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# Functional Communication Training in the Natural Environment: A Pilot Investigation with a Young Child with Autism Spectrum Disorder

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**Abstract**

A child with Autism Spectrum Disorder (ASD) and a history of aberrant behaviors participated in this study with his mother. The primary purpose of the current study was to determine the effectiveness and efficiency of FCT on decreasing problem behaviors, increasing communication mands, and increasing spontaneous communication with a child with ASD in his home environment. Further, the number and diversity of spontaneous verbalizations were anecdotally recorded. The results of the multiple baseline study across mands demonstrated a dramatic decrease in aberrant behavior while increasing the number of mands and the latency to respond. In addition, the participant's number and diversity of words dramatically increased.

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Autism Spectrum Disorder (ASD) is a developmental disability affecting the lives of thousands of children. According to the Centers for Disease Control and Prevention (CDC), approximately 34 in 10,000 children ages 3 to 10 years of age have ASD (CDC, 2004). The Autism Society of America (ASA) reports that 1 in 166 babies born today will develop ASD (Autism Society of America, 2006). The ASA also notes that 1.5 million Americans including children and adults have ASD, while another 15 million Americans (e.g., family, educators, and health care workers) are affected by ASD.

The essential features of ASD include significant impairments in social interaction and communication skills and a highly restricted area of activities and interests (American Psychiatric Association, 2000). Concurrent with these features, children with ASD often exhibit high levels of aberrant behaviors such as screaming, hitting, and

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biting (Sigafoos, 2000); thus, creating substantial obstacles for individuals charged with their education and well being (Durand & Merges, 2001). For example, many parents experience stress when their children engage in tantrums. Unlike parents of non-disabled children, parents of children with ASD usually cannot determine the reason for the tantrum because of their child's deficits in communication. Such issues with communication deficits and aberrant behaviors combined with the increase in the prevalence of ASD demands for the field to respond and provide effective practices to meet these children's needs in applied settings, such as the home and educational environments.

Researchers have responded by examining the relationship between aberrant behavior and communication skills (e.g., Bott, Farmer, & Rhode, 1997; Chung, Jenner, Chamberlain, & Corbett, 1995; Schroeder, Schroeder, Smith, & Dalldorf, 1978; Sigafoos, 2000). Chung et al. (1995) found an inverse relation between communication skills and the display of aberrant behaviors, such as self-injury and aggression. Similarly, Bott et al. (1997) determined that individuals with more developed speech skills displayed a lower frequency of aberrant behaviors than those with impaired speech. Further, Sigafoos (2000) hypothesized in a more recent study that impaired communication development may actually cause aberrant behaviors.

Given the relationship between communication and aberrant behavior, there is a need for evidence-based practices that directly address the communicative impairments of children with ASD (Simpson, 2005). Unfortunately, to date, a dearth of research exists that examines evidence-based practices that address aberrant behaviors and communication skills and have utility in applied settings.

Functional communication training (FCT) represents an evidence-based practice with the potential to positively impact the communication skills and aberrant behavior of children with ASD (Carr& Durand, 1985; Durand & Merges, 2001; Wacker et al., 1990). Developed in the mid-1980s, FCT involves assessing the function of an aberrant behavior (e.g., attention, escape, tangible, or sensory) through a functional analysis (FA) process and then replacing the aberrant behavior with a communicative response that serves the same function. The FA process used typically consists of interviews, direct observations, and analog probe assessment (Brady & Halle, 1997). Interviews involve asking teachers, parents, and other caregivers communicative and behavioral-related questions. The next step consists of directly observing the behavioral and communicative behaviors of the children in various natural settings such as the classroom and playground. Both of these steps aid in developing a hypothesis of the behavior's function. Finally, an analog probe assessment (i.e., functional analysis) is

conducted by manipulating consequences such as contingent delivery of demands, attention, and tangible items based on the occurrence of the aberrant behavior. This type of experimental analysis provides information relating to the function or outcome of the aberrant behavior (e.g., to see if performing the aberrant behavior allows the child to escape the difficult task or gain attention).

After completing the FA process, trainers identify a communicative response to teach the target child that will replace the aberrant behavior. This communicative response may consist of a response from one of the following categories: verbal language, picture communication, gestures, or assistive technology devices (Brady & Halle, 1997). The selection of this response should be based on the child's capability of completing the response, the ease of teaching the response, the acknowledgement from others of the response, and how efficiently the response serves its function (Dunlap & Duda, 2005; Horner & Day, 1991).

After the response selection, the actual communicative response should be systematically taught to the target child (Lalli, Casey, & Kates, 1995). For example, a child may be taught to say, "help" for assistance (i.e., obtaining attention) instead of screaming for help. Also, a child may be taught to give a picture of a requested item (i.e., obtain a tangible) to the caregiver for access to the desired item instead of screaming or engaging in a tantrum to gain the tangible item. In both cases, the trainer must ensure mastery of the response before proceeding further.

The final step in FCT involves ignoring the aberrant behavior (i.e., the use of extinction) and prompting and acknowledging the use of the communicative response that replaces the aberrant behavior (Lalli et al., 1995). For example, while ignoring a tantrum a caregiver may prompt a child to ask for a break and then provide the break after the child responds with the appropriate communicative response. Research findings suggest that the FCT process increases communication and decreases aberrant behaviors (Durand & Carr, 1992; Durand & Merges, 2001; Wacker et al., 2005).

Although FCT research has been conducted with children with ASD, the majority of the FCT research has been conducted with children with severe or profound disabilities (e.g., severe, profound mental retardation), not individuals solely identified as having ASD. Therefore, the application and effectiveness of using FCT with children with autism is less clear; thus, making it difficult to generalize the research findings to children with ASD (Mancil, in press). Further, most research has focused on teaching a single communication mand rather than expanding the communication of children, particularly

spontaneous communication. To complicate matters, there is little research on training caregivers how to use FCT and most of the research was conducted in structured clinical settings, not less structured applied settings, such as typical classrooms and homes. Thus, the primary purpose of the current study was to determine the effectiveness and efficiency of FCT on decreasing aberrant behaviors, increasing communication mands, and increasing spontaneous communication with a child with ASD in his home environment.

## Method

*Participant and Setting*

Scott was a 4-year-old boy who had been diagnosed with pervasive developmental disorder (PDD) without mental retardation. However, Scott seldom used spontaneous verbal language to communicate his needs and wants. Scott was referred by his mother who was seeking assistance to teach her child to communicate functionally. Although Scott was receiving speech and language therapy and applied behavior analysis therapy in clinical settings, his mother expressed concern that the skills Scott acquired in these settings did not generalize to the home environment or school. Scott's mother reported that he rarely used spontaneous verbal communication and he engaged in tantrums (e.g., whined, threw items on floor, dropped to the floor and screamed) to gain access to items of interest. An IQ for Scott was unavailable, but previous testing through the school district indicated that Scott was slightly delayed across all developmental domains.

*Measures and Data Collection*

The primary dependent measures were tantrums and communication responses. Tantrums were defined as kicking without touching others, screaming, or throwing objects on the floor. Duration data was collected on Scott's tantrums and reported as percentage of session time (5-minute sessions) tantrums occurred. The percentage of session time tantrums occurred was calculated as taking the number of seconds of tantrums and dividing by the total number of seconds of the session and multiplying by 100. Duration of session time tantrums occurred was used to give a better depiction of the behavior, because all his tantrums were of high duration and low frequency. Communication responses were defined as handing picture communication cards to the trainer involved in the session. Latency data were collected on the time between the presentation of a mand (i.e., parent asking Scott if he wanted a particular preferred item) and Scott's communication response. Latency is presented as average latency to response in seconds within a session. The average latency to responses

was calculated by adding the latency to respond to each mand during the 5-min session and dividing by the total number of opportunities to respond.

Sessions across all conditions were videotaped using a Panasonic mini-DV digital camcorder and subsequently coded using ibook G4 laptop computers. Each session was conducted for 5-min, averaging 8 (range of 7 – 10) opportunities to respond per session. During each session, the observer recorded the duration of tantrums, number of mands, and latency of Scott's response to the mand.

*Experimental Design*

The functional analysis for Scott was conducted using a multielement design (Kazdin, 1982). Treatment comparisons were conducted across 5-min sessions. One condition was conducted during each FA session, with a total of 24 sessions. These sessions were completed across 2 days. FCT for Scott was conducted using a multiple baseline design across four mands (mand A, B, C, D), which were completed across 58 sessions. Mand A consisted of two conditions: (a) baseline, and (b) intervention, which consisted of two phases (verbal mand, spontaneous communication). Mand B, C, and D consisted of two conditions: (a) baseline, and (b) intervention, which consisted of three phases (verbal mand, spontaneous communication, and distracter). The majority of conditions and phases were identical for all four mands; however, a distracter phase was added to mands B, C, and D.

*Procedures*

*Pre-treatment Procedures*

*Preference assessment.* A preference assessment was conducted to increase the likelihood of the child responding to treatment. As research has indicated and individuals with ASD have described, children with ASD are more likely to respond to treatment that involves their preferences (Grandin, 1995). To identify preferred tangible items for teaching mands, a preference assessment was conducted based on procedures described by Roane et al. (1998). Since the mother commented during an interview that Scott satiates quickly on items, a preference assessment was conducted the first 5-min of each day treatment sessions occurred to ensure his preference had not changed. The mother was interviewed regarding items Scott seemed to enjoy playing with in the past. From this list of items, the top seven were chosen for the preference assessment. This set of seven items was arranged in a circle on the living room floor. Scott was allowed to choose any item, including multiple items. The observer recorded the duration Scott played with each item. Each preference assessment lasted 5-

min. The item Scott played with the most was used for the first mand (mand A).

*Functional analysis.* A functional analysis was conducted to experimentally determine the function of the aberrant behavior. As a plethora of previous research has indicated, aberrant behavior is more likely to decrease when the treatment is connected to the function (Carr & Durand, 1985; Wacker et al., 2005). The functional analysis was conducted similar to procedures outlined by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994), with the exception that they were conducted in Scott's home setting, a tangible condition was included, and an alone condition was not included. Therefore, the functional analysis included the following conditions: social attention, tangible, escape, and free play.

During the attention condition, all environmental variables were held constant including the people present, room, furniture, and noise levels. Scott interacted with a neutral task as determined by a preference assessment (Roane, Vollmer, Ringdahl & Marcus, 1998). Scott's mother attended to each occurrence of Scott's tantrum behavior by giving him attention and stating, "Please don't do that".

During the tangible condition, the environmental variables were held constant (e.g., people, rooms, furniture, noise levels). Scott interacted with a preferred item as determined by a preference assessment (Roane et al., 1998). No task demands were presented; however, Scott's mother provided noncontingent attention to him every 20s (e.g., smiled and said, "Hey, sweetie"). She removed the tangible item after 30s and said, "My turn." When Scott demonstrated tantrum behavior, the mother gave the tangible back to him and said, "Okay, it is your turn."

During the escape condition, the environmental variables were held constant (e.g., people, rooms, furniture, noise levels). Scott interacted with a demanding task as determined by the mother and through observation by the first author. The mother provided noncontingent attention to the child every 20s. She repeatedly (1-min intervals) directed Scott to complete the demanding task. She removed the task for 30s each time Scott demonstrated tantrum behavior and said, "Okay, you don't have to do this."

During the free play condition, the environmental variables were held constant (e.g., people, rooms, furniture, noise levels). Scott interacted with preferred items as determined by a preference assessment (Roane et al., 1998). The mother provided noncontingent attention to the child every 20 seconds. The mother did not present Scott with task demands. Further, she did not provide consequences for aberrant behavior. This condition served as the control condition.

*Experimental Procedures*

*Baseline.* The baseline condition for Scott involved the tangible condition. Scott was shown the item at the beginning of each session. The researcher played with the item for 30s and then placed it on a shelf in Scott's view. This initial sequence was performed to ensure that the tantrums observed were tied to the preferred item (i.e., tangible function) and not some other unknown stimuli. During baseline, data were collected on the duration of tantrums and latency to communication response, which was always zero because no response had been taught, using the procedures previously outlined. Baseline data was collected for each mand because a newly identified preferred tangible item was used to teach the corresponding mand. For example, baseline data collected for mand A corresponded to a toy horse, while data collected for mand B corresponded to a toy helicopter. The baseline condition was designed in the manner described as to enhance experimental control (Kennedy, 2005).

*Response training.* Prior to beginning mand A training, Scott was taught to hand a picture card on demand to the researcher independently for 10 consecutive trials. This was done to facilitate quicker acquisition of the mand and is consistent with the FCT literature (Miranda-Linne & Melin, 1992). During this initial training, the researcher displayed a picture card of a toy car and the toy car on the floor in front of Scott. The card was in reach of Scott, while the toy car was next to the researcher. The researcher said," If you want the car, give me the card." If the child did not respond within 10 seconds, hand-over-hand physical guidance was provided. As described in previous research, pre-training continued until Scott was able to hand the card to the experimenter following a verbal mand 10 consecutive times within 6 seconds (Mancil, in press).

*Mand A.* The tangible item for mand A was toy horses. Mand A consisted of 2 conditions: (a) baseline and (b) intervention. The intervention condition consisted of 2 phases: (a) verbal mand, and (b) spontaneous communication. Baseline procedures were consistent with those described previously. The verbal mand phase involved the researcher playing with toy horses and stating to Scott, "If you want the horse, give me the card." After Scott used the card to request the toy horses, all other verbal mands were stated as follows, "If you want the horse, ask." The phrase "give me the card" was replaced with "ask" to be more reflective of naturally occurring communication interactions (Skinner, 1968). When Scott asked for the horse within an average latency of 6s across three sessions, the researcher moved to the spontaneous communication phase. During the spontaneous communication phase, the researcher played with the horses without

immediately providing a verbal mand. A time delay of 10s was used. If Scott did not ask for the toy within the allotted time delay, the researcher provided a verbal mand. This phase continued until Scott used spontaneous communication on an average between 2 to 3s. For this mand phase, the next mand baseline and intervention conditions, and all others, condition and phase changes were based on a visual analysis of data as described by Kazdin (1982).

*Mand B.* The tangible item for mand B was toy helicopters. Mand B consisted of 2 conditions: (a) baseline and (b) intervention. The intervention condition consisted of 3 phases: (a) verbal mand, (b) spontaneous communication, and (c) distracter. Baseline procedures were consistent with those described previously. The verbal mand phase involved the researcher playing with toy helicopters and stating to Scott, "If you want the helicopter, ask." When Scott asked for the helicopter within an average latency of 6s, the researcher moved to the spontaneous communication phase. During the spontaneous communication phase, the researcher played with the helicopters without immediately providing a verbal mand. A time delay of 10s was used. If Scott did not ask for the toy within the allotted time delay, the researcher provided a verbal mand. This phase continued until Scott responded spontaneously between an average of 2 to 3s and without tantrums and the data was stable for at least three data points (see Figures 1 and 2).

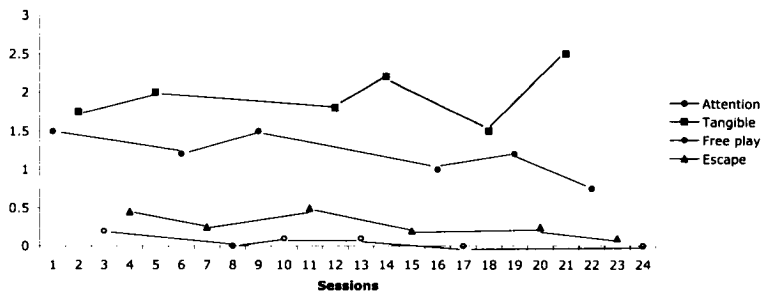


*Figure 1.* Rate of aberrant behavior per min during the analog functional analysis.

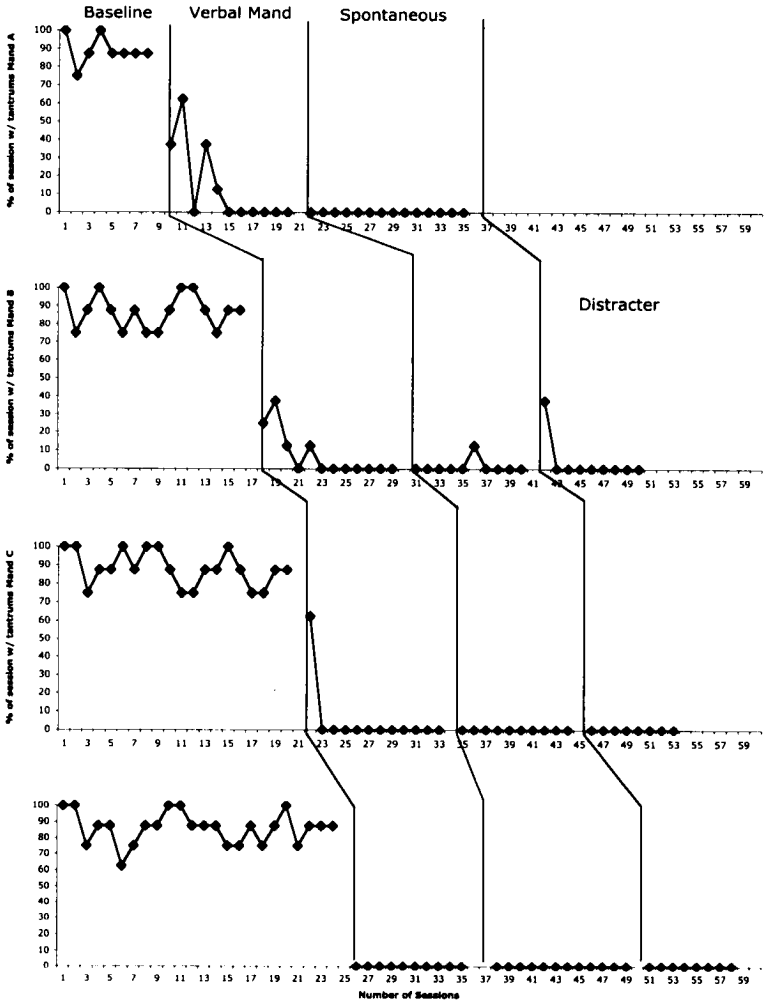


*Figure 2.* Percentage of session with tantrums for mands A, B,C, and D.

Following these three phases, a distracter phase was provided to teach discrimination between cards because Scott now had a mand repertoire greater than one. Activities in this phase were consistent with the spontaneous communication phase, except Scott had to choose between two cards (i.e., correct card and distracter card). When presented with two picture cards (e.g., helicopters and airplane), Scott had to choose the helicopter card for the response to be counted as correct. If he chose the wrong card, the first author presented Scott with the item he chose and recorded an incorrect response. Different cards were used as the alternate card. That is, some cards had items that looked very different from the helicopter (i.e., picture on card was different color), while cards introduced later looked similar to the helicopter. For a card to be similar, the picture on the card had to be the same color and same size. For example, if the correct card was a blue helicopter that was one square inch, a similar card would be a blue airplane that was one square inch. To further prevent Scott from making choices based on characteristics other than the picture, other physical traits of the cards were controlled. For example, all cards were the same size, shape, and background color.

*Mand C.* The tangible item for mand C was a blanket. Mand C consisted of 2 conditions: (a) baseline and (b) intervention. The intervention condition consisted of 3 phases: (a) verbal mand, (b) spontaneous communication, and (d) a distracter phase. Baseline procedures were consistent with those described previously. During the intervention condition, the change agent of the study was transferred from the experimenter to Scott's mother. The verbal mand phase involved the researcher and the mother swinging a blanket and the mother stating to Scott, "If you want to swing in the blanket, ask." If Scott gave the card to the researcher, the researcher pointed to the mother and responded by saying, "If you want to swing, you have to ask your mom." When Scott asked the mother to swing by handing her the communication card within an average of 6s and data was consistent and stable, the researcher moved to the spontaneous phase. During the spontaneous phase, the researcher and mother swayed the blanket without immediately providing a verbal mand. A time delay of 10s was used. If Scott did not ask to swing within the allotted time delay, the mother provided a verbal mand. This phase continued until Scott responded spontaneously between an average of 2 to 3s and without tantrums. Mand C training concluded with the distracter phase. Activities in this phase were consistent with the spontaneous phase, except Scott had to choose between three cards (i.e., discriminate between the correct card and the distracter cards). When presented with three picture cards, Scott had to choose the blanket card. If he chose the wrong card, the mother presented Scott with the item he

chose and recorded an incorrect response. Different cards were used as the alternate card, which were different than cards he previously mastered. Similar to Mand B, some cards had items that looked very different from the blanket, while cards introduced later looked similar to the blanket and other physical characteristics of the cards were controlled.

*Mand D.* The tangible item for mand D was a movie, shown in 30s portions. Mand D consisted of 2 conditions: (a) baseline and (b) intervention. The intervention condition consisted of 3 phases: (a) verbal mand, (b) spontaneous communication, and (d) distracter phase. Baseline procedures were consistent with those described previously. During these conditions, the mother conducted the training while the researcher videotaped. The verbal mand phase involved the mother watching a cartoon movie in 30s intervals and then pausing the movie and stating to Scott, "If you want to watch, ask." When Scott asked the mother to watch by handing her a card with an average latency of 6s, the mother moved to the spontaneous phase. During the spontaneous phase, the mother watched the movie in the same manner as the verbal mand phase, but without immediately providing a verbal mand. A time delay of 10s was used. If Scott did not ask to watch the movie within the allotted time delay, the mother provided a verbal mand. This phase continued until Scott responded spontaneously between 2 to 3s and without tantrums. Mand D training concluded with the distracter phase. Activities in this phase were consistent with the spontaneous phase, except Scott had to choose between four cards. When presented with four picture cards, Scott had to choose the movie card to receive the item. If he chose another card, the mother presented Scott with the item he chose and recorded an incorrect response. Different cards were used as the alternate card. Similar to Mand B and C, some cards had items that looked very different from the blanket, while cards introduced later looked similar to the blanket and other physical characteristics of the cards were controlled.

*Interobserver Agreement*

In order to evaluate interobserver agreement (IOA), a second observer recorded duration of tantrums and latency to response across 40% of sessions across both conditions of the study. Agreement was calculated by dividing the smaller number of seconds by the larger number of seconds (Kennedy, 2005). Agreement on tantrums for baseline intervals averaged 98% (97%-99%). Further, agreement for latency to response during baseline was 100%. During the treatment phase, agreement was 100% for tantrums during all mands, 94% (93%-97%) for latency to response during mand A, 95% (94%-96%) for latency

to response during mand B, 95% (95%-96%) for latency to response during mand C, and 96% (94%-97%) for latency to response during mand D.

## Results

*Preference Assessment*

Scott was presented with a toy horse, toy helicopter, toy car, toy airplane, toy action figure, favorite movie, and a blanket. In the first preference assessment, Scott exclusively chose a toy horse. His other choices for the other mand phases in order of preference were toy helicopter, blanket, and movie. Further, during treatment, Scott continued to choose the same preference items each day the assessment was conducted.

*Functional Analysis*

Scott's results of the functional analysis are depicted in Figure 1. The rate of Scott's tantrums were the highest in the tangible condition ($M$ = 2.0/min, range 1.5-2.5/min), in contrast to the attention condition ($M$ = 1.19/min, range 0.75-1.5/min), escape condition ($M$ = 0.29, range 0.1-0.5/min), and free play condition ($M$ = 0.07, range 0-0.2/min). These results suggest that Scott's tantrum behaviors were maintained by access to tangible items of interest. However, tantrum behavior also occurred at high rates during the attention condition. These results suggest that attention may also serve as a function of Scott's tantrum behavior.

*Functional Communication Training*

As depicted in Figures 2 and 3, during mand training, Scott's tantrums decreased to zero and his latency to respond remained at a low and stable level.

*Mand A.* Scott's tantrum behavior during the verbal mand phase decreased to zero and his latency to respond leveled on an average between 3 and 4s. After implementing the spontaneous communication phase, Scott's tantrums remained at zero and his average latency to respond leveled between 2 and 3s. In addition, after reviewing the videos and anecdotally recording spontaneous verbalizations, Scott's verbalizations had increased from 2 words to 8 words (see Figure 4).

*Mand B.* Scott's tantrum behavior during the verbal mand phase decreased to zero and his average latency to respond leveled between 2 and 3s, which was identified as the targeted goal based on previous literature (Simic & Bucher, 1980). After implementing the spontaneous phase, Scott's tantrums remained at zero except a spike during one session and his average latency to respond leveled between 2 and

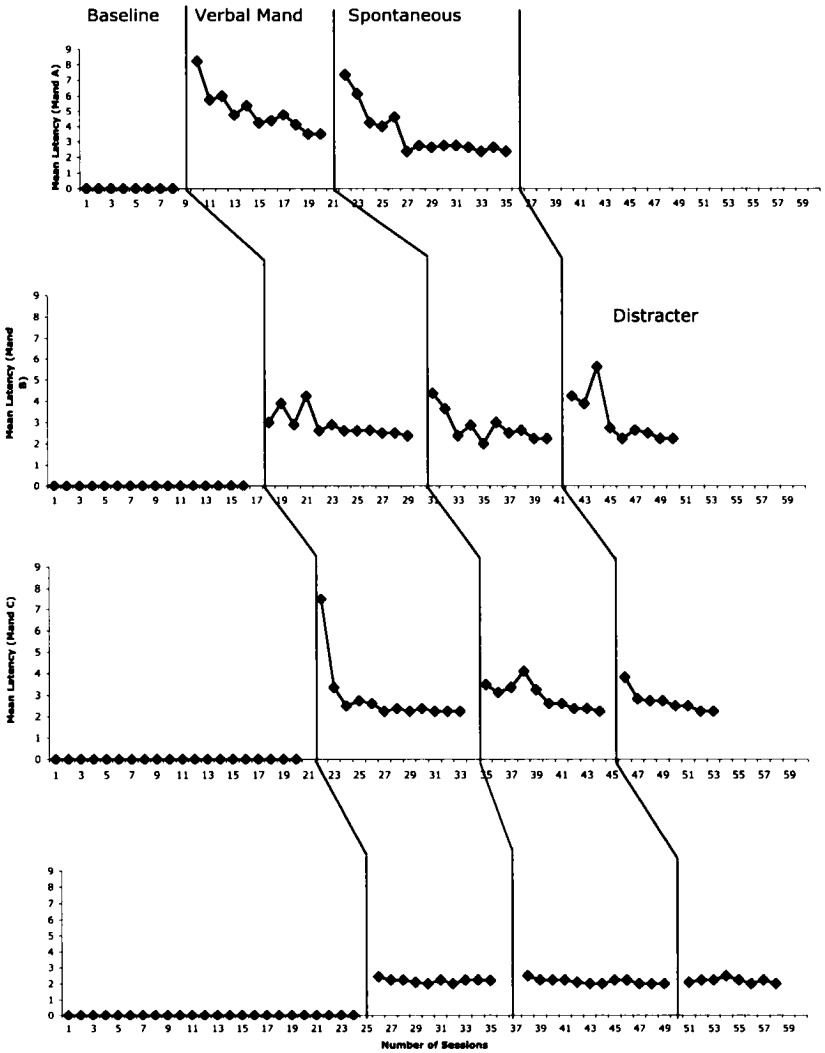


*Figure 3.* Mean latency to respond during mands A, B, C, and D.

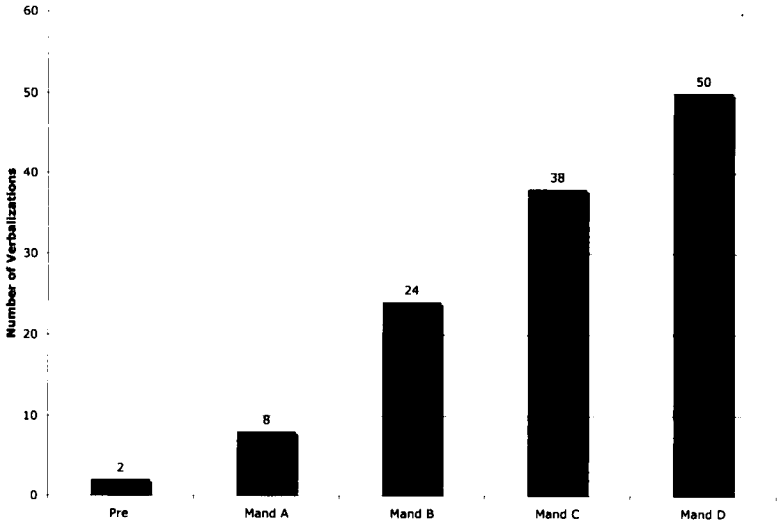


*Figure 4.* Number of spontaneous verbalizations before training and during mands A, B, C, and D. These were recorded post hoc after reviewing the videos for a second time.

3s. During the distracter phase, his tantrums peaked during the first session and then returned and remained at zero. Additionally, Scott's average latency to respond leveled between 2 and 3s. In addition, after reviewing the videos and anecdotally recording spontaneous verbalizations, Scott's verbalizations had increased from 8 words to 24 words.

*Mand C.* Scott's tantrum behavior during the verbal mand phase decreased to zero and his average latency to respond leveled between 2 and 3s. After implementing the spontaneous phase, Scott's tantrums remained at zero and his average latency to respond leveled between 2 and 3s. During the distracter phase, his tantrums session remained at zero and his average latency to respond leveled between 2 and 3s. In addition, after reviewing the videos and anecdotally recording spontaneous verbalizations, Scott's verbalizations had increased from 24 words to 38 words.

*Mand D.* Scott's tantrum behavior during the verbal mand phase decreased to zero and his average latency to respond leveled between 2 and 3s. After implementing the spontaneous phase, Scott's tantrums remained at zero and his average latency to respond leveled between 2 and 3s. During the distracter phase, his tantrums remained at zero

and his average latency to respond leveled between 2 and 3s. Further, his latency to respond during the mand D phase was as low as 1s for several mand responses. In addition, after reviewing the videos and anecdotally recording spontaneous verbalizations, Scott's verbalizations had increased from 38 words to 50 words.

## Discussion

Results indicate that both Scott's aberrant behavior decreased dramatically and his communication increased in the home setting. The current study extends previously conducted research in the area of FCT beyond clinical settings and verbal prompted communication responses. Results of the current study suggest that embedding functional communication training in the natural environment potentially increases spontaneous communication and decreases aberrant behavior, which further supports the direct relationship between communication skills and challenging behaviors in children with autism as noted by Sigafoos (2000). As the number of communication mands mastered increased for the participant, the time required for latency to respond to level off between 2 and 3 seconds decreased. Further, the skill to distinguish between cards during the distracter phase was acquired more rapidly than in previous phases. Spontaneous verbal communication also occurred during the study, which was not directly trained. After analyzing anecdotal notes at the conclusion of the study, the number of spontaneous verbal words spoken by the participant reached 50 words. Further, the participant began using word two and three word combinations.

In addition to increasing communication and decreasing aberrant behavior, this study addressed issues related to generalization and the effects of training parents as change agents. As discussed in the literature (Spradlin & Siegel, 1982), providing training in the natural environment (e.g., home) greatly increases the chance of behaviors generalizing to other settings and people (e.g., from parents to teachers). This study demonstrated that training in the natural environment increased Scott generalization of communication skills from the researcher to the mother and across multiple tangible items.

In addition to the direct results demonstrated in the measured outcomes of the current study, this study has the potential to affect the generalization of skills to other environments outside of the training setting, because the parents are providing the training and will be more likely to use these strategies across other settings. Second, this study included the parent as an essential contributor in the support and education of her child. This factor has been deemed as the most important predictor of overall satisfaction with services (Renty & Roeyers, 2006). Third, since the parent helped teach her child to

communicate, she became more aware of natural environmental stimuli. Thus, she may be less stressed during family outings. Finally, by gaining the knowledge through the training in this project, the mother may become a better consumer of autism research. This will help the parent be capable to choose appropriate services in the future and continue to play an integral role in the advocacy and education of her child with ASD.

In conclusion, this study is an important step in regard to functional communication training as an evidence-based practice that can be used outside of clinics and highly controlled experimental settings. The need for evidence-based practices to extend beyond highly regulated settings is apparent if these practices are going to have widespread application to parents, teachers and other practitioners. This pilot study gives a demonstration of the potential uses of FCT for children with ASD. Specifically, this study demonstrates that individuals (e.g., parents) with little background knowledge or training can implement the training.

## Limitations and Future Research

Despite the positive findings of the study, there are also a few limitations. First, the current study has only one participant who was higher functioning, which limits the generalizability to other children with ASD. However, the findings are promising and do support the need for further research in this area. Second, the researcher conducted the first two mand training phases. This limits the utility of widespread application of FCT in natural environments. If caregivers can be trained to properly implement FCT across all stages, a larger number of children would benefit. Third, no data was collected to demonstrate generalization to a third party such as a classroom teacher or across other settings. Children's independence will continue to be hindered without demonstrating generalization to other people, because communication remains isolated. Finally, the spontaneous verbalization was recorded anecdotally. Although researchers have previously noted the occurrence of spontaneous verbalization following picture communication training, there has not been a systematic analysis to determine the precise causes of such behavioral cusps.

When considering the results and limitations of the current study and previous literature, future research should address a few concerns to extend the literature base of FCT. Future research teams should address maintenance and generalization by training teachers in classrooms and parents in homes while collecting data across time, settings, and people. For example, does parents' training of a child with autism in the home setting generalize to a classroom setting?

Specifically, researchers should analyze the effects that FCT in one environment has on the spontaneous communication of a child with individuals (i.e., teachers, relatives) naïve to the training. The behavioral cusp of spontaneous verbalization also should be systematically analyzed to determine the specific factors that contribute to the development of speech. In addition, researchers have not examined how the increased use of communication mands by children with ASD influences social interactions with their peers. Thus, the field does not know if the peers initiate more or respond more in natural environments with children with ASD who begin to communicate with them. Finally, future research should compare FCT to various other approaches to determine what works best for which type of child.

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