

FUNCTIONAL COMMUNICATION TRAINING WITH AND WITHOUT EXTINCTION AND PUNISHMENT

WAYNE FISHER, CATHLEEN PIAZZA, MICHAEL CATALDO,
ROBERT HARRELL, GRETCHEN JEFFERSON, AND ROBERT CONNER

THE KENNEDY INSTITUTE AND
JOHNS HOPKINS UNIVERSITY SCHOOL OF MEDICINE

Functional communication training has been reported to be a promising treatment for severe behavior problems. In this study, functional communication training alone and combined with extinction and/or punishment was evaluated for 4 clients with severe retardation, behavior problems, and communication deficits. The participants were inpatients on a hospital unit for treatment of severe behavior disorders. They received individualized interventions based on functional assessment that included reinforcement of a communication response with the same function as their destructive behavior. Results showed that for some patients, functional communication training was not sufficient to produce clinically significant reductions in destructive behavior, and the combination of training plus punishment produced the largest and most consistent reductions.

DESCRIPTORS: aggression, concurrent operants, functional analysis, functional communication training, punishment, response classes, response covariation, self-injury

Teaching clients to emit communicative behaviors that produce the same consequences as destructive behaviors can result in concomitant reductions in these destructive behaviors (Bird, Dore, Moniz, & Robinson, 1989; Carr & Durand, 1985; Durand & Carr, 1991; Durand & Kishi, 1987; Wacker et al., 1990). These procedures have been labeled "functional communication training" (FCT). Most FCT treatment packages have generally included two major components. First, a functional analysis is conducted to identify the antecedents and/or consequences maintaining the destructive behaviors. Once these maintaining stimuli are identified, the client is trained to emit a response (e.g., "help me" or manually signing "finished") that produces the same consequences as the destructive behavior.

One interesting aspect of functional communication training is the efficiency with which it has produced reductions in longstanding destructive behaviors. Durand and Carr (1991) reported that an

average of 130 min of training produced rapid, dramatic reductions in self-injury and aggression that were maintained for 18 to 24 months. Functional communication training may produce this impressive generalization because, once trained, the client, rather than parents, teachers, or other caretakers, becomes the change agent. Reports on the efficacy of FCT have also been impressive in that clinically significant reductions in destructive behaviors have occurred with every participant in every published study (Bird et al., 1989; Carr & Durand, 1985; Durand & Carr, 1991; Durand & Kishi, 1987; Wacker et al., 1990).

Although a promising intervention in these respects, there are a number of factors that may limit the generality of this intervention. First, although FCT has typically been identified as a specific treatment package for destructive behaviors, intervention procedures have varied considerably. That is, communication training has often been combined with other operant procedures, such as extinction (Carr & Durand, 1985; Durand & Carr, 1991), prompting and punishment (Wacker et al., 1990), or multiple behavioral recommendations (Durand & Kishi, 1987). Therefore, it is not clear whether the results of investigations on these different procedures can be combined to draw general conclusions about FCT.

This investigation was supported in part by Grant MCJ249149-02 from the Maternal and Child Health Service of the U.S. Department of Health and Human Services. The authors wish to acknowledge Karla Doepke, Shawn Chinn, and Mark Resnik for their competent work on cases included in this investigation.

Requests for reprints should be sent to Wayne Fisher, Neurobehavioral Unit, The Kennedy Institute, 707 N. Broadway, Baltimore, Maryland 21205.

Functional communication training may be most applicable when a functional assessment has clearly indicated that the destructive behavior is maintained by either positive or negative reinforcement. Iwata (1991) conducted functional assessments on approximately 100 individuals with severe self-injury and found self-injury to be maintained by negative reinforcement in one third of the cases and by positive reinforcement in another one fourth of the cases. Thus, in a substantial number of cases of self-injury, the source of reinforcement for the behavior may be unclear, or it may be internal (e.g., the release of beta endorphins) and thus not under social control. It is not clear whether the effects of FCT can be generalized to such cases.

We believe the data published on FCT are sufficient to establish this intervention as an effective treatment for at least some clients with destructive behavior. However, the literature to date on FCT may have presented an overly encouraging picture of its effectiveness. It is unlikely that all cases of destructive behavior will respond as rapidly and dramatically as have the clients reported to date. Thus, having established the initial effectiveness of FCT, subsequent research should determine the generality of FCT across clients, the limitations of this intervention, and how to increase its generality. Toward this end, data are presented for 4 clients we have treated on the Severe Behavior Unit at the Kennedy Institute for whom FCT was presented alone, with extinction, or with punishment.

GENERAL METHOD

Subjects and Setting

Four clients referred for inpatient assessment and treatment of destructive behavior participated. All had profound mental retardation and limited expressive language skills. Bob and Jan occasionally reached for preferred objects. Art and Abe had no gestures, signs, or words. All displayed self-injury that produced tissue damage requiring medical attention. Three of the clients displayed other destructive behaviors (aggression, disruption, and/or pica).

For all 4 patients, the initial assessment and treatment sessions were conducted by trained ther-

apists in individual treatment rooms with one-way observation mirrors. For Jan and Bob, sessions were later conducted on the living unit or in unstructured situations outside of the hospital.

Response Definitions

Self-injury was defined as forceful striking, scratching, rubbing, poking, or biting one's own body parts such that repetition of the behavior over time resulted in tissue damage. *Aggression* was defined as forceful hitting, kicking, pushing, pinching, scratching, biting, or throwing objects at others. *Disruption* (or property destruction) was defined as forceful banging, throwing, overturning, tearing, or climbing on objects not made for that purpose and yelling or screaming. *Pica* was defined as bringing inedible objects in contact with the mouth (actual consumption of objects was prevented). *Communication* was defined as a clearly identifiable word, phrase, sign, or gesture emitted while orienting toward another individual. *Compliance* was defined as correctly completing a task requested by an adult within 10 s of either a verbal or gestural prompt.

Observation System and Interobserver Agreement

Trained observers seated either behind a one-way mirror or off to the side of the room recorded the target responses on hand-held or lap-top computers. All data are presented as responses per minute or per hour. During approximately one third of the sessions, an independent observer collected data. Exact interval-by-interval agreement percentages were calculated for each behavior by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. An agreement was defined as a 10-s interval wherein both observers recorded exactly the same number of occurrences of the target behavior. Agreement coefficients averaged 91.6% or higher for all responses measured across all participants.

Procedure

Functional assessment. The initial functional assessment was based on the procedures developed by Iwata, Dorsey, Slifer, Bauman, and Richman

(1982) and consisted of four or five types of analogue sessions conducted each day: (a) demand, (b) social attention, (c) toy play, (d) alone, and (e) tangible. The tangible session was conducted only with clients for whom it was observed that parents presented tangible items when the child displayed destructive behavior (Jan and Abe).

In the demand session, the therapist used a three-step prompting procedure consisting of sequential verbal, gestural (or modeled), and physical prompts every 10 s until the client completed the request or displayed a destructive behavior. If the client completed the request after a verbal or gestural prompt (i.e., compliance), he or she received praise and physical attention from the therapist. If the client displayed a destructive behavior, the therapist removed the task materials and terminated the request for 30 s (i.e., the child was allowed to escape). During the social attention session, the client was given toys and told to play quietly. The therapist provided a verbal reprimand each time the client displayed a destructive behavior and ignored other responses. In the toy play session, the therapist played with the client and presented praise once every 30 s contingent upon the first 5-s period in which destructive behavior was absent. In the alone session, the client was placed in the treatment room alone without materials. In the tangible session, the client was allowed to play with preferred objects for 1 min prior to the start of the session. When the session began, the therapist withdrew the preferred objects and returned them for 20 s following each occurrence of destructive behavior.

Treatments were evaluated for each child in the functional assessment condition in which maladaptive behaviors were highest, unless otherwise indicated. The baseline data presented for each child are the baseline data from the functional assessment. Each return to baseline condition consisted of a replication of the specific functional analysis procedures that occurred during the original baseline.

Communication training. An errorless backward-chaining procedure was used to train the communication responses. The client was positioned either on the floor or in a chair with one therapist seated in front and another behind the client. For

communication responses that functioned to produce positive reinforcement (e.g., "give me"), the therapist facing the client displayed the reinforcer at the beginning of each trial and verbally prompted the communication response. The therapist behind the client used the minimal amount of hand-over-hand guidance necessary to position the client's arms and hands in the correct form for completing the response and to block any movements inconsistent with the correct response. For communication responses that functioned to produce escape, the prompting procedure was the same but the setting was different. That is, the therapist involved the client in a low-preference activity (e.g., waiting in front of a door, picking up blocks, etc.) before prompting the communication response. Once training was completed and FCT was initiated, the child's use of the communication response was no longer prompted. That is, only spontaneous communication was reinforced.

STUDY 1

Procedure

Assessment. The initial functional analysis for Art consisted of a modification of the procedures developed by Iwata et al. (1982). The four standard conditions described above were used. The modification consisted of conducting two demand conditions, Demand 1 and Demand 2, during the functional assessment. The data presented are from the two demand conditions conducted during the functional assessment. During each phase, the therapist presented prompts to complete instructional requests at a rate of one every 10 s, using the three-step prompting procedure described above. Additional contingencies for each phase are described below.

Baseline. During baseline, Art could terminate requests for 30 s by engaging in the targeted destructive behaviors. The therapist continued the request sequence if signing occurred.

Extinction. During extinction, the therapist continued the request sequence independent of the occurrence of targeted behaviors.

Punishment. The punishment contingency consisted of verbally prompting and physically guiding

Art to complete five requests (e.g., picking up the material he threw five times).

FCT plus extinction. During FCT plus extinction, Art could terminate or escape the request for 30 s by signing "go"; request sequences continued if Art engaged in the targeted maladaptive behaviors.

FCT plus punishment. During FCT plus punishment, Art could terminate or escape the request for 30 s by signing "go"; the occurrence of maladaptive behaviors resulted in the punishment contingency described above.

Demand fading. After all three destructive behaviors resulted in punishment, a demand fading procedure was initiated wherein Art could escape requests through signing only after completing a requisite number of requests. The number of requests required was gradually increased from 2 to 26.

Results and Discussion

The results for Art for all behaviors in Demand 1 sessions and for disruptive behaviors in Demand 2 sessions are presented in Figure 1. The rates of aggressive and self-injurious behavior for Demand 2 sessions are not depicted graphically because those behaviors remained at zero or near zero throughout all manipulations. In Demand 1 sessions, the rates of disruptive behavior were high during the first phase when disruption was on extinction and aggression and self-injury produced escape. The introduction of punishment resulted in a rapid reduction in disruption to near-zero levels. However, in Demand 1 sessions, in which signing was not available as an escape response, the introduction of punishment for disruption was followed by a temporary increase in self-injury, and subsequently, a marked and sustained increase in aggression. Similarly, when punishment was introduced for aggression in Demand 1, aggression decreased, and self-injury increased substantially.

During Demand 2, the rates of disruption were high during FCT plus extinction. Allowing Art to escape the demand for signing did not result in reduced levels of disruption even though disruption was on extinction. The introduction of punishment

for disruption resulted in a rapid reduction in disruption to near-zero levels. When FCT plus punishment was introduced for disruption in Demand 2 sessions, the rates of self-injury and aggression remained at zero when signing was available as an escape response.

Interestingly, when punishment was first reversed in Demand 1 sessions, disruption increased to levels higher than in the first extinction phase, while self-injury and aggression remained at relatively low levels. However, additional reversals were completed in both the demand sessions following the introduction of the entire treatment package (FCT plus punishment plus demand fading) during which disruption, aggression, and self-injury all remained at near-zero levels. Finally, in the phase with the entire package in place, the rate of requests increased to a point at which Art was completing 26 requests prior to signing to produce escape, without an increase in disruption, aggression or self-injury. As the criterion number of requests increased, the rate of signing dropped proportionally, suggesting that Art learned to discriminate when the sign functioned to produce escape.

The next study is a case in which the client's self-injury appears to have been eliminated through FCT plus extinction, but the treatment was not effective when generalized to the living unit.

STUDY 2

Procedure

FCT. The effects of FCT were evaluated in the tangible session. The tangible session from the functional assessment (described above) was used as the baseline for the assessment of FCT. During FCT, the therapist immediately presented a box of preferred toys to Jan contingent upon her independently emitting the sign "more" or following a maladaptive behavior. After the return to baseline phase, FCT was reintroduced, and Jan's destructive behaviors were placed on extinction (i.e., toys were not returned following destructive behaviors). Extinction was added because it seemed clinically prudent. The effects of adding extinction to FCT were not evaluated with Jan.

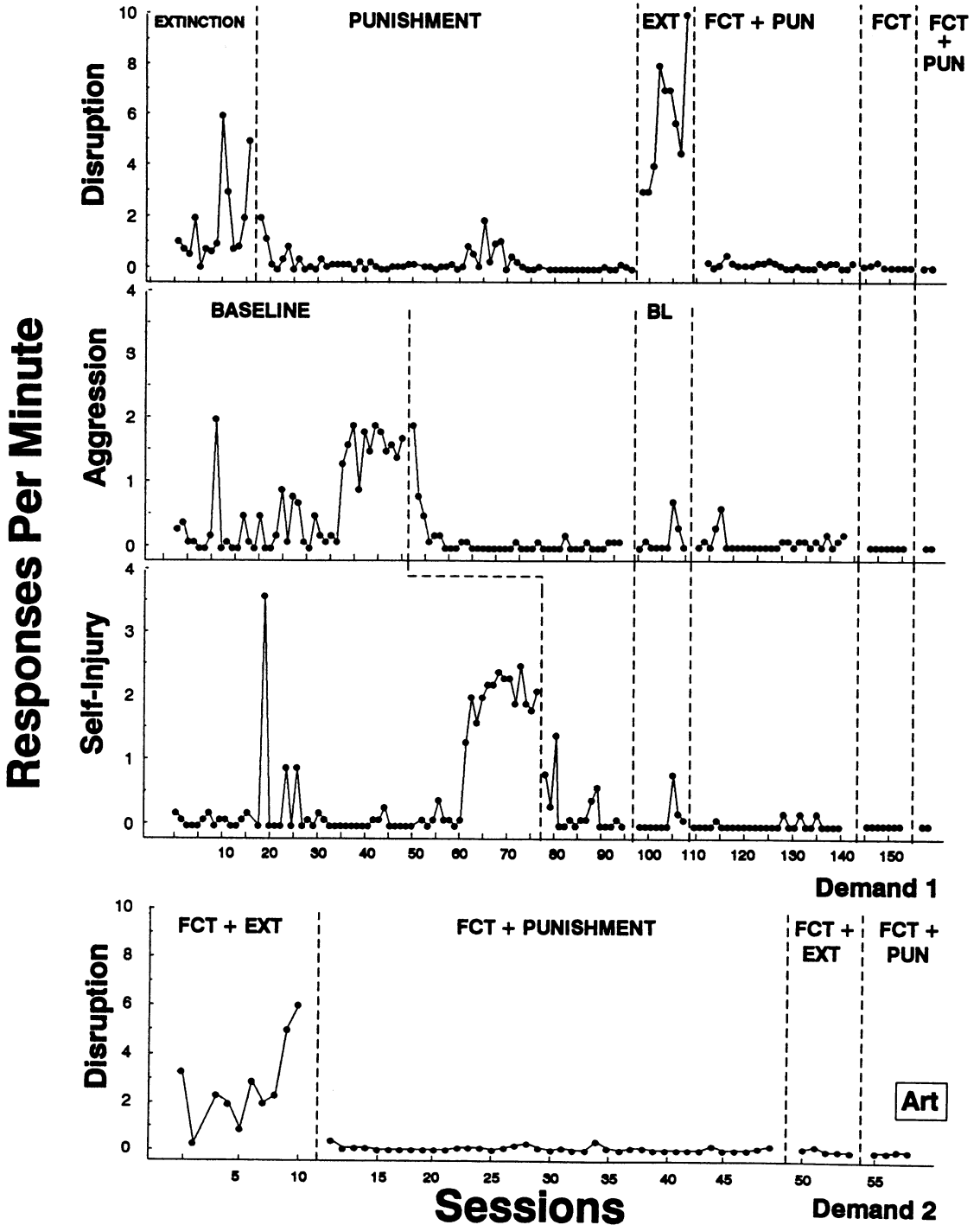


Figure 1. The rates of disruption, aggression, and self-injury for Art in Demand 1 and Demand 2 sessions under the conditions of baseline, extinction (EXT), punishment (PUN), functional communication training (FCT), functional communication training plus extinction (FCT + EXT), and functional communication training plus punishment (FCT + PUN).

FCT plus punishment. After introducing FCT plus extinction in the tangible session, FCT plus extinction was introduced across the day on the unit. The FCT procedure was expanded by teaching Jan a communication for escaping requests ("finished"), gaining adult attention (through clapping), and changing environments ("go"). After this expanded FCT procedure was implemented on the unit and did not result in reductions in destructive behavior, a 30-s basket-hold time-out was implemented.

Results and Discussion

The results for Jan's behavior in the tangible session are presented in the top graph of Figure 2. In the first baseline condition, the rates of destructive behavior were variable and high ($M = 4.9$), and communication was low ($M = 0.75$). When FCT was introduced, destructive behavior decreased ($M = 1.07$), and communication increased ($M = 4.5$). In the third phase (baseline), destructive behavior increased to levels higher than the original baseline ($M = 7.3$), and communication decreased ($M = 1.86$). In the final phase (FCT plus extinction), destructive behavior decreased to near-zero levels ($M = 0.38$), and communication increased ($M = 6.98$). However, as depicted in the second graph of Figure 2, the introduction of FCT plus extinction on the living unit did not result in clinically significant reductions in Jan's destructive behavior ($M = 14.11$). These results demonstrate that reinforcement of communication can result in concomitant decreases in destructive behavior without directly manipulating the consequences for the destructive behavior under some circumstances but not under others. When the punishment procedure was added to FCT, the rates of destructive behavior decreased markedly ($M = 1.9$). These results demonstrate that the addition of punishment to FCT can result in marked decreases in destructive behavior and increases in communication.

The next study is a case in which FCT did not produce clinically significant decreases in destructive behavior initially. However, when FCT followed a phase of FCT plus punishment, the lowered rates

of self-injury produced through FCT plus punishment were maintained by FCT alone.

STUDY 3

Procedure

FCT. The effects of FCT were evaluated in the demand condition. The demand session from the functional assessment (described above) was used as the baseline for the assessment of FCT. During the FCT condition, the therapist terminated requests for 30 s if Bob independently displayed the communication response once he had complied with one request or if he displayed self-injury.

FCT plus punishment. Because FCT did not result in significant decreases in maladaptive behaviors, a punishment procedure was added. The punishment procedure, contingent demands, consisted of providing Bob with a verbal reprimand (e.g., "no hitting") and then verbally and physically prompting Bob to complete five requests (e.g., touching body parts) following an episode of destructive behavior.

Results and Discussion

The results for Bob are depicted in Figure 3. During the first baseline demand sessions, the per-minute rates for self-injury and communication averaged 4.6 and 0, respectively. When FCT was introduced, self-injury decreased slightly ($M = 3.1$), and communication increased ($M = 1.1$). When punishment was added to FCT, self-injury increased for the first seven sessions and then decreased. The mean rate of self-injury for this phase was 2.2, and for the last five sessions of the phase the mean rate was 0.36. The rate of communication increased to 2.0 during this phase, and Bob was escaping every request through communication. When punishment was withdrawn in the next phase, the rates of self-injury remained relatively low ($M = 1.4$), and the rates of communication decreased slightly ($M = 1.4$). When baseline contingencies were reintroduced in the next phase, self-injury increased ($M = 5.1$), and communication decreased ($M = 0.7$). Reintroduction of FCT resulted in only a slight decrease in self-injury ($M = 4.2$) and almost

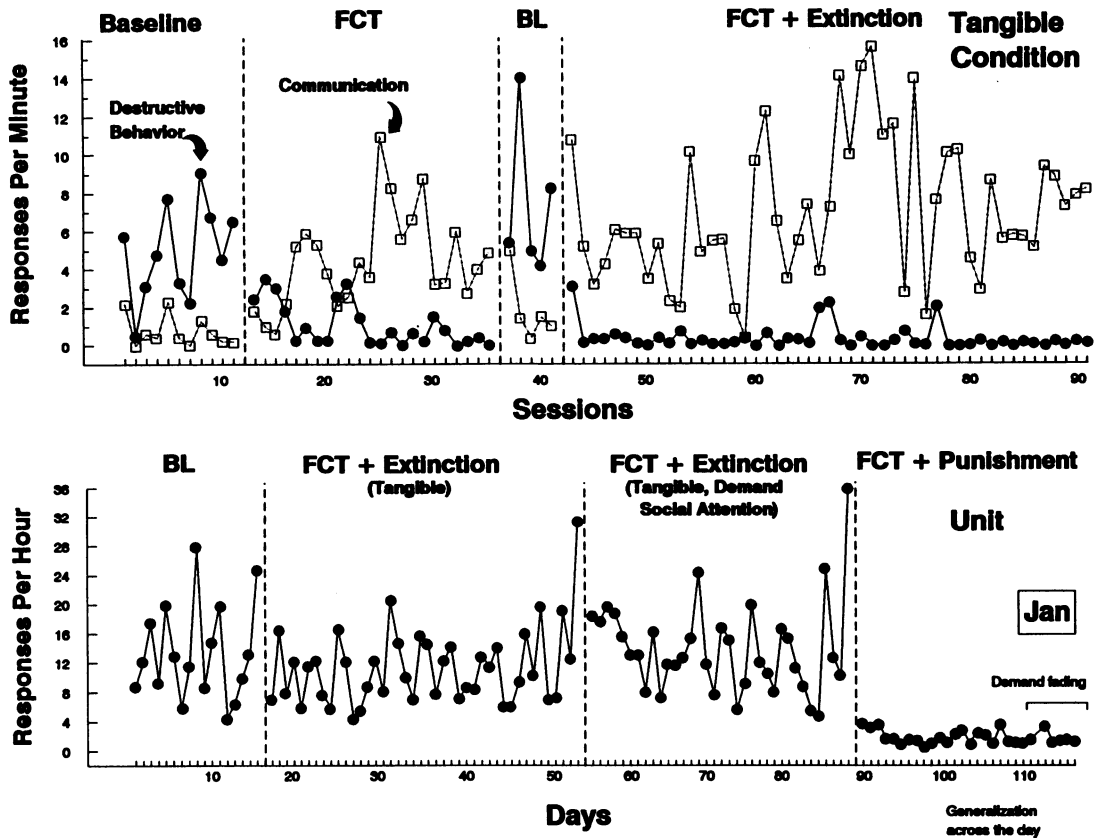


Figure 2. The rates of destructive behavior and communication for Jan in the tangible session and on the living unit under the conditions of baseline (BL), functional communication training (FCT), functional communication training plus extinction (FCT + EXT), and functional communication training plus punishment (FCT + PUN).

no change in communication ($M = 0.5$). When punishment was added to FCT, self-injury decreased ($M = 1.5$), and communication increased ($M = 2.3$).

In the next study, a case is presented in which neither FCT, FCT plus extinction, nor FCT plus punishment was successful in reducing self-injurious behavior.

STUDY 4

Procedure

FCT. The effects of FCT were evaluated in the tangible condition from the functional assessment and in a second tangible session conducted in a different environment (a session room on a separate floor). During baseline, the therapist returned a

tangible item (i.e., a toy) to Abe contingent upon self-injury. During FCT, the therapist immediately presented the toy to Abe contingent upon Abe independently displaying the sign "more" or engaging in self-injurious behavior.

FCT plus extinction. In the next phase, FCT plus extinction was introduced in the sessions conducted in Treatment Room 1 and then in sessions conducted in Treatment Room 2. During this condition, self-injury was placed on extinction (i.e., the toys were not returned when Abe engaged in self-injury); Abe gained access to the preferred toy for 20 s only when he emitted the sign "more."

FCT plus punishment. In the last phase, a punishment procedure was added first in the sessions conducted in Treatment Room 1 and subsequently in the sessions conducted in Treatment Room 2. The punishment procedure consisted of a 30-s bas-

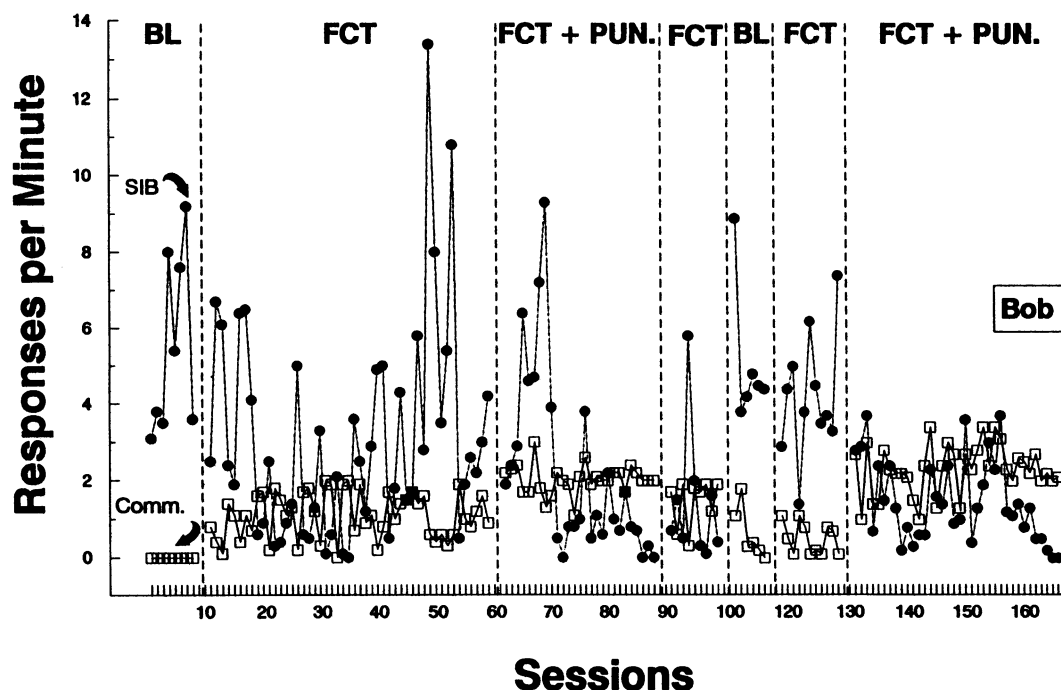


Figure 3. The rates of self-injury for Bob in the demand session under baseline (BL), functional communication training (FCT), and functional communication training plus punishment (FCT + PUN).

ket-hold time-out (Mace, Page, Ivancic, & O'Brien, 1986) implemented contingent upon self-injury. Abe continued to receive the toy for 20 s after signing "more."

Helmet fading. Abe wore a hard helmet with a Plexiglas face mask throughout the assessment and treatment phases, except during helmet fading attempted during the FCT plus extinction phase in Treatment Room 1. The first change consisted of removing his helmet. However, after just two sessions without a helmet, Abe's self-injury produced marked tissue damage. Therefore, his regular helmet was replaced with a soft seizure helmet without a face mask for the remainder of the phase. The hard helmet was reintroduced at the beginning of the FCT plus punishment phase to guard against additional tissue damage in the event a significant punishment burst occurred.

Results and Discussion

The results for Abe are presented in Figure 4. In the first tangible session (top graph of Figure 4), the baseline rates of self-injury were variable across sessions ($M = 1.68$), whereas communica-

tion was low and more stable ($M = 0.55$). When FCT was introduced, self-injury increased ($M = 3.05$), and communication decreased ($M = 0.3$). When extinction was added to FCT, there was a decreasing trend for self-injury and an increasing trend for communication for the first four sessions. During the next six sessions, Abe exhibited high-rate, high-intensity self-injury and communication decreased to near-zero levels. Thereafter, communication increased and remained stable so that Abe was consistently receiving the tangible reinforcer through communication. However, self-injury remained variable throughout this phase until an attempt was made to fade Abe's helmet, at which time self-injury increased dramatically. When punishment was added to FCT, communication remained stable, and Abe continued to receive tangible reinforcement through communication. The rates of self-injury showed a general downward trend but did not reach levels substantially different from baseline ($M = 2.3$). In the second tangible condition (bottom graph in Figure 4), the rates of self-injury were equivalent for baseline and FCT ($M = 1.2$ and 1.08 , respectively), and commu-

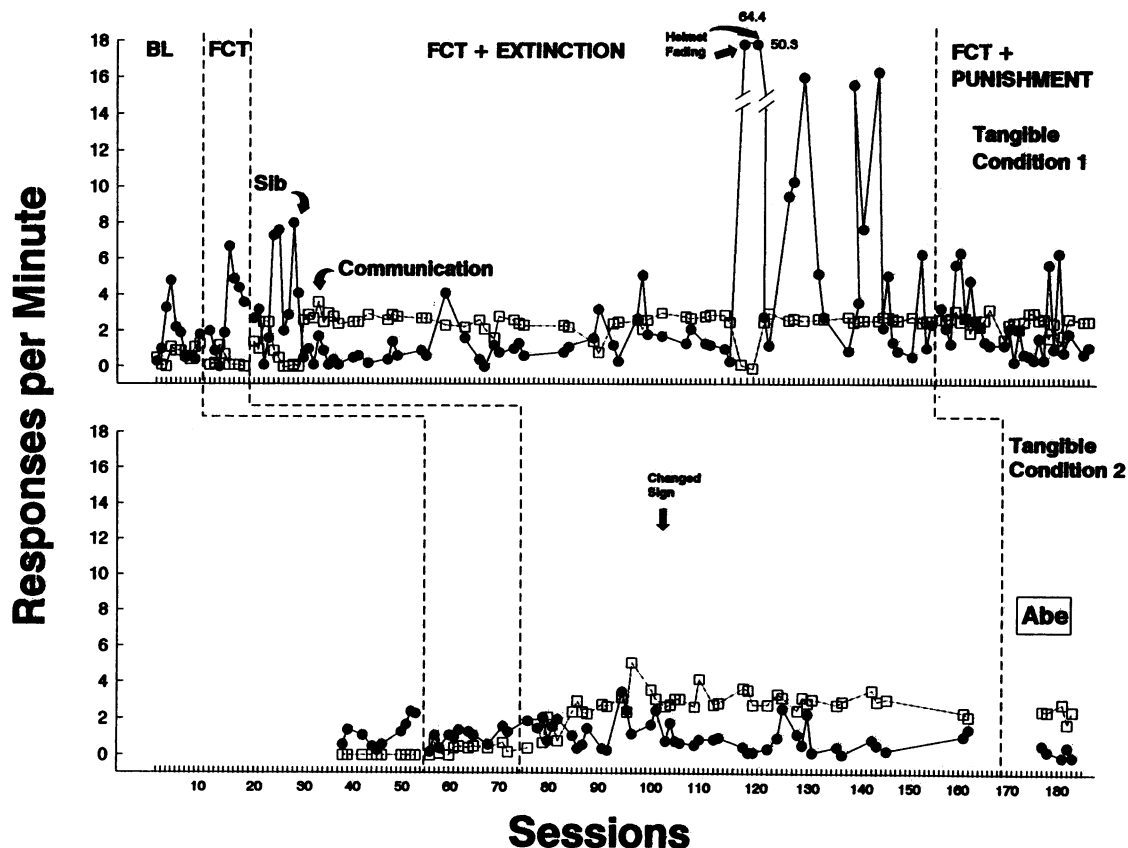


Figure 4. The rates of self-injury for Abe in the two tangible sessions under baseline (BL), functional communication training (FCT), functional communication training plus extinction (FCT + EXT), and functional communication training plus punishment (FCT + PUN).

nication increased only slightly when FCT was introduced (from a mean of 0 to 0.35). When extinction was added to FCT, communication increased so that Abe was consistently receiving the tangible reinforcer through communication ($M = 2.8$), but self-injury did not decrease ($M = 1.1$). The rates of self-injury decreased when punishment was added to FCT ($M = 0.29$), and communication remained stable ($M = 2.4$). Thus, whereas FCT plus extinction or punishment produced increases in communication, FCT alone or combined with either extinction or punishment did not result in a consistent or stable reduction in self-injury.

GENERAL DISCUSSION

The effects of FCT, FCT plus extinction, and FCT plus punishment were evaluated using single-case methodology with 4 clients.

Effects of FCT. Functional communication training was introduced alone with 3 clients (Jan, Bob, and Abe). Only Jan met our minimum discharge goal of a 70% reduction in destructive behavior through FCT alone. However, even with this client, the goal was attained only in a controlled analogue session.

Effects of FCT plus extinction. Functional communication training plus extinction was used with 3 clients (Art, Abe, and Jan). For Art, when extinction was used alone without FCT, disruptive behaviors remained at high levels. During FCT plus extinction, the availability of a communication behavior with which he could escape requests did not reduce his disruptive behavior. For Jan, FCT plus extinction was an effective treatment in controlled analogue situations; however, low rates of behavior were not maintained when FCT plus extinction was attempted on the living unit, possibly because Jan

requested a wider variety of tangible items, some of which could not be immediately delivered because of practical constraints (e.g., refrigerated foods were stored in another room). For Abe, FCT plus extinction resulted in increases in communication but did not substantially decrease his rates of self-injurious behavior.

Effects of FCT plus punishment. The effects of FCT plus punishment were assessed with all clients. For Art, the addition of a punishment contingency alone, without FCT, resulted in decreases in disruptive behaviors. However, following the implementation of punishment alone for disruption, increases occurred in aggression and self-injury. When a punishment contingency for disruption was added to FCT, rates of self-injury and aggression remained low. That is, the availability of a communication behavior that produced escape from requests in one demand condition appeared to prevent the increases in aggression and self-injury seen in the other demand condition, in which communication was not available as an escape response (punishment without FCT). Thus, FCT may have had a prophylactic effect on aggression and self-injury. The most convincing demonstration of this effect with Art was in the last three phases (Figure 1). After a phase that included punishment for all three destructive behaviors and reinforcement for communication on a lean schedule (resulting from demand fading), a reversal was completed wherein Art could escape from requests on a continuous reinforcement schedule using any of the destructive behaviors or communication. He consistently escaped through communication, and all three destructive behaviors remained at near-zero levels. Functional communication training alone was sufficient to maintain low rates of destructive behavior after a phase in which FCT was combined with punishment. One possible reason for this result was that after Art had learned that signing consistently produced escape, and disruption, aggression, and self-injury consistently resulted in punishment, the punishment contingency could be withdrawn without a concomitant increase in maladaptive behavior.

The effects of FCT following phases with and without punishment were also examined in the demand session with Bob. Functional communi-

cation training was introduced in the demand session three times, first after a baseline phase, next after FCT plus punishment, and then again after a baseline phase, completing an A-B-A design in which A is FCT alone following a baseline phase and B is FCT alone following an FCT plus punishment phase. The rates of self-injury were much lower during the FCT phase that followed an FCT plus punishment phase than either FCT phases that followed baseline. These results suggest that the availability of an appropriate escape response (i.e., communication) may help to maintain lowered rates of destructive behavior after punishment is withdrawn or faded from a treatment package. In addition, the rates of communication were higher during the FCT plus punishment phases than during the FCT phases that followed, suggesting that FCT and punishment have effects on both communication and destructive behavior.

For Jan, the addition of a punishment procedure resulted in substantial decreases in destructive behavior on the living unit. For Abe, FCT plus punishment did not result in clear and sustained decreases in self-injury.

The results of these studies indicate that FCT may be an important component of a treatment package for destructive behavior in children with severe to profound mental retardation or autism. However, with most of our cases, FCT was not sufficient to produce clinically significant reductions in destructive behavior. Generalized and enduring treatment effects on destructive behavior were produced only when FCT was combined with punishment.

Although our findings on the effects of FCT may appear to be contrary to those of previous reports, the apparent differences may be because most FCT procedures combine communication training with other operant procedures. In the Carr and Durand (1985) and Durand and Carr (1991) studies, mild destructive behaviors were on extinction and behaviors posing a physical risk were blocked or resulted in brief physical restraint throughout baseline and treatment phases. Similarly, in the Bird *et al.* (1989) study, reinforcement for communication was combined with ignoring or physical redirection for self-injury or aggression. In the Durand and Kishi

(1987) study, a variety of procedures were combined with FCT (e.g., curriculum recommendations).

In the Wacker et al. (1990) investigation, FCT was part of a treatment package that included punishment, but FCT was presented alone during a component analysis. The results of the component analysis suggested that both FCT and punishment were necessary to maximize reductions in destructive behaviors. In that study, FCT plus punishment was superior to both FCT plus extinction and differential reinforcement of other behavior plus punishment. As in the study by Wacker et al. (1990), our data show that the combination of FCT and punishment is superior to FCT and FCT plus extinction in reducing severe destructive behavior.

There may be several reasons why reinforcement of communication, which produced the same consequence as destructive behavior, may not result in significant reductions in destructive behavior. One possible explanation is that the newly trained communication response may become a member of the same response class as the destructive behavior through FCT. When two or more responses have the same function (e.g., produce the same reinforcer) under similar stimulus conditions, the responses may form a response class (Skinner, 1953). When a response class is formed, reinforcement of one of the responses can maintain other responses in the response class (Cataldo, Ward, Russo, Rioridan, & Bennet, 1986; Russo, Cataldo, & Cushing, 1981; Sherman, 1964). Thus, if communication and destructive behavior form a response class through FCT because both produce the same reinforcer under similar stimulus conditions, then reinforcing communication may also serve to maintain the response strength of the destructive behavior.

A second reason why FCT alone may not be a sufficient treatment for destructive behavior is that the communication and destructive behavior may form a response chain. Other investigators have reported instances in which a client's destructive behavior has become chained to the communication response through FCT (Fisher, Jefferson, Conner, & Cataldo, 1989; Wacker et al., 1990). These behavioral chains may develop because communication is being reinforced under stimulus condi-

tions in which the probability of destructive behavior is high, thus increasing the probability of destructive behavior being followed by communication and reinforcement. We speculate this may be most likely in situations in which (a) the client requires many trials in order to learn the schedules for the destructive and communication responses, (b) the client's destructive behavior has a lengthy and strong reinforcement history, (c) the communication response has a short and weak reinforcement history, and (d) the destructive behavior is placed on extinction at the same time as the communication response is placed on a continuous reinforcement schedule. Under such conditions, the client's rate of destructive behavior may temporarily increase (i.e., an extinction burst), thus increasing the likelihood that he or she will emit the destructive behavior, then the communication response, and then receive reinforcement. With the errorless shaping procedure we used to train signing with our nonverbal clients, we attempted to prevent physically all responses except the correct sign to help teach the communication response and to prevent this chaining phenomenon. However, preventing the destructive behavior was not always physically possible. The procedure was especially difficult to implement with clients who displayed destructive behavior motivated by escape from requests, because sign training constituted a demand situation that further increased the probability of the destructive behavior.

An alternative hypothesis is that over a longer period of time, FCT alone may produce beneficial effects for some clients. In the Wacker et al. (1990) study, FCT alone was in effect for only four sessions per client. In the current investigation, the length of FCT phases varied greatly, ranging from 8 to 49 sessions. However, the effectiveness of FCT alone did not appear to be related to length of the FCT phases. For Jan, FCT produced rapid reductions in destructive behavior in the tangible session (i.e., clear changes were noticeable by the fifth FCT session). For Bob, FCT was ineffective in reducing self-injury even after 49 sessions.

A potential limitation of FCT, whether or not it is combined with extinction or punishment, is that there are many circumstances in community

settings where it is inappropriate for a client to escape nonpreferred activities through communication (e.g., taking medicine, bathing, brushing teeth, etc.). Similarly, it is not practical for parents or teachers to provide attention or access to preferred objects or activities every time the child displays the appropriate communication response (Fisher *et al.*, 1989; Fisher, Piazza, Cataldo, & Harrell, 1990). Further, clients who consistently escape instructional requests through communication are missing learning opportunities. We have successfully used demand fading (B. A. Iwata, personal communication, June, 1991) and reinforcement fading with clients for whom this has been a problem.

When demand fading is added to a functional communication package, the individual is required to complete one or a few tasks before the communication will function to produce escape. Then, the number of requests the client must complete before escaping through signing is gradually increased. With reinforcement fading, the client is required to wait a few seconds after emitting the sign associated with a positive reinforcer (e.g., social attention), and then the length of the delay is gradually increased. The goals of these fading procedures are to teach the client to tolerate the stimulus conditions previously associated with high rates of destructive behavior, to make the treatment package more generalizable to community settings, and to increase the client's learning opportunities in demand situations. In all of the cases in which demand or reinforcement fading was implemented, we were able to increase the number of requests or the latency to delivery of reinforcement following communication while maintaining low levels of destructive behavior. These fading procedures require a fair amount of treatment time, but they may be important to the long-term success of treatment packages based on FCT.

The research literature on the effects of treatment packages based on FCT on destructive behavior is still relatively small, and additional study is clearly warranted. Researchers may wish to consider investigating variables that predict outcome for FCT-based treatment packages. Functional communication training is a treatment approach closely tied

to functional assessment. It may be that the results of functional assessment (or other patient data) can help to predict which clients will respond to FCT alone and which clients will require the addition of other operant procedures. It may also be useful to determine both the cost effectiveness and treatment efficacy of FCT-based treatments relative to other operant approaches that are not dependent upon the identification of maintaining stimuli through functional assessment (e.g., a token economy).

In this investigation, extinction or punishment was added to FCT in a series of cases in which FCT alone was not sufficiently effective. However, it is possible that other procedures could be combined with FCT and produce equivalent results. With escape-motivated destructive behavior, one potential approach might be to combine FCT with procedures designed to increase compliance to instructional requests. Parrish, Cataldo, Kolko, Neef, and Egel (1986) have shown that reinforcement of compliance can produce decreases in maladaptive behavior without directly manipulating the consequences associated with this behavior. Alternatively, an antecedent intervention that could potentially enhance the effectiveness of FCT involves interspersing easy or high-probability requests with difficult or low-probability requests. These procedures have produced increases in compliance to low-probability requests (i.e., behavioral momentum) and decreases in maladaptive behavior (e.g., Horner, Day, Sprague, O'Brien, & Heathfield, 1991; Mace *et al.*, 1988).

With destructive behavior maintained by social reinforcement, one alternative to extinction or punishment that might enhance the effectiveness of FCT involves the use of noncontingent reinforcement (Vollmer, Iwata, Zarcone, Smith, & Mazaleski, 1992). In this procedure, social attention is provided according to a dense, time-based schedule that is not influenced by the client's behavior. Over time, the rate of reinforcement is gradually faded if the client's destructive behavior remains at or below a predetermined criterion. Future investigators may wish to examine whether these or other interventions may be useful adjuncts to FCT.

Finally, a proper understanding of the basic prin-

ciples underlying a particular technique can often result in improved clinical outcomes and may be particularly important for clients with the most severe or complex behavior problems. We have suggested (Fisher et al., 1990), as have others (e.g., Mace, 1991), that the basic literature on concurrent operants (Catania, 1966; Herrnstein, 1961) and response classes (Cataldo et al., 1986; Russo et al., 1981; Sherman, 1964) provides a potentially useful explanation of why destructive behavior may be maintained even when an efficient, alternative response (i.e., communication) is available. This literature may also provide an explanation of why punishment appears to be an important treatment component for some clients. Reinforcement of communication combined with punishment of destructive behavior may help the client discriminate between the two schedules of consequences for these concurrent operants. These explanations should form the basis of hypotheses for future research on FCT and destructive behavior.

REFERENCES

- Bird, F., Dores, P. A., Moniz, D., & Robinson, J. (1989). Reducing severe aggressive and self-injurious behaviors with functional communication training. *American Journal on Mental Retardation*, 94, 37-48.
- Carr, E. G., & Durand, V. M. (1985). Reducing behavior problems through functional communication training. *Journal of Applied Behavior Analysis*, 18, 111-126.
- Cataldo, M. F., Ward, E. M., Russo, D. C., Riordan, M. M., & Benner, D. (1986). Compliance and correlated problem behavior in children: Effects of contingent and noncontingent reinforcement. *Analysis and Intervention in Developmental Disabilities*, 6, 265-282.
- Catania, A. C. (1966). Concurrent operants. In W. K. Honig (Ed.), *Operant behavior: Areas of research and application* (pp. 213-270). New York: Appleton-Century-Crofts.
- Durand, V. M., & Carr, E. G. (1991). Functional communication training to reduce challenging behavior: Maintenance and application in new settings. *Journal of Applied Behavior Analysis*, 24, 251-264.
- Durand, V. M., & Kishi, G. (1987). Reducing severe behavior problems among persons with dual sensory impairments: An evaluation of a technical assistance model. *Journal of the Association for Persons with Severe Handicaps*, 12, 2-10.
- Fisher, W., Jefferson, G., Conner, R., & Cataldo, M. F. (1989). *Nonverbal communication training in the treatment of self-injury and other aberrant behavior*. Paper presented at the annual meeting of the Association for Behavior Analysis, Milwaukee, WI.
- Fisher, W. W., Piazza, C. C., Cataldo, M. F., & Harrell, R. (1990). The effects of nonverbal communication training and punishment in the treatment of self-injury and other aberrant behavior. In D. Wacker (Chair), *Further evaluation of functional communication training with severe behavior disorders*. Symposium conducted at the annual meeting of the Association for Behavior Analysis, Nashville, TN.
- Herrnstein, R. J. (1961). Relative and absolute strength of response as a function of frequency of reinforcement. *Journal of the Experimental Analysis of Behavior*, 4, 267-272.
- Horner, R. H., Day, M., Sprague, J. R., O'Brien, M., & Heathfield, L. T. (1991). Interspersed requests: A nonaversive procedure for reducing aggression and self-injury during instruction. *Journal of Applied Behavior Analysis*, 24, 265-278.
- Iwata, B. A. (1991). The functions of self-injurious behavior: An experimental-epidemiological analysis. In S. O'Brien (Chair), *Considerations in the treatment of severe maladaptive behaviors*. Symposium conducted at the annual meeting of the Association for Behavior Analysis, Atlanta, GA.
- Iwata, B. A., Dorsey, M., Slifer, K., Bauman, K., & Richman, G. (1982). Toward a functional analysis of self-injury. *Analysis and Intervention in Developmental Disabilities*, 3, 1-20.
- Mace, F. C. (1991). Recent advances and functional analysis of behavior disorders. In S. O'Brien (Chair), *Considerations in the treatment of severe maladaptive behaviors*. Symposium conducted at the annual meeting of the Association for Behavior Analysis, Atlanta, GA.
- Mace, F. C., Hock, M. L., Lalli, J. S., West, B. J., Belfiore, P., Pinter, E., & Brown, D. K. (1988). Behavioral momentum in the treatment of noncompliance. *Journal of Applied Behavior Analysis*, 21, 123-141.
- Mace, F. C., Page, T. J., Ivancic, M. T., & O'Brien, S. (1986). Effectiveness of brief time-out with and without contingent delay: A comparative analysis. *Journal of Applied Behavior Analysis*, 19, 79-86.
- Parrish, J. M., Cataldo, M. F., Kolko, D. J., Neef, N. A., & Egel, A. L. (1986). Experimental analysis of response covariation among compliant and inappropriate behaviors. *Journal of Applied Behavior Analysis*, 19, 241-254.
- Russo, D. C., Cataldo, M. F., & Cushing, P. J. (1981). Compliance training and behavioral covariation in the treatment of multiple behavior problems. *Journal of Applied Behavior Analysis*, 14, 209-222.
- Sherman, J. A. (1964). Modification of nonverbal behavior through reinforcement of related verbal behavior. *Child Development*, 12, 717-723.
- Skinner, B. F. (1953). *Contingencies of reinforcement: A theoretical analysis*. New York: MacMillan.
- Vollmer, T. R., Iwata, B. A., Zarcone, J. R., Smith, R. G., & Mazaleski, J. L. (1992). The role of noncontingent attention in the treatment of self-injurious behavior main-

tained by socially-mediated positive reinforcement. In B. A. Iwata (Chair), *Assessment and treatment of self-injurious behavior*. Symposium conducted at the annual meeting of the Association for Behavior Analysis, San Francisco, CA.

Wacker, D. P., Steege, M. W., Northup, J., Sasso, G., Berg, W., Reimers, T., Cooper, L., Cigrand, K., & Donn, L. (1990). A component analysis of functional communication training across three topographies of severe be-

havior problems. *Journal of Applied Behavior Analysis*, 23, 417-429.

Received August 10, 1991

Initial editorial decision October 26, 1991

Revision received March 3, 1992

Final acceptance October 27, 1992

Action Editor, F. Charles Mace