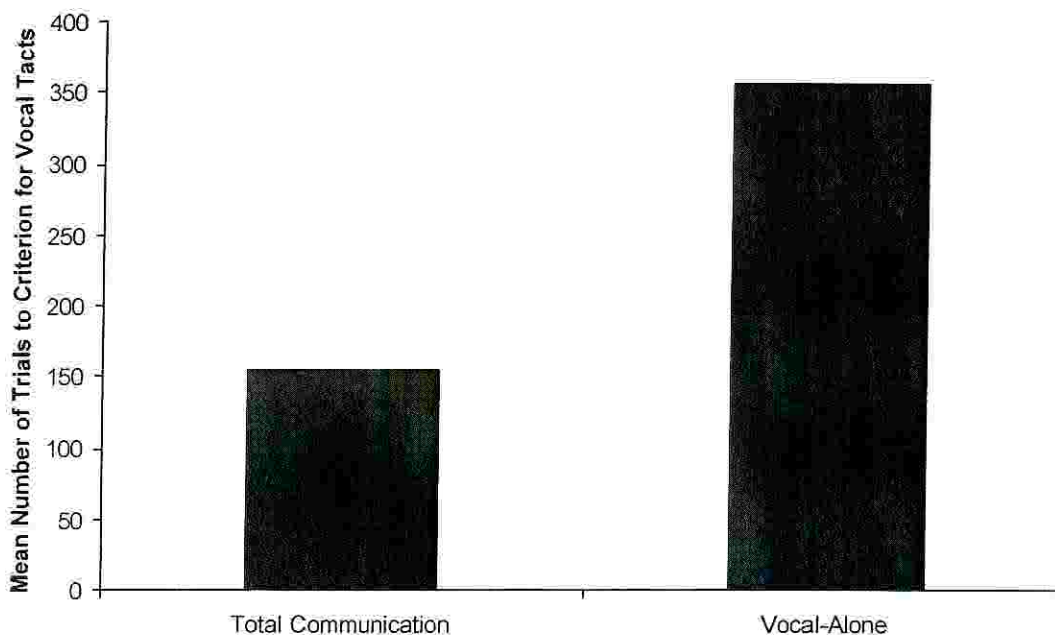


Figure 2. The mean number of trials to criterion for vocal tacts in the total communication condition and vocal-alone condition.

Discussion

The results indicate that, for the child with autism in this study, the TC procedure was superior to VA procedure to support the acquisition of tact responses. The participant acquired almost four times the number of responses following TC training as she did following VA training, and mastery was achieved in the TC condition following significantly fewer teaching trials. These results support previous research which has suggested that the addition of manual sign language to vocal training programs (TC) may increase vocal responding in learners for whom vocal-alone training has not produced satisfactory outcomes (Barrera et al., 1980; Barrera & Sulzer-Azaroff, 1983; Konstantareas, 1984; Sisson and Barrett, 1984).

A number of possible explanations for the facilitative effect of manual sign language on the vocal verbal behavior of children with autism have been offered. Barrera and Sulzer-Azaroff (1983) attributed the superior results of TC training to the increase in available sensory cues provided by the simultaneous presentation of manual signs. They asserted that these cues provide additional input to the sensory systems of children with autism, thereby facilitating the development of the vocal repertoire. Konstantareas (1984) suggested that the iconicity of the manual signs may be a contributing factor in the success of TC training or that the use of the signs may result in the storage of a visual image that later aids recall of the vocal responses.

A more thorough behavioral analysis of the findings of this and previous studies reporting similar outcomes may now be possible because of research in recent years stimulated by B.F. Skinner's (1957) theoretical analysis of verbal behavior. Two studies have recently demonstrated the benefit of TC training for increasing the mand repertoires of children with autism who have limited vocal skills (Charlop-Christy, Carpenter, Le, LeBlanc, & Kellet, 2002; Tincani, 2004). Charlop-Christy et al studied three individuals who were learning mand responses in the form of picture exchange (PECS). Vocal responding increased in all three of the participants when their PECS responses were paired with the teacher's production of the word for requested item. The authors concluded that the development of vocalizations may have been due to a combination of factors, including (1) the verbal behavior function being targeted (i.e., mand); (2) the participants tendency to echo the teacher's vocalization; (3) consistent adventitious reinforcement of echoic response; (4) inherent use of a delay procedure, and (5) each participants' pre-treatment repertoire of echoic behavior.

Tincani (2004) measured increases in vocal responding by comparing the effects of PECS training and TC (sign plus vocal) training on the development of vocal manding. He found that both systems produced an increase in vocalizations but TC training led to more vocal responding than did PECS. Both Tincani's study and Cherlap et al's (2002) study used TC training similar to the methods used in the present research to increase vocalizations in their participants. The different forms of total communication used in these studies (PECS-based vs. sign-based) both improved vocal responding. However since TC with manual sign produced superior results, manual sign appear to have a facilitative advantage over PECS in supporting the production of verbal behavior. A plausible explanations for the development of vocalizations offered by Charlop-Christy, et al (2002) could account for the effects of TC training using either picture exchange or manual sign. But what then could explain the superior effects of sign language found by Tincani (2004)? One possibility is to consider these findings according to Skinner's (1957) analysis of language. Specifically, sign language, as with vocal verbal behavior, constitutes topography-based verbal behavior (Michael, 1985). Michael suggests that this kind of verbal behavior is characterized by each operant (sometimes a word) having a different topography (motor movement) for each controlling relation or referent. However, in the case of PECS and other picture/icon selection or exchange systems the motor movement is almost identical for each response and what is different is the picture or icon selected. Michael (1985) referred to this type of responding as selection-based verbal behavior. This difference may be more important than it appears. Sundberg and Partington

(1998) offer an explanation as to how sign language during TC training may gain its superiority over selection-based systems. "Once the motor movements are learned, specific vocalizations can be matched with the signs. This sign-vocalization prompt can help in other ways as well. A child can use signs to prompt his own vocalizations" (p.77). In other words, the unique topographies of individual manual signs (in contrast to the consistent topography of selection systems) may allow each sign to act as a "built in prompt". In fact, Tincani (2004) offers this explanation to account for the superiority of sign compared to PECS in the development of vocal responses by children with autism. Similarly, the participant in this study either signed the tact and then emitted the vocal response or she first looked at the sign she produced and then emitted the vocal response. The use of signs as prompts for vocalization seemed to be confirmed by the behavior of the participant in our study based on anecdotal observations.

One of the important findings of this study is the fact that the responses taught were tacts and not mands. Mands are associated with more valuable forms of reinforcement since the form of the response specifies a reinforcer that is presently potent. In the case of tacts, more generalized social reinforcement usually maintains these responses as was the case in this study. In this study however, the participant had a reasonably well developed vocal mand repertoire but failed to develop and maintain a vocal tact repertoire. Despite the seemingly less powerful social reinforcement associated with the tact response the manual signs appeared to act as supplementary stimulation leading to the acquisition of vocal tact responses. This is important since most verbal behavior is maintained by generalized forms of reinforcement, such as the vocal intraverbal response, and therefore most functions of verbal responding may be susceptible to the effects of total communication training with manual sign language.

This study is limited by the fact that findings of only one participant are reported here. Replication of these findings with additional participants with autism who have varying characteristics and levels of disability will be needed in order to determine the benefits of total communication training with a wide range of participants. In addition, while no formal maintenance data were collected anecdotal reports indicate the maintenance of the tacts acquired during TC training. In fact, the acquisition data and maintenance reports were so positive that Sarah continues to be taught all verbal behavior with the support of TC using manual sign language. She almost always signs prior to vocalizing and when she fails to emit a vocal response, a request made by her teacher that Sarah sign the response almost always evoked the correct vocalization.

Future researchers may want to determine the effectiveness of TC with simultaneous manual sign and vocal training for learners who emit echoic responses and potentially vocal mands but fail to emit high rate vocal intraverbal responses. In fact, we conducted a second study to address this issue however due to some methodological flaws the results were not included in this report. Nevertheless, the results were promising and suggest that intraverbal vocal responding may be facilitated through TC training using manual sign language.

The pattern of results in this line of research have important implications for practitioners and parents who wish to teach vocal responses to children with autism who exhibit weak vocal responding. It appears that with some of these children vocal-alone training may not be sufficient to produce vocal tact responding and therefore the addition of manual sign language may provide a necessary method in the development of this repertoire. Persons responsible for the design and implementation of language training programs for children with autism who have not yet developed satisfactory vocal responses should consider the evocative effects of TC with manual sign language as an addition to their language training programs.

References

Barlow, D. H., & Hayes, S. C. (1979). Alternating treatment design: One strategy for comparing

- the effects of two treatments in a single subject. *Journal of Applied Behavior Analysis*, 12, 199-210.
- Barrera, R. D., Lobato-Barrera, D., & Sulzer-Azaroff, B. (1980). A simultaneous treatment comparison of three expressive language training programs with a mute autistic child. *Journal of Autism and Developmental Disorders*, 10, 21-37.
- Barrera, R. D., & Sulzer-Azaroff, B. (1983). An alternating treatment comparison of oral and total communication training programs with echolalic autistic children. *Journal of Applied Behavior Analysis*, 16, 379-394.
- Bonvillian, J. D., & Nelson, K. E. (1976). Sign language acquisition in a mute autistic boy. *Journal of Speech and Hearing Disorders*, 41, 339-347.
- Brady, D. O., & Smouse, A. D. (1978). A simultaneous comparison of three methods for language training with an autistic child: An experimental single case analysis. *Journal of Autism and Childhood Schizophrenia*, 8, 271-279.
- Clarke, S., Remington, B., & Light, P. (1988). The role of referential speech in sign language learning by mentally retarded children: A comparison of total communication and sign-alone training. *Journal of Applied Behavior Analysis*, 21, 419-426.
- Carr, E. G. (1979). Teaching autistic children to use sign language: Some research issues. *Journal of Autism and Developmental Disorders*, 9, 345-359.
- Carr, E. G., Binkoff, J. A., Kologinsky, E., & Eddy, M. (1978). Acquisition of sign language by autistic children. I: Expressive labeling. *Journal of Applied Behavior Analysis*, 11, 489-501.
- Carr, E. G., & Kologinsky, E. (1983). Acquisition of sign language by autistic children II: Spontaneity and generalization effects. *Journal of Applied Behavior Analysis*, 16, 297-314.
- Casey, L. O. (1978). Development of communicative behavior in autistic children: A parent program using manual sign language. *Journal of Autism and Childhood Schizophrenia*, 8, 45-59.
- Charlop-Christy, M. H., Carpenter, M., Le, L., Leblanc, L. A., & Kellet, K. (2002). Using the picture exchange communication systems (PECS) with children with autism: Assessment of PECS acquisition, speech, social-communicative behavior, and problem behavior. *Journal of Applied Behavior Analysis*, 35, 213-231.
- Fulwiler, R. L., & Fouts, R. S. (1976). Acquisition of American sign language by a noncommunicating autistic child. *Journal of Autism and Childhood Schizophrenia*, 6, 43-51.
- Gardner, R. A., & Gardner, B. T. (1969). Teaching sign language to a chimpanzee. *Science*, 165, 644-672.
- Goodwyn, S. W., Acredolo, L. P., & Brown, C. A. (2000). Impact of symbolic gesturing on early language development. *Journal of Nonverbal Behavior*, 24, 81-103.
- Konstantareas, M. M., Webster, C., & Oxman, J. (1979). Manual language acquisition and its

- influence on other areas of functioning in four autistic and autistic-like children. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 20, 337-350.
- Konstantareas, M. M. (1983). Sign language as a communicative prosthesis with language-impaired children. *Journal of Autism and Developmental Disabilities*, 14, 1984.
- Layton, T., & Baker, P. (1981). Description of semantic-syntactic relations in an autistic child. *Journal of Autism and Developmental Disorders*, 11, 385-399.
- Michael, J. (1985). Two kinds of verbal behavior plus a possible third. *The Analysis of Verbal Behavior*, 3, 1-4.
- Miller, A., & Miller, E. E. (1973). Cognitive-developmental training with elevated boards and sign language. *Journal of Autism and Childhood Schizophrenia*, 3, 65-85.
- Schaeffer, B., Kollinzas, G., Musil, A., & MacDowell, P. (1977). Spontaneous verbal language for autistic children through signed speech. *Sign Language Studies*, 17, 287-328.
- Sisson, L. A., & Barrett, R. P. (1984). An alternating treatments comparison of oral and total communication training with minimally verbal retarded children. *Journal of Applied Behavior Analysis*, 17, 559-566.
- Skinner, B. F. (1957). *Verbal behavior*. Englewood Cliffs, New Jersey: Prentice Hall.
- Sundberg, M. L. (1996). Toward granting linguistic competence to apes: A review of Savage-Rumbaugh et al.'s language comprehension in ape and child. *Journal of the Experimental Analysis of Behavior*, 65, 477-492.
- Sundberg, M. L., & Partington, J. W. (1998). *Teaching language to children with autism or other developmental disabilities*. Pleasant Hills, CA: Behavior Analysts, Inc.
- Tincani, M. (2004). Comparing the picture exchange communication system and sign language training for children with autism. *Focus on Autism and Other Developmental Disabilities*, 19, 152-163.

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If you wish to run the same ad in multiple issues for the year, you are eligible for the following discount:

1/4 Pg.: \$40 - per issue
1/2 Pg.: \$75 - per issue
Full Page: \$150.00 - per issue

An additional one-time layout/composition fee of \$25.00 is applicable

For more information, or to place an ad, contact Halina Dziewolska by phone at

(215) 462-6737 or e-mail at: halinadz@hotmail.com