

# Combining Noncontingent Escape and Functional Communication Training as a Treatment for Negatively Reinforced Disruptive Behavior



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**Abstract:** Research has shown that noncontingent escape (NCE) and functional communication training (FCT) can be effective treatments for challenging behavior. One limitation of the NCE procedure is the failure to provide explicit contingencies for learning an alternative adaptive behavior. Additionally, problems can arise with a FCT procedure. In this study, FCT was superimposed on an existing NCE schedule in an attempt to maintain the advantages of each procedure while removing known limitations. The data showed that with NCE plus FCT, rates of disruptive behavior remained at near zero levels while compliance with task demands and appropriate verbal responses increased to levels significantly above baseline. The authors discuss the effectiveness of the procedure for addressing the limitations of each intervention.

The use of functional assessment and analysis methodologies to identify the environmental variables in which challenging behavior occurs has been extremely effective in determining the design of intervention strategies (Gresham, Beebe-Frankenberger, & MacMillan, 1999; Neef, 1994). Functional assessment procedures have demonstrated that negative reinforcement can play a significant role in the maintenance of challenging behavior (Iwata, 1987). Iwata, Pace, Dorsey, Zarcone, Vollmer, Smith, et al. (1994/1982) found, for example, that for 38% of participants in their study, self-injurious behavior was sensitive to negative social reinforcement in the form of escaping demands or other aversive stimulation. Results of their study suggested that the development of nonaversive treatments, such as noncontingent escape (NCE) and functional communication training (FCT), for behavior maintained by negative reinforcement may be beneficial for individuals who engage in challenging behaviors.

Carr et al. (2000) noted that noncontingent reinforcement (NCR) has become “one of the most reported function-based treatments for aberrant behavior” (p. 377) in the research literature. NCR typically involves the delivery of the reinforcer maintaining the challenging be-

havior on a time-based (response-independent) schedule (Vollmer, Iwata, Zarcone, Smith, & Mazaleski, 1993). When such a procedure is applied to challenging behavior maintained by escape from demands, the principle of NCR remains (i.e., access to reinforcement independent of behavior), but the treatment becomes noncontingent escape. NCE has been used as a treatment package that comprises three components: (a) fixed-time schedules determine when the participant receives access to preferred reinforcement during the session, independent of occurrences of challenging or adaptive behavior; (b) an extinction component in which the experimenter provides no programmed consequences contingent on the challenging behaviors; and (c) fading, where the NCE schedule is gradually decreased from a dense (continuous) schedule to a leaner but still time-based, response-independent schedule (Vollmer, Marcus, & Ringdahl, 1995).

FCT involves the delivery of the reinforcer maintaining the challenging behavior contingent on the emission of a newly trained communicative response (Durand, 1990). Essentially, FCT is a specific form of a differential reinforcement procedure where target alternative responses are reinforced while the challenging behavior is placed on ex-

inction. However, researchers have argued that FCT is distinct from differential reinforcement procedures due to the control the participant has over the delivery of the reinforcement (Wacker & Reichle, 1993).

Research has demonstrated the effectiveness of both NCE and FCT as treatments for challenging behaviors. NCE has been shown to be effective as a treatment for behaviors such as aggression (Vollmer et al., 1995; Vollmer et al., 1998), disruption (Coleman & Holmes, 1998), and self-injurious behavior (Vollmer et al., 1995). FCT has been found to be an effective treatment for a variety of behavioral disorders, including self-injurious behavior (Lalli, Casey, & Kates, 1995), aggression (Carr & Durand, 1985), and disruption (Shukla & Albin, 1996), as well as for challenging behaviors maintained by attention (Durand & Carr, 1991), escape (Fisher et al., 1993), and access to preferred items (Bird, Dores, Moniz, & Robinson, 1989). In addition, treatment effects have been shown to transfer across new tasks, environments, and teachers (Durand & Carr, 1991).

Recent studies have identified numerous benefits of implementing either NCE or NCR rather than other common behavior-reduction procedures, such as FCT. First, NCR/NCE has been shown to result in a higher rate of reinforcer delivery compared to other comparable procedures (e.g., differential reinforcement of other behavior; Vollmer et al., 1993). Second, NCR/NCE schedules have been reported to be relatively easy to implement compared to other procedures, although no social validity assessments have been reported to support this claim (Carr et al., 2000). Third, NCR/NCE has been shown to produce less extinction-induced behavior (e.g., aggressive bursts of behavior) compared to other treatments (Tucker, Sigafos, & Bushell, 1998; Vollmer et al., 1995).

The research literature has also identified potential problems that might arise with the implementation of NCE or NCR. First, neither explicitly promotes or strengthens an appropriate alternative response (Carr et al., 2000; Tucker et al., 1998). Second, adventitious reinforcement of the challenging behavior may occur (Vollmer, Ringdahl, Roane, & Marcus, 1997). The current study will examine the first problem through an extension of the work of Marcus and Vollmer (1996) and Goh, Iwata, and DeLeon (2000).

Marcus and Vollmer (1996) addressed the need to shape or strengthen an appropriate alternative response by combining NCR and differential reinforcement of alternative behavior (DRA) as an intervention for behavior maintained by positive reinforcement in the form of access to preferred tangibles (e.g., toys, music). The results showed that rates of challenging behavior remained lower than baseline levels, and an alternative response—"toys please"—was strengthened when a DRA schedule was superimposed on a previously existing NCR schedule. The researchers pointed out that the combined NCR plus DRA package

maintained the established advantages of NCR, such as ease of implementation, high rates of reinforcement, and reduced extinction-related side effects, while addressing one of the limitations of this procedure, namely the lack of the provision of explicit contingencies to teach an alternative response. This suggests that NCE/NCR could also be used to establish rapid control over a challenging behavior, providing an opportunity for the development of an alternative response.

Goh et al. (2000) also used a combination of NCR and DRA as an intervention for behavior maintained by social positive reinforcement (e.g., access to food for one participant, access to attention for another). Those reinforcers were delivered under a dense NCR schedule. The researchers also delivered the same reinforcers concurrently under DRA contingencies in an attempt to increase an appropriate alternative behavior. Results showed that the NCR plus DRA intervention successfully decreased the challenging behavior, but little or no increase in the alternative behavior was observed. Only when the NCR schedule was thinned while the DRA schedule remained unchanged did challenging behavior remain low, and the alternative behavior increased. The researchers concluded that the concurrent implementation of dense NCR schedules and DRA contingencies is incompatible. They suggested that the most effective way of combining NCR and DRA procedures is to begin intervention using only dense NCR schedules and to add a DRA contingency after the NCR schedule has been thinned.

Studies have also identified potential problems that may arise during the use of FCT as an intervention for challenging behaviors. First, treatment of escape-maintained behaviors may not benefit from the immediate delivery of the reinforcer (Marcus & Vollmer, 1995). For example, in previous studies, researchers have terminated an ongoing task immediately after the participant emitted the trained escape response (Fisher et al., 1993; Wacker et al., 1990). Lalli et al. (1995) pointed out that for FCT to be an effective treatment for escape-maintained challenging behavior, clinicians must use it in a way that can maintain treatment effects while improving participation in the target task. To address this, Lalli et al. (1995) evaluated the use of a changing response criterion following the implementation of FCT. The researchers increased the response requirements before the participants were able to escape through emitting the trained communication response. The results showed that FCT with a changing criterion gradually increased compliance with requests and maintained low rates of challenging behavior.

Another problem associated with using FCT to decrease escape-maintained challenging behavior is illustrated in the treatment literature by reported instances in which the participant's challenging behavior has become chained to the communication response through FCT (e.g., Wacker et al., 1990). Data presented by Shirley, Iwata,

Kahng, Mazaleski, and Lerman (1997) demonstrated that during the FCT phase, two participants began to exhibit a combination of self-injurious behavior and signing and required approximately 25 training sessions before their rates of signing exceeded their rates of self-injurious behavior. The researchers hypothesized that these response chains may develop because communication is being reinforced under stimulus conditions in which the probability of the challenging behavior is high, thus increasing the probability that challenging behavior will be followed by communication and reinforcement.

Third, for some individuals with limited behavioral repertoires, shaping an alternative response can be time-consuming and, as a result, extinction bursts might occur when challenging behavior is no longer reinforced (Vollmer et al., 1993).

Combining FCT with an NCE or NCR intervention may be useful, as it would permit the initial elimination of a contingent relationship between the response and consequence despite the continued availability of the functional reinforcer. Once the inappropriate behavior has been reduced to manageable levels, FCT procedures could be introduced to shape and establish an appropriate alternative communicative response.

The current study attempted to extend the work of Marcus and Vollmer (1996) and Goh et al. (2000) to the use of noncontingent and differential negative reinforcement as an intervention for escape-motivated disruptive behavior. The primary purpose of the present study was to evaluate the effectiveness of combining NCE with FCT in sequence in order to first reduce disruptive behavior and then increase compliance with task demands. We attempted to maintain the established advantages of each procedure while addressing their limitations. Specifically, it was hypothesized that the NCE component would reduce the probability of undesirable FCT-based response chains developing, while the FCT component would provide explicit contingencies for learning an appropriate alternative response.

## Method

### PARTICIPANT AND SETTING

Approval for the study from The University of Auckland Human Subjects Ethics Committee and informed parental consent were both obtained prior to any data collection. R was a 4-year-old boy previously diagnosed with autism. He was referred for treatment because of a history of extremely aggressive (e.g., hitting, head banging) and disruptive behavior (e.g., screaming, throwing objects). R had a limited nonfunctional vocal repertoire that consisted mainly of immediate or delayed echolalia, and he was resistant to preacademic instructional sessions. All sessions were conducted in an unoccupied room in R's home. The

room was approximately 6 square meters, had carpet on the floor, and had one wall dominated by windows. Items in the room included a video camera, a table, two chairs, a couch, and a mirror. Other items in the room varied according to the experimental conditions. Depending on the participant's daily schedule, three to four 10-min sessions were conducted 3 days per week. A 10-min break occurred between each session. All sessions were videotaped with the recorder in a fixed position so that both R and the instructor were visible at all times.

### DATA COLLECTION, RELIABILITY, AND TREATMENT INTEGRITY

Frequency data were collected on target behaviors during all phases and are presented as mean number of responses per minute. The target behaviors were occurrences of disruptive behavior, appropriate verbalization, and compliance. *Disruption* was defined as forceful hitting, kicking, head banging (forceful contact of the head against another person), biting, throwing objects at others or around the room, overturning furniture, and screaming. *Appropriate verbalizations* were defined as the participant independently saying "finished" after completing the targeted number of tasks. Prompted verbalizations were those produced by the participant following a verbal prompt from the researcher (e.g., "say, 'finished'"). *Compliance* was defined as correctly completing a requested task without physical guidance or the emission of disruptive behavior.

All behaviors were recorded using a paper-and-pencil recording system. Data were scored at a later time from videotapes recorded with a hand-held camera. Interobserver agreement was assessed during at least 33% of the videotaped sessions, equally distributed across all phases. This was done by having a second observer independently observe and categorize the behaviors recorded on the videotapes at a different time than the primary observer. Sessions were partitioned into 15-s intervals, and observers' records were compared on an interval-by-interval basis. Exact agreement was calculated by dividing the exact agreements per 15-s interval by the number of exact agreements plus disagreements and multiplying by 100%. An exact agreement was defined as both observers recording the same frequency of a target response during a 15-s interval. Average exact agreement coefficients for disruptive behavior during the functional analysis were (a) demand, 95.76%; (b) social attention, 100%; (c) toy play, 100%; and (d) alone, 100%. Mean agreement for the dependent variables were computed separately for each treatment condition. All are satisfactory, with means ranging from 95.8% to 100% (see Table 1).

Procedural integrity checks were conducted during approximately 40% of the sessions, equally distributed across all conditions. Correct use of the procedures was scored when the researcher implemented the designated

**Table 1. Mean Interobserver Agreement Percentages for Disruption, Appropriate Verbalization (Prompted and Unprompted), and Compliance for Each Treatment Condition**

Dependent variable	Condition				
	BL	NCE	NCE + FCT(tr)	RBL	NCE + FCT(wc)
Disruption	95.76	98.6	100	97.80	100
AP up	100	100	100	100	100
AP p	100	100	100	100	100
Compliance	98.33	100	100	98.75	100

*Note.* BL = baseline; NCE = noncontingent escape; NCE + FCT(tr) = noncontingent escape plus functional communication training (training); RBL = return to baseline; NCE + FCT(wc) = noncontingent escape plus functional communication training (work criteria); AP = appropriate verbalization (up = unprompted, p = prompted).

procedure within 2 s of a target behavior during the functional analysis and all phases of the intervention. Procedural integrity data showed that the researcher correctly implemented the procedures on an average of 93% of opportunities during the functional analysis and on an average of 95% of the opportunities during the intervention phases.

### EXPERIMENTAL SEQUENCE AND DESIGN

A functional analysis was conducted initially to identify the variables that maintained the participant's disruptive behavior. Functional analysis conditions were presented during 10-min sessions in a multielement design.

Following the functional analysis, the authors evaluated the combined effects of NCE and FCT on the participant's disruptive behavior, appropriate verbalizations, and compliance, using a reversal design.

### FUNCTIONAL ANALYSIS

The participant was exposed to four assessment conditions (alone, attention, toy play, demand) based on the procedures described by Iwata, Dorsey, et al. (1994/1982).

#### *Alone*

The participant was observed alone in the room with no access to toys or books and no social consequences for disruptive behavior. The purpose of this condition was to identify whether the participant's disruptive behavior was maintained by nonsocial (automatic) reinforcement.

#### *Social Attention*

The participant, researcher, and various toys and books were in the room. The researcher directed the participant toward the materials at the beginning of each session (e.g., "You play with these while I do some work") but otherwise ignored the participant. Contingent on the occurrence of disruptive behavior, the researcher would provide brief so-

cial attention in the form of reprimands or statements of concern (e.g., "Stop hitting"). This condition was conducted to determine whether the disruptive behavior was maintained by positive reinforcement in the form of attention.

#### *Toy Play*

The participant, researcher, and various toys and books were in the room. The researcher provided opportunities for attention and interaction on a fixed-time 30-s schedule contingent on the absence of the disruptive behavior. The purpose of this condition was to observe the rate of disruptive behavior in an enriched environment.

#### *Demand*

The participant and the researcher were in the room seated at a table with task materials selected from the participant's preacademic program. All instructional tasks were receptive language tasks and required the participant to match sets of materials (e.g., colors, numbers, shapes, pictures of animals). Escape from continuous tasks was provided for 30 s, contingent on each occurrence of disruptive behavior. No leisure items were available. Reinforcement in the form of praise was delivered contingent on compliance, and a three-step graduated prompting procedure (verbal instruction, demonstration, physical guidance) was presented if compliance did not occur. The purpose of this condition was to determine whether disruptive behavior was maintained by negative reinforcement in the form of escape from demands.

### TREATMENT CONDITIONS

All sessions began with a request to "come and sit down." At this point the first instructional trial would be presented (e.g., the participant would be presented a colored card and be instructed to "put with same"). Similar to the demand condition in the functional analysis, a three-step

prompting procedure was used. This procedure was also repeated following breaks from instructional trials. Treatment effects were evaluated using a reversal (A-B-C-A-D) design, in which the B condition consisted of NCE, the C condition consisted of NCE plus FCT (training), and the D condition consisted of NCE plus FCT with a work criterion.

### **Baseline**

Baseline conditions were identical to the demand condition described in the functional analysis.

### **Noncontingent Escape**

During NCE, the researcher allowed the participant to escape from the task on a fixed-time (FT) schedule. R received 30-s breaks from instructional demands; however, his behavior did not influence the frequency of these breaks. The breaks were signaled verbally by the researcher saying, "You can finish." Disruptive behavior no longer directly produced escape, but breaks were not delayed or withheld when disruptive behavior occurred. For example, if the current FT interval was 40 s, the participant was allowed to finish after every 40 s, independent of whether disruptive behavior occurred during the interval. If necessary, physical guidance was used to keep the participant on task in the intervals between scheduled NCE as recommended by Iwata, Pace, Kalsher, Cowdery, and Cataldo (1990). The schedule for increasing the FT intervals (inter-reinforcement intervals) was based on the fading schedule described by Vollmer et al. (1995) and determined by the participant's performance in the previous session. The escape schedule was faded from FT 10 s to FT 10 min. The fading was accomplished across sessions by initially adding 10 s to the interval when the rate of disruptive behavior was at or below 0.3 responses per minute during any given session. After the FT schedule reached 1 min, the schedule increased in larger units from 1 min, to 1 min 20 s, to 1 min 40 s, to 2 min, to 2.5 min, to 3 min, to 3.5 min, to 4 min, to 4.5 min, to 5 min, to 6 min, to 7 min, to 8 min, to 9 min, and finally to 10 min. If the rate of disruptive behavior went above 0.3 responses per minute for one session, the fading schedule was set back to the previously accomplished step.

### **NCE Plus FCT**

Once the FT intervals in the NCE condition reached FT 1 min, training trials were conducted to teach the participant a self-initiating (Koegel, Koegel, & Carter, 1999) alternative response that would result in escape from instructional demands. The alternative response was saying "finished." The researcher presented an instruction to the participant as in the previous NCE condition. Once the participant had complied, the researcher said, "Say, 'finished'" and allowed the participant 5 s to emit the verbal

response independently. Contingent on noncompliance, the researcher modeled the appropriate verbal response. If disruptive behavior occurred during a trial, the researcher waited 5 s after it ceased then prompted the verbal response. The researcher provided verbal reinforcement (i.e., praise) and a 30-s escape from the task demands contingent on the verbal response (independent or prompted). Once unprompted verbalizations significantly exceeded prompted verbalizations, the participant's use of the communication response was no longer prompted. That is, only spontaneous verbalizations were reinforced. The NCE fading schedule, described in the previous condition, continued to be in effect in this condition at FT 1 min 20 s.

In this manner, the participant received a break in one of two ways: (a) contingent on compliance on a fixed-ratio (FR) 1 schedule in which (at this phase of the study) R was negatively reinforced on every presentation of the verbal response (prompted or unprompted) or (b) noncontingently on a FT schedule.

### **Return to Baseline**

The reversal phase was identical to baseline conditions described in the demand condition of the functional analysis.

### **NCE Plus FCT with Changing Criterion**

The aim of this condition was to gradually increase the response requirement before the participant could request a break from instructional demands. Thus, the FR designation refers to the number of tasks that the participant had to complete before saying "finished" was reinforced (i.e., FR 2 to FR 10). Escape from task demands was contingent on completion of the required number of tasks and presentation of the newly trained verbal response and/or once the current NCE interval had finished.

The work criterion for each session was based on the increasing FR schedule. For example, if the current FR schedule was FR 4, the participant was required to comply with four instructional tasks and emit the required verbal response ("finished") before a break from task demands was obtainable. The work criterion was gradually increased from FR 2 to FR 10. This was achieved across sessions by adding two task requirements when the rate of disruptive behavior was at or below 0.3 responses per minute during any given session. The participant was able to escape from demands by saying "finished" any time after the specified number of tasks in the current work criterion were completed. If the verbal response occurred before the work criterion or the time interval on the NCE schedule was met, the researcher said, "No, you haven't finished yet." Contingent on noncompliance, the researcher physically guided the participant to emit the task-related response. Reinforcement in the form of praise was given for compliant behavior. The three-step graduated prompting procedure was used where necessary.

## Results

Figure 1 shows the results of the functional analysis. The mean rates of disruptive behavior under the four conditions of the functional analysis were (a) demand, 2.5 responses per minute; (b) social attention, .08; (c) toy play, 0; and (d) alone, 0. The participant's disruptive behavior occurred almost exclusively during the demand condition, indicating that the behavior was maintained by negative reinforcement in the form of escape from instructional demands. Data from this analysis was used to determine the specific manner in which NCE and FCT would be implemented during the treatment conditions.

Figure 2 shows the results of each treatment condition on disruptions, compliance, and appropriate verbalizations. The data show that on implementation of the NCE condition, a rapid reduction in the rate of disruptive responses per minute (reaching 0 by the fourth NCE session) occurred. During baseline, disruptive behavior averaged 2.5 responses per minute relative to the NCE treatment mean of 0.2 responses per minute. Additionally, the participant's independent compliance with requests markedly increased compared to baseline. During baseline, compliance was low and variable, averaging 1.2 responses per minute compared to the NCE condition in which the participant complied at a mean rate of 6.3 responses per minute.

As demonstrated in Figure 2, throughout the NCE plus FCT (training) condition, disruptive responses remained very low, only occurring in 3 of the 11 sessions at a rate of 0.1 responses per minute. Immediate increases in appropriate unprompted verbalizations were observed fol-

lowing the introduction of the FCT (training; 0.5 responses per minute in the first session). Figure 3 shows the rates of both prompted and unprompted verbal responses during the FCT (training) phase. A rapid increase in unprompted verbalizations is paralleled by the planned decrease in prompted verbalizations, such that unprompted verbalizations occurred more often than prompted by the second training session (1.1 responses per minute compared to 0.4 responses per minute). Unprompted appropriate verbal responses averaged 1.2 responses per minute compared to prompted appropriate verbal responses that averaged 0.2 responses per minute. Data from this analysis was used to determine when FCT (training) had been successfully completed. As a result of the FR 1 reinforcement schedule operating throughout the NCE plus FCT (training) condition, compliance was observed at a consistently low rate through this phase, ranging from 1.4 to 1.6 responses per minute ( $M = 1.5$  responses per minute).

A return to baseline resulted in an increase in disruptive behavior to just below baseline levels ( $M = 1.2$  responses per minute), an initial increase in compliance followed by a rapid decrease ( $M = 5.3$  responses per minute), and a large and immediate decrease in appropriate verbalization ( $M = 0.1$  responses per minute).

The implementation of NCE plus FCT (changing criterion) resulted in an immediate reduction in the rate of disruptive behavior. The participant's rates of disruptive behavior remained low ( $M = 0.09$  responses per minute) throughout the whole phase as the work criterion for obtaining a break was increased. In this condition the participant had the opportunity to independently request a break following completion of the current FR schedule.

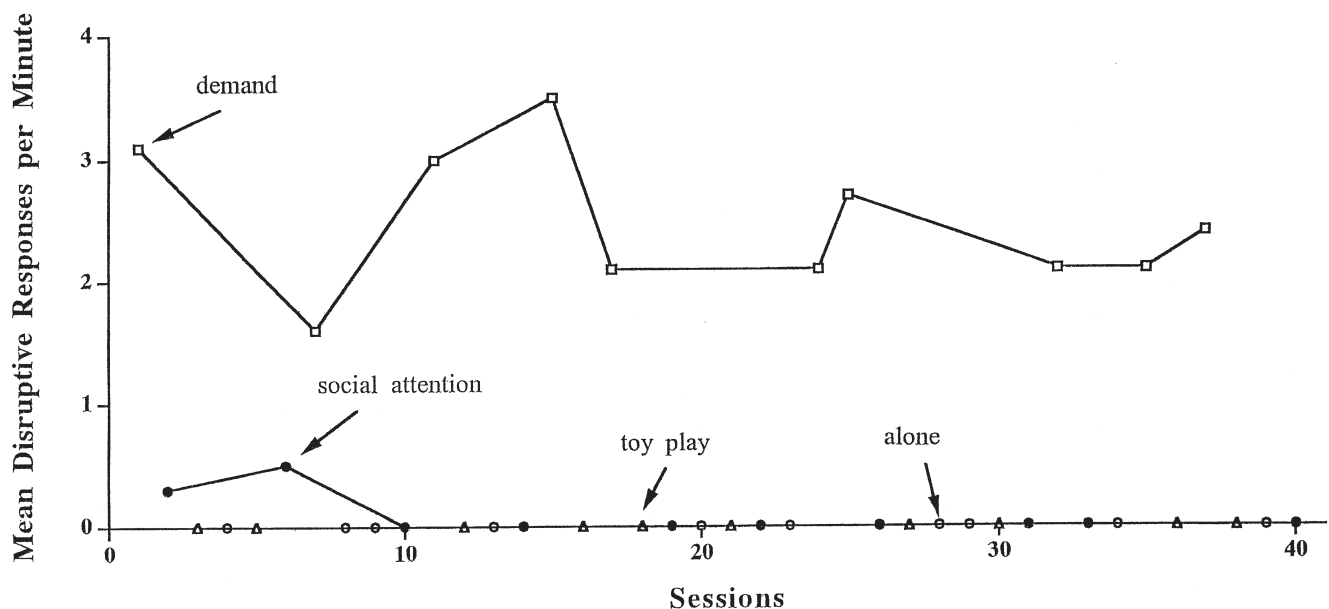
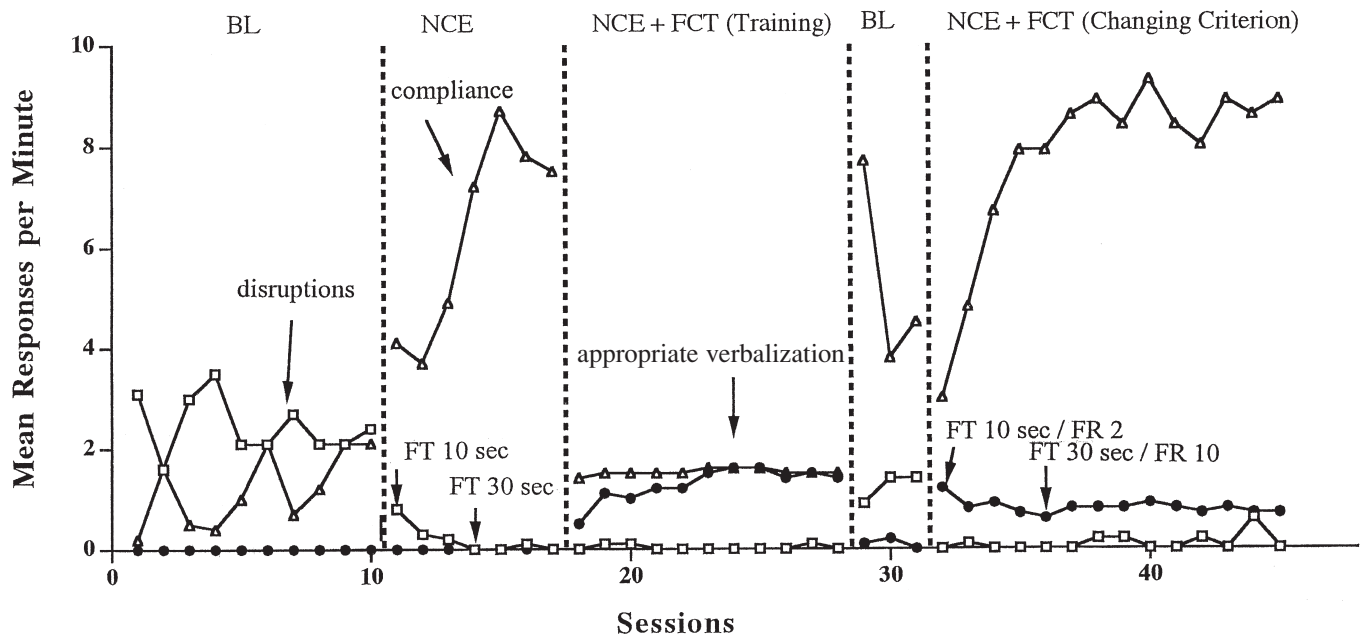
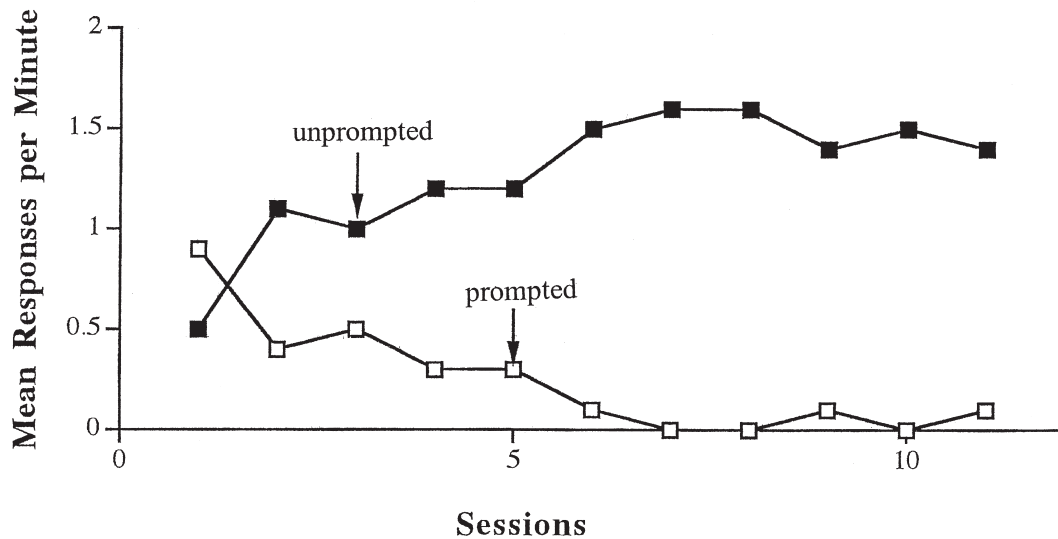


Figure 1. Mean rate of disruptive behavior under four conditions in the functional analysis.



**Figure 2.** Mean rate (per minute) of disruptions, compliance, and appropriate verbalizations under each experimental condition. *Note.* BL = baseline; NCE = noncontingent escape; NCE + FCT = noncontingent escape plus functional communication training; FT = fixed time; FR = fixed ratio.



**Figure 3.** Mean rate of prompted and unprompted verbal responses during the functional communication training phase.

For example, during the FR 6 phase (Session 34), the participant had approximately 11 opportunities, one following every sixth completed task, to successfully request a break. The number of tasks completed increased proportionately until the FR 10 phase, where the participant had, on average, nine opportunities to request a break. Therefore, data for the appropriate verbalizations and compliance rates in this condition reflect the rate at which

the participant independently requested a break following completion of the FR schedule (i.e., completion of the minimum number of required tasks). Independent appropriate verbalizations immediately increased and remained at a consistent rate ranging from 0.6 to 1.2 responses per minute ( $M = 0.8$ ). The participant's independent compliance with requests rapidly increased in the first four sessions and remained at a high level for the remainder of the

condition compared to the previous conditions ( $M = 7.7$  responses per minute; see Figure 2).

## Discussion

The primary purpose of this study was to evaluate the effectiveness of combining NCE with FCT in sequence, first to reduce disruptive behavior and then to increase compliance with task demands. An initial functional analysis indicated that the participant's disruptive behavior was being negatively reinforced by escape from task demands. Following this, a series of conditions were introduced in which NCE was presented alone, in combination with a FCT (training) condition, and, finally, in combination with a FCT (work criterion) condition. Response patterns indicate that disruptive behavior remained at near zero levels, the appropriate verbal response ("finished") was rapidly established then remained at a steady level in accordance with the opportunities provided to escape (i.e., completion of the work criterion), and compliance with task demands quickly increased and remained at high levels across the treatment stages. In the brief reversal to baseline, disruption increased, though not to the rate observed during baseline; appropriate verbal responses decreased to a rate similar to that observed during the initial baseline; and compliance rapidly dropped within two sessions. These results suggest that the combined treatment package of NCE and FCT was effective in reducing disruptive behavior and increasing compliance with task demands.

The second aim of this study was to address the limitations of NCE and FCT by combining the two procedures. First, researchers have expressed concern that NCE/NCR packages do not contain an explicit contingency to teach an alternative response. Marcus and Vollmer (1996) successfully addressed this by superimposing a DRA treatment condition over an existing NCR procedure for challenging behavior maintained by self-injurious behavior and aggression. Goh et al. (2000) also used a combination of NCR and DRA as an intervention for behavior maintained by social positive reinforcement. However, the authors concluded that the concurrent implementation of dense NCR schedules and DRA contingencies is incompatible. Goh et al. suggested that the most effective way of combining NCR and DRA procedures is to begin intervention using only dense NCR schedules and to add a DRA contingency after the inappropriate behavior has been reduced and the NCR schedule has been thinned. The current study extends this work to the treatment of negatively reinforced behavior. When the FCT component was added to the existing NCE procedure, disruptive behavior remained well below baseline levels, while an appropriate alternative verbal response—"finished"—was taught.

Second, research conducted by Shirley et al. (1997) pointed out that most studies on FCT fail to present the results of the initial acquisition of the alternative response

during the FCT training phase. Researchers who have reported a training time recorded acquisition taking anywhere from 3 to 9 sessions (Wacker et al., 1990), 6 sessions for one participant and 28 sessions for another (Shirley et al., 1997). Such differences in results have been attributed to the formation of a response chain between the challenging behavior and the alternative response. The present study addressed this by introducing the NCE procedure alone. This resulted in a decrease in disruptive behavior, therefore creating an opportunity to teach the alternative response. Additionally, the data indicated that the unprompted emission of the alternative response exceeded occurrences of the prompted responses within 2 sessions (although this condition was continued for another 9 sessions to ensure stability in the response) while disruptive behavior remained at zero levels. These results indicate that the alternative response was acquired more quickly than in previous studies and response chaining between the disruptive behavior and the alternative response was avoided by first decreasing the frequency of challenging behavior through NCE and then teaching the alternative response through FCT. The procedure presented here enhances those described by Fisher et al. (1993) and Lalli et al. (1995) by providing an alternative approach to treatment that addressed the development of undesired response chains.

Vollmer et al. (1995) demonstrated that the provision of escape, even when noncontingent, resulted in significant reductions in self-injurious behavior. In the current study, NCE was introduced alone, following baseline. The primary aim of this condition was to decrease disruptive behavior in order to create an opportunity to teach the alternative response and prevent the development of a response chain. The results show an inverse relationship between the participant's disruptive behavior and compliance to task demands, that is, increased compliance and decreased disruptive behavior. This lends additional support to work on the effectiveness of NCE as treatment for escape-maintained disruptive behavior. However, this support is offered cautiously due to the limited number of sessions (7) in the NCE condition in the present study, the inclusion of a single participant, and the absence of data showing generalization to the natural environment.

Reductions in challenging behaviors observed during both NCE and NCR treatment packages have, in previous research, been attributed to a combination of either the alteration of the behavior's establishing operation or extinction (Fischer, Iwata, & Mazaleski, 1997; Hanley, Piazza, & Fisher, 1997). For example, Lalli, Casey, and Kates (1997) have shown that for one participant, NCR without extinction was effective in reducing self-injurious behavior. NCR was hypothesized to account for the immediate reduction because reinforcement was initially provided on a schedule that was sufficient to alter the establishing operation from deprivation to satiation. In contrast to those results, Han-

ley, Piazza, and Fisher found that extinction was a necessary component for reduction in aggressive behavior. In the present study, disruptive behavior decreased to near zero levels over the first four sessions of the NCE condition. Such a result indicates that the initial reductions observed in disruptive behavior were most likely a result of the extinction component of NCE. However, as the intervention progressed, the alteration of establishing operations (Michael, 1982, 2000) may also have played a role. That is, during the NCE plus FCT (training) condition, both prompted and unprompted communicative responses produced reinforcement (i.e., escape from task demands) following every request that resulted in compliance (FR 1). It is possible that continued reductions in disruptive behavior throughout the acquisition phase could be attributed to a reduction in the requirement for a break; therefore, the participant's motivation to engage in escape behavior may have decreased, that is, the establishing operation effect for escape was altered.

During the NCE plus FCT (work criterion) condition, disruptive behavior was reduced to zero in the first session, making it difficult to attribute response reductions in this condition to extinction. Disruptive behavior was never emitted, and as a result, there was no opportunity to learn that the behavior did not produce escape. Additionally, inclusion of the FCT intervention in this study was not intended to provide a definitive comparison between the two procedures. It is not possible to assess the differential treatment effects of NCE and FCT in this phase as the independent contributions of the various components of the treatment package were not evaluated. Further research on this issue would be valuable.

One potential concern when using either NCE or NCR procedures is that the response-independent reinforcement may be delivered immediately following the presentation of challenging behavior providing adventitious reinforcement (Vollmer et al., 1997). Such effects were not evident in the current investigation. A possible explanation for this is provided by Hagopian, Fisher, and Legacy (1994). These researchers hypothesized that if reinforcement (e.g., escape from demands) was initially delivered on a dense schedule (e.g., 10 s), in which the rate of reinforcement exceeded the rate of disruptive behavior, the participant would receive reinforcement more often in the absence of disruptive behavior than in its presence. This explanation can be applied to the current study. Additionally, as opportunities to escape were faded, both disruptive behavior and reinforcement occurred infrequently, making adventitious reinforcement unlikely.

Marcus and Vollmer (1995) pointed out that previous research on FCT has failed to report compliance data and very rarely included compliance as a dependent variable. In this study, Marcus and Vollmer reported preliminary data demonstrating that an FCT treatment procedure for disruptive behavior maintained by escape from task de-

mands reduced rates of disruption; however, compliance rarely occurred. The current study addressed this concern by incorporating a work criterion in the final condition. This consisted of, over time, increasing the criterion for a break. Once the FCT work criterion reached FR 10, the participant could receive a break any time after compliance with 10 requests and when appropriate verbalization had been emitted. Results consistent with previous FCT research using various work criteria procedures (e.g., Lalli et al., 1995) were obtained. That is, NCE plus FCT (work criteria) gradually increased compliance with requests and maintained low rates of disruptive behavior. It is possible that the effectiveness of this component of the intervention can be attributed to aspects of the instructional procedure, such as the researcher's instructions or consistency of the tasks, which may have increased the predictability of the situation (Lalli, Casey, Goh, & Merlino, 1994). Future research could examine the roles of such variables to evaluate the independent contributions of the various components of this treatment package while holding constant consequences for challenging behavior (Piazza, Contrucci, Hanley, & Fisher, 1997).

The ease with which the current treatment package was implemented offered an additional advantage. Previous research has suggested that NCE procedures are relatively easy to implement because the method for increasing the escape schedule follows a simple rule to increase the FT interval following a designated number of intervals without the presentation of challenging behavior (Coleman & Holmes, 1998). Researchers have also suggested two explanations as to why FCT procedures can be easily implemented. First, participants can appropriately prompt care providers to deliver the reinforcement, and second, the alternative response can be recognized and reinforced in other settings with untrained individuals (Durand & Carr, 1991). By combining these two procedures into a two-step process, introducing NCE followed by FCT, the current study trialed an intervention that may be appealing to care providers.

One interesting finding was an apparent preference for FCT as a means of obtaining the desired reinforcement. In the final condition, the participant had two ways of escaping from task demands: (a) working until the NCE time interval expired or (b) saying "finished" anytime after completing the work criterion. From Session 33 (NCE 20 s; FR 4) until the end of treatment, the NCE component rarely came into play. Generally, the participant obtained the maintaining reinforcement by completing the work criterion and emitting the appropriate response. This finding supports research by Hanley, Piazza, Fisher, Contrucci, and Maglieri (1997), who suggested that—as in this study—participants preferred to control access to the reinforcement.

Another interesting finding concerned the compliance data in the NCE condition. Response patterns indicate that

compliance with task demands rapidly increased over four sessions, followed by a decrease in the last two sessions. One possible disadvantage of NCE and NCR procedures is reduced motivation to perform either the challenging behavior or any alternative behavior (Vollmer et al., 1997). Data in the current study show compliance decreasing when five sessions had been completed, possibly reflecting a reduction in motivation to emit any behavior once the participant learned that reinforcement could be obtained independent of responding. This interpretation should be considered with caution as the procedure was evaluated in a very brief condition. Future research on negatively reinforced challenging behavior could examine the effect that procedures such as NCE have on compliance to task demands.

#### LIMITATIONS OF STUDY

Some limitations of the study should be noted. First, generalizability of the findings obtained in the current study is limited because the study concerns a single participant in a single setting. The intervention was not implemented in additional settings with other individuals. Second, generalization and maintenance effects were not examined. Third, all sessions were brief (10 min), so the effectiveness of the intervention was demonstrated for only brief periods of time. Thus, the viability of the intervention over longer periods is unknown. Further research is needed in which these procedures are used with additional participants in order to test the generality of these findings. In addition, the procedures used in the current study could be extended to include environmental manipulations outside the treatment setting. For example, the treatment package could be implemented in the classroom with teachers or peers acting as the therapists.

Several unanswered questions remain that warrant additional study. First, extinction procedures are common components of both NCE and FCT procedures. Previous research has demonstrated that FCT is ineffective as a treatment for challenging behavior without an extinction or punishment component (Fisher et al., 1993). It may be that a lagged NCE, NCE + FCT treatment package eliminates the need for an extinction component in the FCT procedure because the challenging behavior has already been reduced in the NCE condition. Therefore, future research might further analyze the necessity of the extinction component. Second, the social significance of the intervention is unknown. It may only be assumed that the decrease in disruptive behavior and increase in compliance to task demands provided a meaningful change to the participant's quality of life during those instructional tasks, and one can only speculate as to the impact such an intervention might have over time if these effects were extrapolated forward. Future research could explore these variables and could also include a measure of social validity to investi-

gate the feasibility, desirability, and acceptability of the intervention for key stakeholders.

#### CONCLUSIONS

Results from the present study suggest that the combined NCE plus FCT package maintains the established advantages of each procedure while addressing their limitations. The combined procedure effectively reduced disruptive behavior, enabling shaping procedures to be introduced gradually and thereby eliminating the possibility of the disruptive behavior and the alternative response forming a response chain. In addition, compliance to task demands was increased and maintained at levels that resulted in significantly more teaching opportunities.

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Action Editor: Robert L. Koegel

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