

*DISCRIMINATED FUNCTIONAL COMMUNICATION: A PROCEDURAL
EXTENSION OF FUNCTIONAL COMMUNICATION TRAINING*

DAVID E. KUHN

KENNEDY KRIEGER INSTITUTE AND
JOHNS HOPKINS UNIVERSITY SCHOOL OF MEDICINE

AND

ANNA E. CHIRIGHIN AND KATRINA ZELENKA

KENNEDY KRIEGER INSTITUTE

A limitation associated with communication-based interventions for problem behavior is the potential for requesting reinforcement at high rates. Multiple-schedule arrangements have been demonstrated to be effective for controlling rates of responding (Hanley, Iwata, & Thompson, 2001). In the current study, we extended previous research by teaching individuals to attend to naturally occurring discriminative stimuli (e.g., caregiver behavior) instead of arbitrary stimuli (e.g., picture cards). Following successful treatment with functional communication and extinction, 2 participants were taught to request attention differentially based on whether the caregiver was engaging in a variety of “busy” (e.g., talking on the phone) or “nonbusy” (e.g., reading a magazine) activities. Following training, each participant engaged in communication primarily when caregivers were engaged in nonbusy activities.

Key words: functional communication training, multiple schedules, social skills

Functional communication training (FCT; Carr & Durand, 1985) has been used as a treatment for a variety of behavioral functions, including the reduction of problem behaviors maintained by positive reinforcement (e.g., contingent access to attention, leisure materials, preferred edible items) and negative reinforcement (e.g., contingent escape from instructional tasks; Fisher, Kuhn, & Thompson, 1998; Hagopian, Fisher, Sullivan, Acquistio, & LeBlanc, 1998; Hagopian, Kuhn, Long, & Rush, 2005; Kahng, Iwata, DeLeon, & Worsdell, 1997). In a typical FCT paradigm, the functional reinforcer is delivered on a relatively dense schedule of reinforcement (e.g., Kelley, Lerman, & Van Camp, 2002) following the emission of a targeted, socially acceptable communication response (e.g., a picture ex-

change), and reinforcement is no longer delivered following the inappropriate behavior (i.e., extinction).

A potential limitation of FCT procedures is that following acquisition of the communicative response, individuals may communicate for the reinforcer at high rates or at times when the reinforcer cannot be delivered easily (Volkert, Lerman, Call, & Trosclair-Lasserre, 2009). For example, a child may request access to a video when there is no television present or may request parental attention when the parent is cooking or talking on the phone. To address such situations, some researchers have examined the effects of programming delays to reinforcement in an effort to make FCT treatments more practical for implementation. For example, Hagopian et al. (1998) systematically increased the interval between the communicative response and the delivery of the reinforcer (e.g., attention), whereas Roane, Fisher, Sgro, Falcomata, and Pabico (2004) thinned reinforcer delivery during FCT by restricting access to the participant’s communication materials.

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Address correspondence to David E. Kuhn, Westchester Institute for Human Development, 305 Cedarwood Hall, Valhalla, New York 10595 (e-mail: dkuhn@wihd.org).

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Multiple-schedule arrangements also have been used to thin reinforcer delivery during FCT. Hanley, Iwata, and Thompson (2001) arranged a multiple schedule such that the functional reinforcer (i.e., a piece of popcorn) was available only after communication (i.e., pressing a microswitch) in the presence of a discriminative stimulus (S^D ; a large white circular card). By contrast, communication produced no differential social consequence (i.e., extinction) in the presence of a different stimulus (S^A ; a red rectangular card). Hanley *et al.* found that a multiple-schedule arrangement was effective for thinning reinforcer delivery following communication to 1 min of white-card access for every 4 min of red-card access, while adequate communication and low rates of problem behavior were maintained. Several other investigations (e.g., Fisher *et al.*, 1998; Tiger & Hanley, 2005) have demonstrated the utility of multiple-schedule arrangements for thinning reinforcer delivery during FCT.

There appear to be several benefits of using a multiple-schedule arrangement to facilitate reinforcer delivery thinning following FCT. First, the relevant stimuli provide salient cues regarding the availability or unavailability of reinforcement. Second, caregivers can control when reinforcement is and is not available by manipulating the presentation of the relevant stimuli. In addition, the discriminative stimuli may assist in the maintenance of treatment effects when transferred to novel settings. However, the use of multiple schedules is not without potential limitations. Most, if not all, applied research on multiple schedules has employed artificial stimuli to signal the reinforcement schedules, such as drawings, cards, and leis (Fisher *et al.*, 1998; Hanley *et al.*, 2001; Tiger & Hanley, 2005). These stimuli represent added materials that must be transported between environments. In addition, caregivers must be vigilant in the presentation and removal of the stimuli to maintain adequate stimulus control over responding. Finally, for

this arrangement to be successful, the individual must attend to the relevant stimuli. Thus, although effective, multiple schedules may present specific challenges for implementation.

To date, no research has examined the utility of multiple schedules through the incorporation of naturally occurring stimuli. For example, individuals with well-developed social repertoires may learn that the probability of reinforcement depends on the environmental conditions under which a request for reinforcement is made, including whether the requested reinforcer is readily available (e.g., asking to watch TV while at a restaurant) or whether another person is available to deliver the reinforcer (e.g., requesting tickles from the person driving the car).

In naturalistic (nonclinical) settings, the introduction or removal of the schedule-correlated stimuli is likely to be associated with different caregiver activities. That is, a caregiver would likely present an S^D (e.g., saying, "Do you want to play?") during times when he or she is available to reinforce communications (i.e., is not busy) and remove the S^D or present an S^A (e.g., picking up a book to read) during times when he or she would not be able to reinforce communications (i.e., is busy). Thus, during each of these times, caregivers would be likely to engage in behaviors that could be characterized as either busy or nonbusy. These overt behaviors may have discriminative functions, especially when they are associated with differential reinforcement. Developing procedures to teach individuals to attend to and discriminate between caregiver behaviors would represent a significant advancement in both the treatment of socially mediated problem behaviors and the applied research on multiple schedules. Thus, the purpose of the current study was to extend the research on the use of multiple schedules following FCT by teaching individuals with developmental disabilities to recognize potential discriminative stimuli that he or she might encounter in naturalistic

settings (i.e., the overt behavior of staff) and to respond to those stimuli within the context of a multiple-schedule arrangement in the treatment of attention-maintained problem behavior.

METHOD

Participants and Settings

Two individuals who had been admitted to an inpatient unit for the assessment and treatment of severe problem behavior participated in this study. Angela was an 8-year-old girl who had been diagnosed with autistic disorder, stereotypic movement disorder with self-injurious behavior, and unspecified mental retardation. Her primary topographies of problem behavior included self-injurious behavior (SIB) and disruption. She could follow two-step instructions, had a limited verbal vocabulary, and occasionally used a few signs. Greg was a 9-year-old boy who had been diagnosed with disruptive behavior disorder (not otherwise specified), moderate mental retardation, and cerebral palsy. He was receiving treatment for aggression and disruption. He communicated primarily using vocal speech and could follow multistep instructions. Due to enunciation difficulties secondary to the cerebral palsy, Greg also communicated using American sign language (ASL).

All sessions were conducted in an individual therapy room (approximately 3 m by 3 m) or in a bedroom on the inpatient unit. Observers recorded data from behind a one-way observation window or, when that was not possible, from within the room as unobtrusively as possible. With the exception of the FCT acquisition sessions, all sessions were 10 min in duration; 6 to 10 sessions were conducted daily.

Response Measurement and Interobserver Agreement

Event recording was used to collect data on Angela's functional communication response (the vocal statement, "excuse me") and her primary problem behavior, head banging (de-

fining as forceful contact of her head on a hard surface). She also displayed other topographies of SIB (e.g., hand-to-head hitting, hand biting, knee-to-head hitting, and eye poking) and disruption (e.g., pushing or swiping objects off surfaces, throwing objects), but these responses were not sensitive to positive reinforcement as a maintaining reinforcer and were not targeted in the treatment analyses described below.

Event recording was used to collect data on Greg's primary problem behaviors, aggression (hitting, scratching, kicking, pinching, grabbing) and disruption (breaking, ripping, tearing objects; throwing objects more than 0.6 m away from a person; hitting and banging on walls and objects; kicking walls or objects; swiping objects off surfaces). His functional communication response was saying "talk to me" while displaying the corresponding ASL sign. Greg also was taught an observing response, which consisted of him saying "Are you busy?" while displaying the corresponding ASL sign. For each communication response, separate data were collected for responses that occurred during busy and nonbusy periods. As a measure of procedural integrity, observers recorded the amount of time in which therapists actually engaged in busy and nonbusy activities.

Trained observers used laptop computers to record the frequency of problem, functional communication, and observing (Greg only) behaviors, and the duration of therapist engagement in busy and nonbusy activities. For all analyses and treatment evaluations, interobserver agreement for frequency-based measures was computed using a proportional agreement calculation. Each session was partitioned into 10-s bins. Agreement coefficients were calculated by dividing the smaller frequency by the larger frequency within each 10-s bin, averaging all of the resulting quotients within a session, and converting the ratio to a percentage. For Angela, data were collected during 39% of all sessions; mean agreement was 95% (range, 94% to 96%) and 95% (range, 91% to 97%) for

head banging and functional communication, respectively. For Greg, data were collected during 37% of all sessions; mean agreement was 94% (range, 75% to 100%) and 97% (range, 93% to 100%) for combined aggression and disruption and all communication (functional communication and observing responses), respectively. Interobserver agreement for duration-based measures was computed by dividing the sum of occurrence agreement (number of intervals when both observers recorded therapist behavior at least once) plus nonoccurrence agreement (number of intervals when both observers did not record therapist behavior) by the sum of occurrence agreement, nonoccurrence agreement, and total disagreements (number of intervals when one observer recorded therapist behavior at least once and the other observer did not record any therapist behavior), and converting the quotient to a percentage. Mean interobserver agreement was 96% and 99% for Angela and Greg, respectively.

Procedure

Functional analysis. Functional analyses were conducted with each participant using procedures similar to those described by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994), although a pairwise design (Iwata, Duncan, Zarcone, Lerman, & Shore, 1994) was employed for Angela. During the functional analyses, specific test conditions (i.e., attention, demand, tangible, and ignore) were compared with a control condition (i.e., toy play). Four test conditions and the control condition were evaluated for Angela, whereas two test conditions and the control were evaluated for Greg. In the toy-play condition, the participants had access to preferred toys, and the therapist delivered praise once every 30 s and ignored problem behavior. During the demand condition, the therapist presented instructions to complete a series of tasks, using a graduated prompting hierarchy involving

sequential verbal, modeled, and physical prompts. The therapist provided praise if the participant completed the task and removed the demand materials and ended the instructional sequence for 30 s following problem behavior. During the attention condition, the participants had access to low-preference toys (i.e., a CD player for Angela, a book and ball for Greg), and the therapist provided brief attention in the form of a verbal reprimand (e.g., “don’t do that”) following each occurrence of problem behavior. During the tangible condition (Angela only), the therapist provided 2-min access to a highly preferred food (cereal) prior to the onset of each session. At the start of the session, the therapist removed the food. Following each occurrence of problem behavior, the therapist delivered an additional bite-sized portion of the food. Finally, during the ignore condition (Angela only), no leisure materials were present, and the therapist did not provide any differential consequences following problem behavior (e.g., no attention).

Acquisition of communication responses. Following the functional analyses, the therapist taught a communication response to each participant as an appropriate alternative response for obtaining the functional reinforcer (i.e., social attention). The therapist taught both participants their targeted communication response using procedures similar to those described by Fisher *et al.* (1998). The therapist taught Angela to say “excuse me,” which she mastered in 21 five-trial sessions. The therapist taught Greg to say “talk to me,” paired with the corresponding ASL sign. Greg mastered his communication response in nine five-trial sessions. Throughout the acquisition phase, all problem behavior was placed on extinction (the therapist ignored problem behavior).

Functional communication training with extinction (FCT+EXT). Following the acquisition of each participant’s FCT response, an evaluation of the effectiveness of FCT combined with extinction of problem behaviors was

Table 1

Therapist busy activities	Therapist nonbusy activities
Cooking	Sitting doing nothing
Writing	Reading a magazine
Napping	Listening to music
Cleaning	Watching television
Talking	Brushing hair
Telephone	Reading a newspaper

conducted. Across baseline and FCT+EXT conditions, the therapist engaged in two different activities during the course of each session. Specifically, for half of each session the therapist engaged in an activity that was categorized as busy, and during the other half of each session, the therapist engaged in an activity that was categorized as nonbusy. Busy and nonbusy activities were identified as activities that commonly occur in the natural environment and were categorized as busy or nonbusy based on whether or not the activity could be interrupted easily (see Table 1 for lists of busy and nonbusy activities). For each session, one busy and one nonbusy activity were selected randomly from the list. A sufficient number of sessions were conducted such that every activity was selected at least once in both baseline and FCT conditions. During each session the order of busy and nonbusy activities was randomized across sessions. For example, in one session the therapist engaged in a busy activity for the first half of the session and a nonbusy activity for the second half, and in a second session the order was reversed.

The baseline condition was similar to the attention condition of the functional analysis (i.e., the participant had access to low-preference toys, and the therapist provided a verbal reprimand following each instance of problem behavior), except that the duration of reinforcement was increased to 30 s, and physical attention was added to the verbal attention for both participants. In the FCT+EXT condition, participants received 30 s of verbal and physical attention following the emission of their target FCT response, and problem behavior no longer

produced attention. During the baseline and treatment conditions, problem behavior (baseline) or FCT responses (FCT+EXT) were reinforced independent of the activity in which the therapist was engaged. For both participants, FCT evaluations were conducted with reversal designs.

Discriminated functional communication training (DFCT). After Angela and Greg learned to appropriately request adult attention while displaying low levels of problem behavior, DFCT was conducted to teach them when it was and was not appropriate to request adult attention, based on the activity of the therapist. That is, the goal of this phase was to teach the participants to attend to the overt behavior of the therapist as signals regarding the availability of reinforcement. A multiple baseline design was used with each participant, across pairs of busy and nonbusy therapist behaviors.

For each participant, two busy and two nonbusy activities were selected randomly from the list (see Table 1). Next, one of the selected busy activities was paired with one of the selected nonbusy activities for each participant, such that two pairs of busy and nonbusy activities were created for each participant. During all phases, the therapist engaged in busy activities. The busy activities were talking to another person (Pair 1) and cleaning (Pair 2) for Angela and napping (Pair 1) and writing (Pair 2) for Greg. Nonbusy activities were sitting while doing nothing (Pair 1) and listening to music (Pair 2) for Angela and sitting doing nothing (Pair 1) and reading a magazine (Pair 2) for Greg. To provide several opportunities within a session to discriminate between the activities, the therapist alternated between activities every 2.5 min. For example, during Pair 1 sessions with Greg, the therapist engaged in napping for the first 2.5 min, sitting and doing nothing for the second 2.5 min, napping again for the third 2.5 min, and sitting doing nothing again for the final 2.5 min. The order of busy and nonbusy activities within each

pair was randomized across sessions such that approximately one half of all sessions began with a busy activity and the other half began with a nonbusy activity.

Baseline sessions were identical to the FCT+EXT condition described above, in which appropriate communication (e.g., saying, "excuse me") was reinforced for 30 s (e.g., the therapist saying, "Of course, I will talk to you," while providing physical attention) independent of the therapist engaging in busy or nonbusy behavior, and problem behavior was placed on extinction. During the DFCT condition, the therapist provided 30 s of social attention only following communication that occurred while the therapist was not busy, and the therapist ignored any requests made during times associated with busy activities. In the final phase of DFCT, the therapist provided Angela with noncontingent access to highly preferred items identified via a preference assessment (Fisher *et al.*, 1992) in an attempt to further decrease the occurrence of head banging (Fisher, O'Connor, Kurtz, De-Leon, & Gotjen, 2000).

DFCT with observing behavior (Greg only). Because Greg's problem behavior persisted at low levels during times in which the therapist was busy, the therapist taught him to emit an observing response. Specifically, the therapist taught Greg to say, "Are you busy?" while he displayed the corresponding ASL sign. A response of "yes" by the therapist indicated that subsequent requests for attention would be not be reinforced, whereas "no" indicated that attention would be available following an appropriate request (i.e., "talk to me"). To minimize the amount of attention Greg received during the communication sequence, the therapist signed "yes" or "no" following his inquiry but did not provide a vocal response.

A modeling procedure was used to teach Greg the observing response. One therapist engaged in a busy or nonbusy activity (e.g., napping or sitting doing nothing), and a second therapist would ask, "Are you busy?" while

displaying the corresponding ASL sign. If the first therapist signed "yes," the second therapist did not ask for attention. However, if the first therapist signed "no," the second therapist requested attention by saying "talk to me" and displaying the corresponding ASL sign, which resulted in the delivery of attention. After this observing behavior was modeled for two sessions, identical training sessions were conducted with Greg. Training continued until he appropriately asked for attention only when the therapist signed "no" following the observing response during 80% of trials for three consecutive sessions.

Following training, the observing behavior was introduced into each pair in accordance with a multiple baseline design. With the exception of the additional observing response, the DFCT with observing behavior condition was identical to the DFCT condition described above.

Generalization. Following the initial FCT and DFCT evaluations, generalization was conducted to determine whether the acquired skills related to discriminated responding would transfer to therapist activities from the list (i.e., Table 1) that were not included in the DFCT phase of the investigation. Pairings of busy and nonbusy activities were arranged similar to those described during FCT+EXT (see above). The generalization condition was similar to the DFCT condition in that the therapist differentially reinforced communication during nonbusy times only. A total of six sessions were conducted in this phase such that each therapist activity (busy and nonbusy) was presented only once. Again, the specific pairings were selected randomly from the lists of activities, and the order of busy and nonbusy activities was randomized in terms of which type of activity occurred first.

RESULTS

Functional analysis. The results of the functional analysis for Angela are depicted in

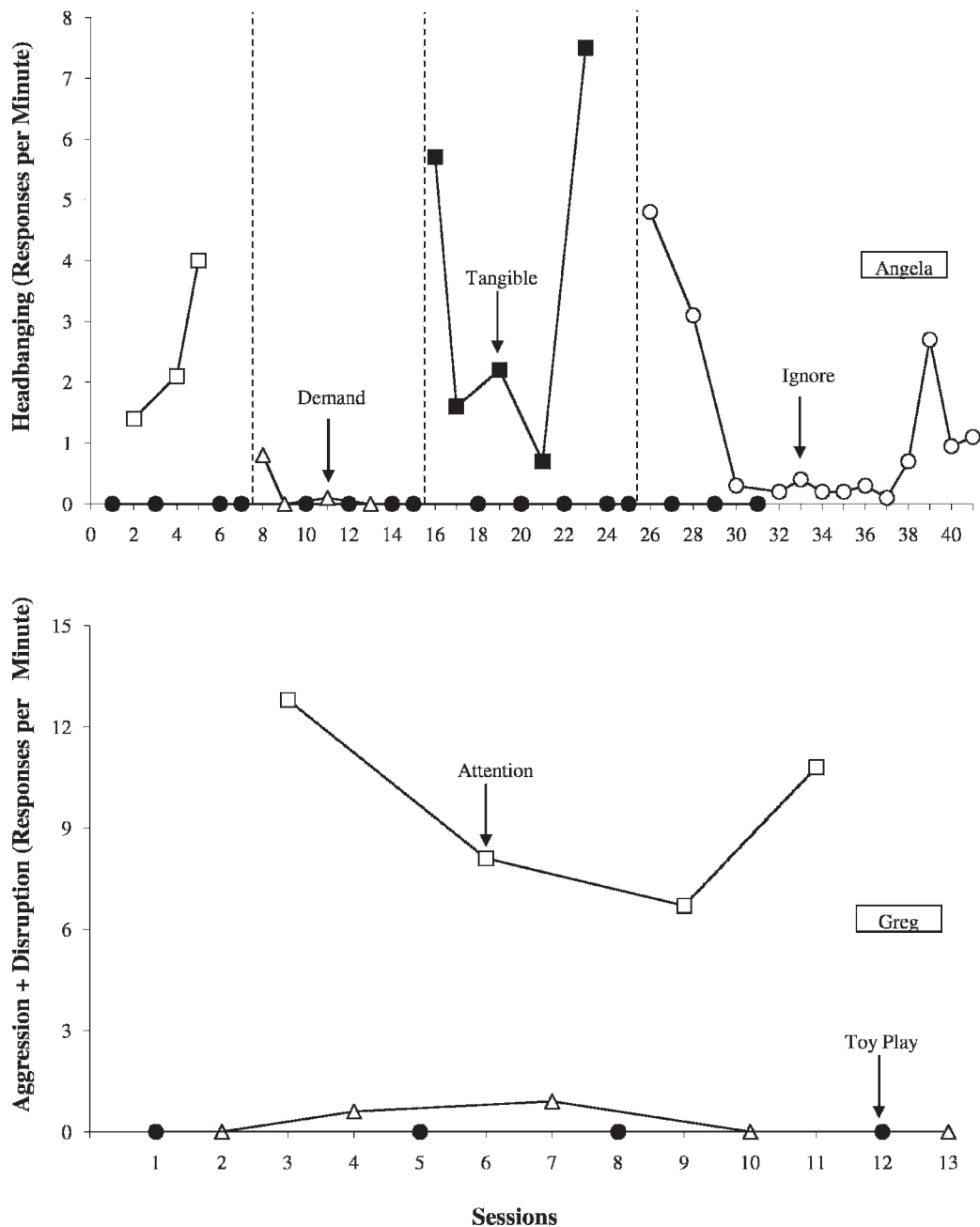


Figure 1. Responses per minute of problem behavior during the functional analyses for Angela (top) and Greg (bottom).

the top panel of Figure 1. Angela displayed the highest rates of head banging in the social attention ($M = 2.5$ responses per minute) and tangible ($M = 3.5$) conditions, compared to the ignore ($M = 1.3$), demand ($M = 0.2$), and toy-

play (0) conditions. The results of the functional analysis suggested that Angela's problem behavior was maintained, in part, by positive reinforcement in the form of contingent access to social attention. It should be noted that head

banging gradually decreased but reemerged during the ignore conditions. It was hypothesized that the reemergence of this behavior was secondary to the initiation of a response-blocking component, which was added due to head injuries sustained outside the session-related activities (i.e., attending to head banging via response blocking may have functioned inadvertently as a reinforcer in the ignore condition). Nevertheless, based on this pattern of responding, it is possible that head banging also was maintained by automatic reinforcement. It should be noted that head banging was the only topography of problem behavior found to be maintained by access to attention; other topographies of problem behavior (other SIB and disruption) were found to be maintained by escape from demands and automatic reinforcement, respectively (data available from the first author).

The results of Greg's functional analysis are depicted in the bottom panel of Figure 1. He displayed high rates of combined aggression and disruption in the social attention ($M = 8.8$ responses per minute) condition and very low levels in the demand ($M = 0.3$) and toy-play (0) conditions. These data indicated that Greg's problem behavior was maintained by positive reinforcement.

FCT+EXT. Results from the FCT+EXT evaluations are depicted in Figure 2. For both participants, baseline phases were characterized by relatively high levels of problem behavior ($M_s = 5.8$ and 2.4 responses per minute for Angela and Greg, respectively). After the introduction (and reintroduction) of FCT+EXT, immediate reductions in problem behavior were observed for Angela and Greg ($M_s = 0.6$ and 0.3 , respectively). In addition, communication emerged for both participants. Overall mean rates of communication during FCT+EXT phases were 1.75 and 1.33 responses per minute for Angela and Greg, respectively. When the occurrence of communication in the presence of busy and nonbusy therapist activ-

ities was assessed, similar rates of communication were observed during busy and nonbusy times for Angela ($M_s = 1.21$ and 1.71 responses per minute, respectively) and Greg ($M_s = 1.40$ and 1.48 responses per minute, respectively). Angela allocated a mean of 51% of requests for attention during times in which the therapist engaged in nonbusy activities and 49% during times in which the therapist engaged in busy activities. Similarly, for Greg, the allocation of communication responses was comparable across times in which the therapist was not busy and busy ($M_s = 53\%$ and 47% , respectively).

Results of this treatment evaluation suggested that reinforcing alternative, appropriate communication while placing problem behavior on extinction decreased rates of problem behavior for both Greg and Angela. In addition, based on undifferentiated responding across busy and nonbusy activities, it was evident that neither Angela nor Greg discriminated when therapist attention was available.

DFCT. Figure 3 depicts the percentage of all communication that occurred in the presence of either busy or nonbusy activities across the baseline and DFCT conditions for Angela (top two panels) and Greg (bottom two panels). Percentages were calculated by dividing the number of communication responses that occurred during the busy period (or nonbusy period) by the total number of communication responses emitted in the session, and converting this ratio to a percentage. During baseline, levels of communication were similar in both the presence and absence of busy and nonbusy activities for Angela (Pair 1: $M_s = 49.8\%$ and 50.2% , respectively; Pair 2: $M_s = 64.6\%$ and 35.4% , respectively) and for Greg (Pair 1: $M_s = 49.2\%$ and 50.8% , respectively; Pair 2: $M_s = 48.9\%$ and 51.1% , respectively). After the therapist began to reinforce communication emitted only in the presence of nonbusy activities, requests for attention occurred more often when the therapist was not busy for

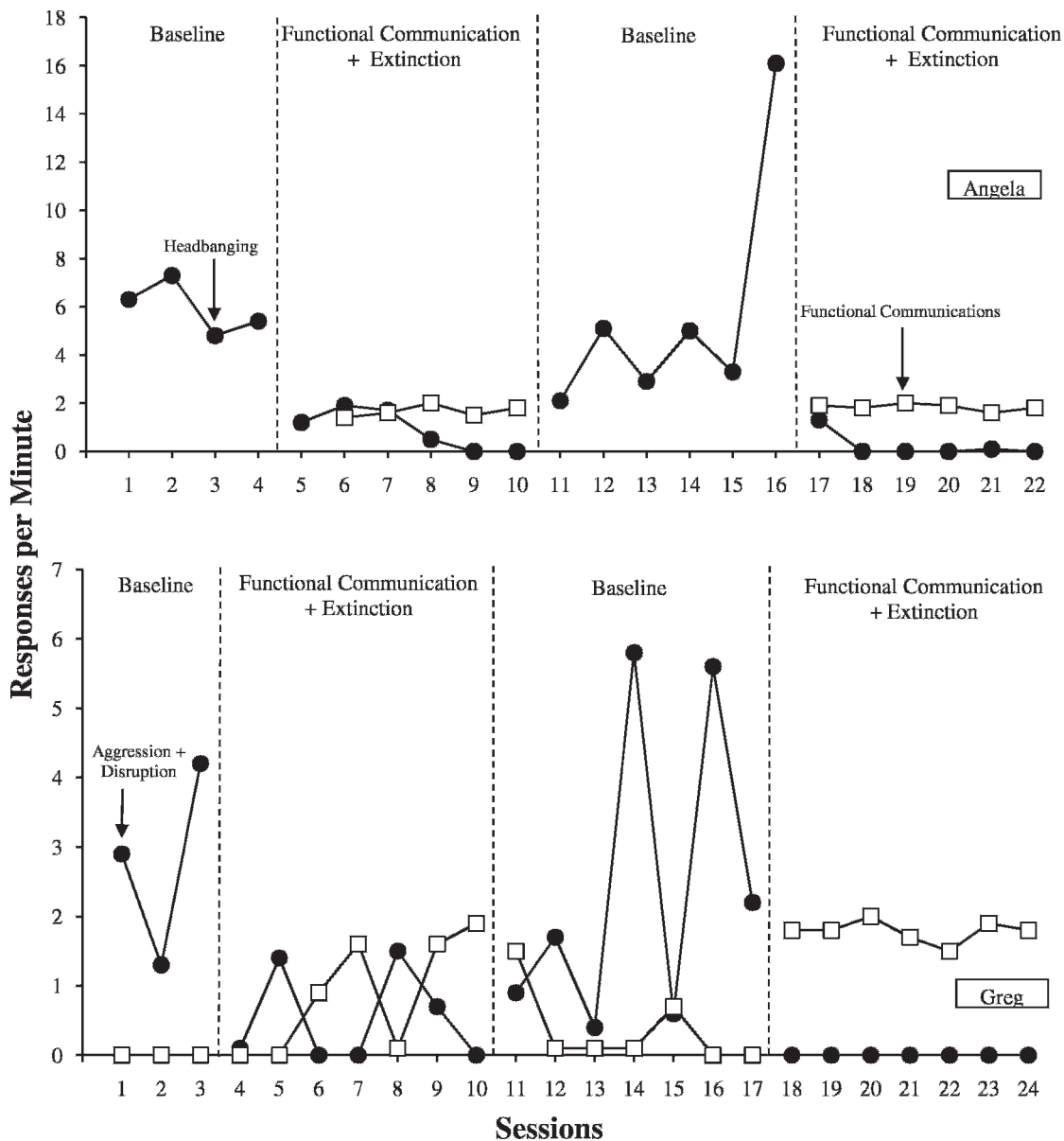


Figure 2. Responses per minute of problem behavior and communication during the FCT+EXT evaluation for Angela (top) and Greg (bottom).

Angela (Pair 1: $M = 82.3\%$; Pair 2: $M = 73.1\%$) and for Greg (Pair 1: $M = 84\%$; Pair 2: $M = 87.2\%$), compared to when the therapist was busy for Angela (Pair 1: $M = 17.7\%$; Pair 2: $M = 23.3\%$) and Greg (Pair 1: $M = 11.2\%$; Pair 2: $M = 12.8\%$). These results were maintained for Angela following the introduc-

tion of preferred items during nonbusy times ($M_s = 86.7\%$ and 93.6% for Pair 1 and Pair 2, respectively) and during busy times ($M_s = 8.7\%$ and 6.4% , for Pair 1 and Pair 2, respectively).

Following the introduction of the observing behavior contingency into both Pairs 1 and 2,

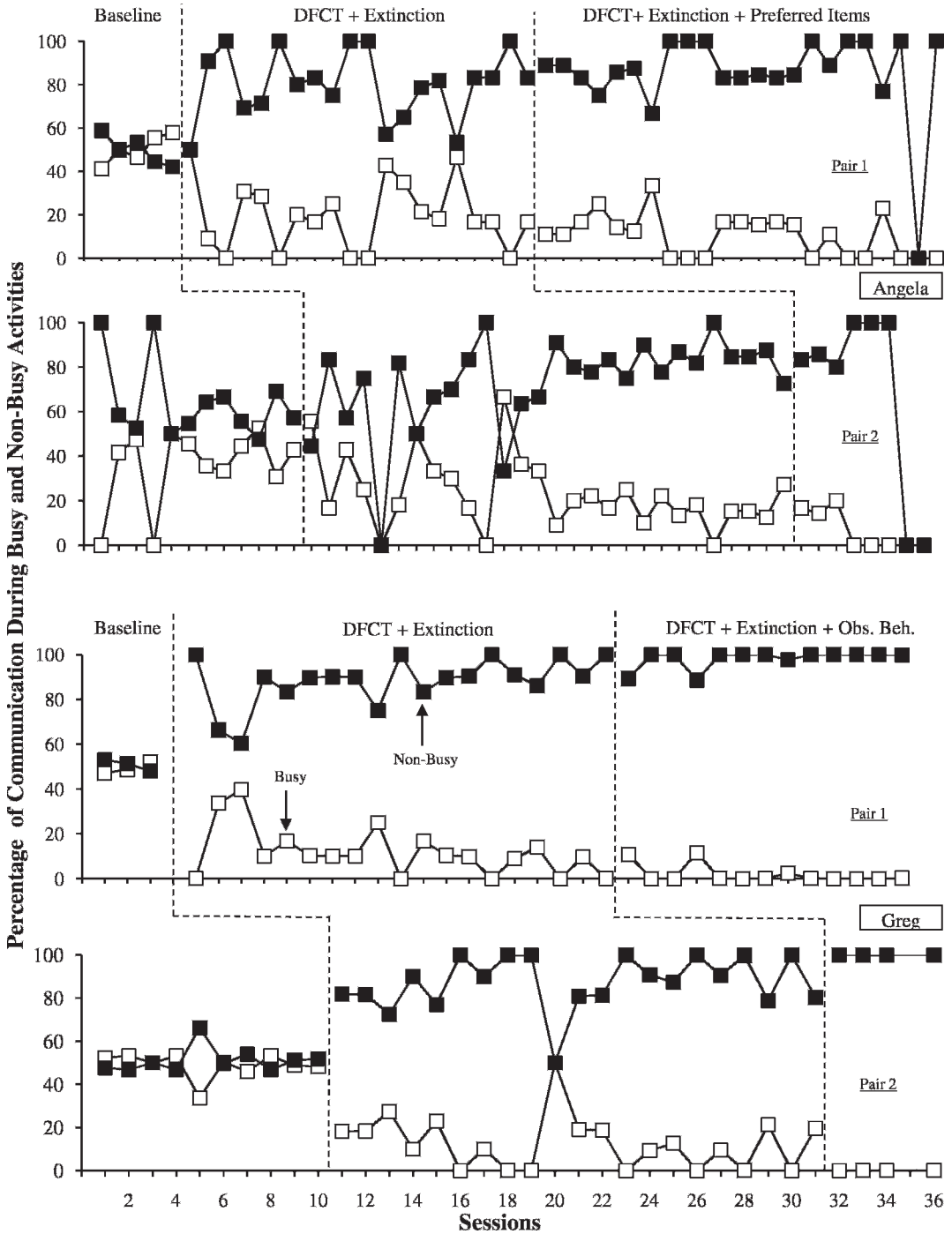


Figure 3. Percentage of total communication during busy and nonbusy activities during DFCT across Pairs 1 and 2 for Angela (top two panels) and Greg (bottom two panels).

Greg rarely emitted the communication response when the therapist was busy, as evidenced by the percentage of communication responses that occurred in the presence of busy activities in Pairs 1 and 2 ($M_s = 0.7\%$ and 0.02% , respectively). Throughout this phase, he predominantly engaged in the observing behavior during times when the therapist was engaged in a nonbusy activity ($M = 76.9\%$ for Pair 1 and 95.4% for Pair 2, data not shown but are available from the first author).

Figure 4 depicts rates of problem behavior observed during the baseline and DFCT evaluations for Angela (top two panels) and Greg (bottom two panels). During baseline, problem behavior occurred at mean rates of 0.1 and 1.0 per minute for Pair 1 and Pair 2, respectively, for Angela. For Greg, near-zero levels of problem behavior were observed during baseline. Recall that the baseline condition of the DFCT evaluation was identical to the FCT+EXT condition; thus, the observed rates during the baseline condition of the DFCT analysis were similar to those observed during the initial FCT+EXT treatment evaluation (see Figure 2). After the introduction of the DFCT contingency, head banging increased slightly for Angela in Pairs 1 and 2 ($M_s = 1.7$ responses per minute for both pairs), whereas problem behavior persisted at low levels for Greg in both Pair 1 and Pair 2 ($M_s = 0.6$ and 0.7 , respectively). When the therapist provided Angela with noncontingent access to preferred toys (i.e., bumble ball, massager), head banging decreased to near-zero levels across both pairs ($M_s = 0.1$ and 0.01 for Pair 1 and Pair 2, respectively). In addition, as shown in the DFCT with observing behavior condition (Figure 4, bottom two panels), rates of problem behavior persisted at near-zero levels for Pair 1 and Pair 2 activities ($M_s = 0.1$ for both pairs).

Generalization of discriminated functional communication. Results of the generalization analysis are depicted in Figure 5. Angela requested attention more frequently during

times in which the therapist engaged in nonbusy activities, as evidenced by the percentage of communication responses that occurred in the presence of nonbusy activities ($M = 83\%$) compared to times in which the therapist was busy ($M = 17\%$). Similarly, for Greg, the highest rates of communication were observed while the therapist was not busy ($M = 92\%$) compared to when the therapist was busy ($M = 8\%$).

DISCUSSION

In the current study, 2 participants learned to communicate appropriately for attention using verbal responses rather than problem behavior. More important, these individuals demonstrated conditional discriminations by requesting attention from the therapist predominantly when attention was available, as signaled by the overt behavior exhibited by the therapist. These data suggest that the participants attended to the behavior of the therapists as schedule-correlated stimuli. In addition, both participants were able to transfer the learned discrimination skills rapidly to busy and nonbusy activities that were not trained specifically in the DFCT phase. Thus, the current data support the utility of schedule-correlated stimuli to control rates of communication and reinforcer delivery during FCT procedures (Fisher et al., 1998; Hanley et al., 2001). Furthermore, these data extend previous research by the inclusion of naturally occurring social stimuli as S^D s (as opposed to artificial S^D s).

Stimulus control over communication was achieved for both Angela and Greg as demonstrated in the DFCT phase of this investigation. It is noteworthy that for Greg the additional contingency of emitting an observing response was helpful in further facilitating discriminations between busy and nonbusy activities. After training the observing behavior, Greg rarely requested attention if the therapist had indicated that he or she was busy. Wyckoff (1952) described the role and potential benefits of observing responses within discrimination

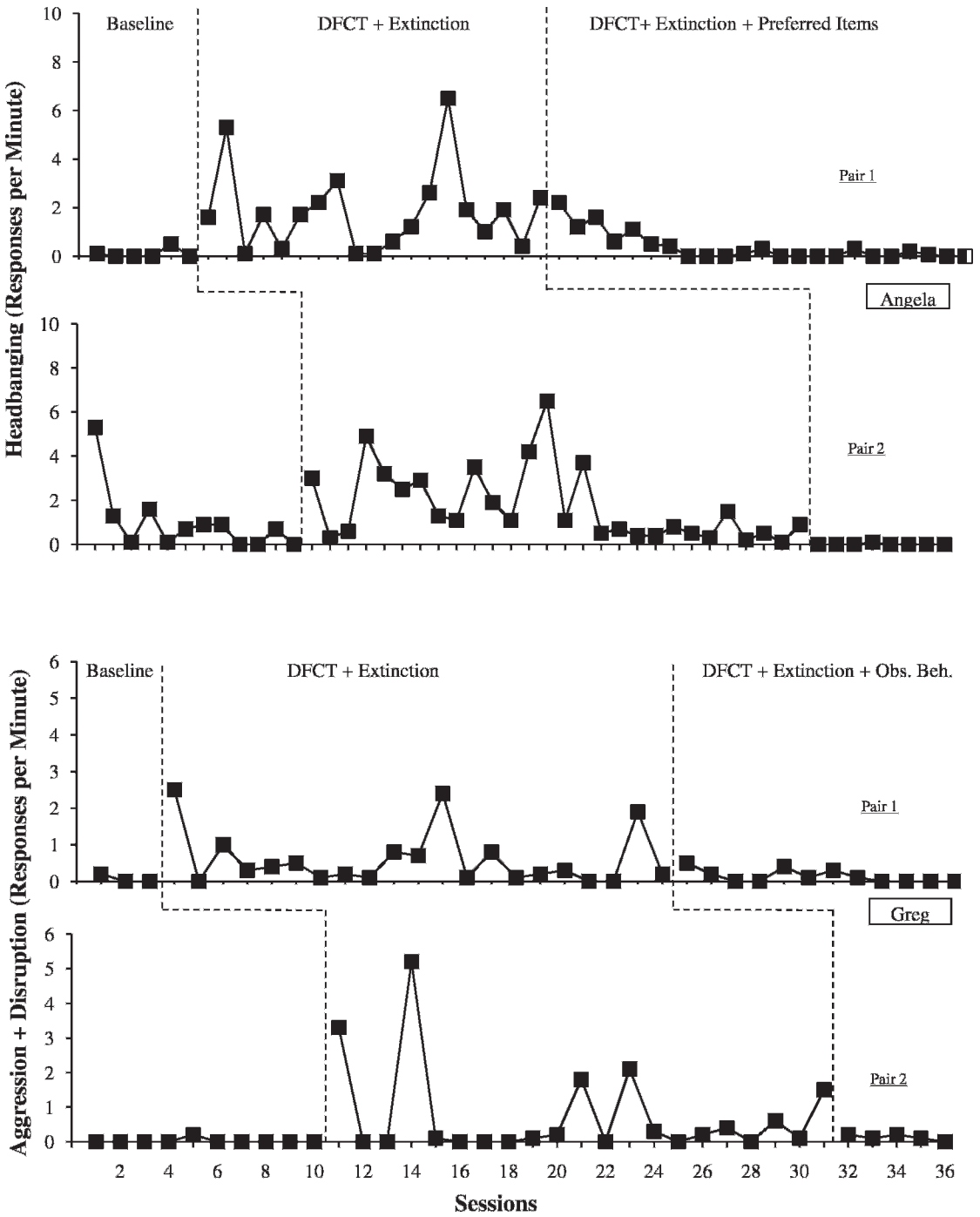
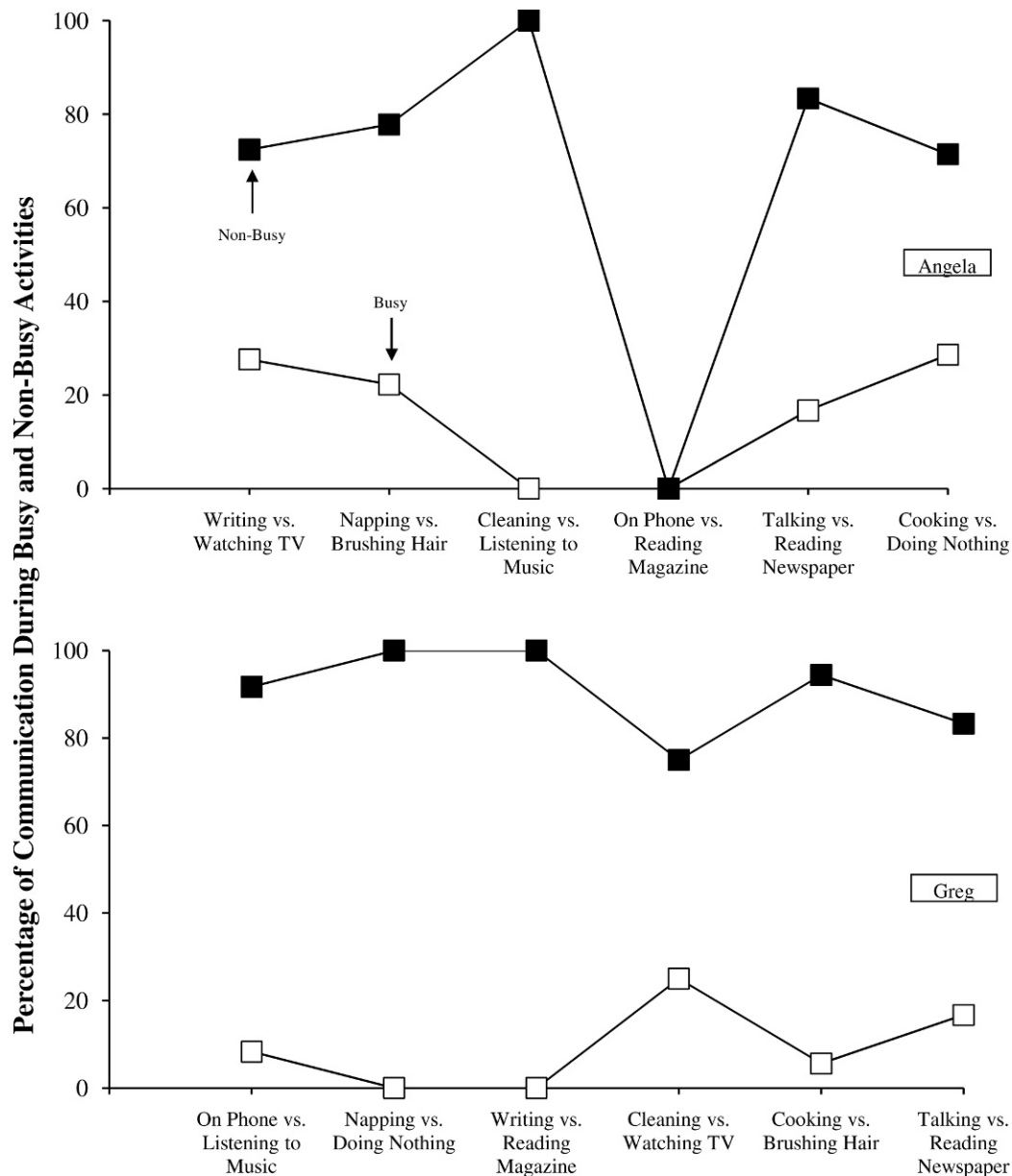


Figure 4. Responses per minute of problem behavior during DFCT across Pairs 1 and 2 for Angela (top) and Greg (bottom).



Busy vs. Non-Busy Behavior

Figure 5. Percentage of total communication during busy and nonbusy activities during DFCT generalization for Angela (top) and Greg (bottom).

learning. Using a basic experimental arrangement, Wyckoff described a condition in which a rat could learn whether a target response (running through a compartment door) would be reinforced by first raising its head above the

door to check for the presence or absence of an S^D . Wyckoff suggested that the observing response persisted in an organism's repertoire because the S^D s also function as conditioned reinforcers. This notion is consistent with the

dual function of stimulus changes within a behavior chain (e.g., Kuhn, Lerman, Vorndran, & Addison, 2006).

Although multiple-schedule arrangements have been demonstrated to be effective for facilitating reinforcer delivery thinning, as described earlier, a possible limitation of this type of intervention is that, in the past, it has involved the use of artificial stimuli that must be presented and removed at the discretion of a therapist or caregiver. The current arrangement permitted staff to engage in activities as he or she typically would in the home or community, under the assumption that his or her behavior functions as an S^D or S^A . It is possible that other studies that have employed multiple schedules have inadvertently included manipulations of schedule-correlated social stimuli. For example, it may be the case that the preschoolers who participated in the investigation conducted by Tiger and Hanley (2005) attended not only to the presence or color of the lei that the experimenter wore but also to the experimenter's overt behavior (e.g., the active delivery of reinforcement to 1 participant may have signaled extinction of responding for Participant 2). Even though Tiger and Hanley stated that the experimenter looked down throughout each session except when he or she provided attention, it is possible that the differential responding within the mixed condition (the lowest levels of communication were associated with times in which the experimenter diverted his or her attention to other students) occurred because the students learned that the experimenter was busy when he or she was attending to another student.

It could be argued that the effects observed in the current study can be explained in a manner similar to that offered by Tiger and Hanley (2005). That is, it is possible that the current participants continued to respond during nonbusy times simply because the delivery of attention functioned as an S^D for subsequent communications and that responding decreased

during busy times simply as a function of extinction. Alternatively, it is possible that the change in therapist behavior functioned as a conditioned punisher to the extent that each stimulus change (i.e., therapist behavior) was correlated with a differential outcome. That is, removal of attention might approximate a time-out contingency. Thus, after repeated pairings, the therapist's behavior (e.g., the therapist getting on the phone) may have suppressed the participant's responding each time the therapist picked up the receiver. Although these explanations remain possible, it is more likely that the participants were attending to the behavior of the therapists, because the therapist's behavior alternated between busy and nonbusy within sessions, and communication primarily occurred during nonbusy times, even following the absence of responding during busy times. Furthermore, both participants displayed alternative behavior during busy times that suggested that they were discriminating between the behaviors of the therapist. For example, they were typically observed to interact with the available leisure items, to sit in a chair looking in the direction of the therapist, or simply to walk around the session room during busy times.

In this study we attempted to teach the participants discrimination among the behaviors of therapists that were associated with different schedules of reinforcement. Only a few specific activities were trained; however, generalization to untrained busy and nonbusy activities was achieved. It is unclear what specific aspects or dimensions of the busy and nonbusy activities functioned as the S^D s. One possibility is simply the physical orientation of the therapists. During several of the busy activities (e.g., cooking, cleaning, talking to someone else), the therapist often faced away from the participant; however, during most of the nonbusy activities, the therapist faced the participant. Although it may not be possible to orient oneself away from the child or adult who

requests attention persistently, physical orientation may be a highly salient S^D or S^A and may be trained more easily. Future research could evaluate differential social cues to determine which dimensions of therapist behavior (e.g., orientation) may function as schedule-correlated stimuli. Also, to ensure that the differential responding was a function of stimulus control and not simply extinction for communication in the presence of busy behavior, future research could evaluate the effects of DFCT without extinction.

Clearly, the number of possible behaviors that could be characterized as busy or nonbusy is too numerous to train. Therefore, it is likely that individuals will need to contact the discriminative functions of different caregiver behaviors as he or she confront them. One way to facilitate that process would be to use an observing behavior, as was done with Greg. By asking "Are you busy?" across all situations, Greg was able to learn whether subsequent requests for attention would be reinforced. Thus, as Greg was exposed to novel therapist behaviors, he was able to clarify whether or not those constituted busy or nonbusy activities and could then respond accordingly. Despite the ability to discern what type of reinforcement schedule was in effect, Greg engaged in the observing behavior most often during times when therapists were not busy, indicating that he made conditional discriminations based on the overt behavior of the therapists.

Unfortunately, the observing response component of this study was not replicated with Angela. The observing behavior was added with Greg as a way to decrease residual communications during busy times. Future research could replicate these procedures, particularly those used with Greg, and demonstrate their effectiveness across time and settings as well as across other behavioral functions. Another possible limitation of this study has to do with the specific busy and nonbusy activities. For the purpose of this study, the appearances of the

activities were arranged to be fairly distinct; however, this is not always the case in the natural environment. There are times when two topographically similar behaviors may be characterized differently in terms of reinforcement availability. For example, in one scenario a parent may be sitting at a table working on a crossword puzzle during which time his or her attention is available (i.e., nonbusy). However, on another occasion the same parent may be sitting at the same table completing some important paperwork that should not be interrupted (i.e., busy). In this example, the nature of the table work is the critical variable, but that may not be apparent to the child who is communicating for attention. In addition, there may be times when the schedule of reinforcement associated with the same behavior is inconsistent both across and within caregivers.

Another limitation to this study is that the communication response of both participants was vocal rather than physical (e.g., manual sign or picture exchange). This type of response allowed the participants to contact extinction of the response during busy times more naturally than if the response involved the participant approaching the therapist and attempting to hand over a card. In addition, Greg was able to identify the probability of reinforcement from across the room simply by asking "Are you busy?" without disrupting the ongoing therapist activity. For individuals who are nonverbal, different accommodations would need to be made, particularly if one were trying to introduce an observing behavior. One possibility would be the use of a sound-producing device, such as a bell, that could be activated by the participant as a means to clarify the schedule of reinforcement.

In conclusion, it is possible that problem behaviors emerge as a function of individuals not discriminating when reinforcement is or is not available and are maintained because the behavior is not differentially reinforced. Thus, teaching individuals to attend to naturally

occurring discriminative stimuli may minimize the likelihood of problem behaviors emerging or may decrease existing problems. Providing individuals with developmental disabilities with the skills to identify and respond to the form of social events as discriminative stimuli may yield results that have both clinical and social significance.

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