FURTHER EXAMINATION OF DISCRIMINATED FUNCTIONAL COMMUNICATION

YANERYS LEON AND NICOLE L. HAUSMAN

KENNEDY KRIEGER INSTITUTE AND
UNIVERSITY OF MARYLAND, BALTIMORE COUNTY

SUNGWOO KAHNG

KENNEDY KRIEGER INSTITUTE AND
JOHNS HOPKINS UNIVERSITY SCHOOL OF MEDICINE

AND

JESSICA L. BECRAFT

KENNEDY KRIEGER INSTITUTE

One child with developmental disabilities was taught to mand for attention by saying "excuse me." Treatment effects were extended to multiple training contexts by teaching the participant to attend to naturally occurring discriminative stimuli through differential reinforcement of communication during periods of the experimenter's nonbusy activities (e.g., reading a magazine). Results are discussed in terms of future research on the generalization and maintenance of functional communication in the natural environment.

Key words: functional communication, treatment generalization

_____

Although research has demonstrated that functional communication training (FCT) is effective as treatment for severe problem behavior (e.g., Hagopian, Fisher, Sullivan, Acquisto, & LeBlanc, 1998), one potential limitation of FCT is that once the alternative response is taught, individuals may request the relevant reinforcer at high rates or at inappropriate times. Recent studies have reported communication in excess of one response per minute (e.g., Hagopian, Contrucci-Kuhn, Long, & Rush, 2005; Hanley, Iwata, & Thompson, 2001). Such rates of communication make high integrity implementation of FCT difficult or ethically questionable depending on the reinforcer used.

One solution to this potential side effect of FCT is to thin the schedule of reinforcement by using multiple schedules (e.g., Hanley et al., 2001). In such arrangements, specific stimuli are correlated with different schedules of reinforcement and serve as discriminative stimuli for the availability or unavailability of reinforcement. Although the use of multiple schedules has proven to be effective in facilitating reinforcement schedule thinning, most applied research has used artificial stimuli (e.g., picture cards, lanyards) that must be transported between different environments and purposefully manipulated to signal which schedule is in effect. A notable exception is that of Kuhn, Chirighin, and Zelenka (2010), who extended this line of research by teaching individuals to attend to naturally occurring stimuli (i.e., caregiver behavior) and to differentially request reinforcement based on whether the caregiver was engaging in busy or nonbusy behavior. Results of the evaluation indicated that individuals with developmental disabilities

could be taught to attend to naturally occurring discriminative stimuli and respond accordingly in a multiple-schedule arrangement.

Although Kuhn et al. (2010) examined whether or not participants' communication occurred under novel busy and nonbusy activities, the evaluation was limited to one setting (inpatient unit) and a limited number of caregivers. Thus, the purpose of the current study was to replicate Kuhn et al. and extend their findings by implementing treatment across multiple novel situations, settings, and experimenters.

METHOD

Participants and Setting

Peter was an 11-year-old boy who had been diagnosed with pervasive developmental disorder, intellectual disability, and bipolar disorder. He had an extensive verbal repertoire including speaking in full sentences and participating in reciprocal conversation. He had been admitted to an inpatient unit for the assessment and treatment of problem behavior (aggression and disruption). Prior to this study, the results of a functional analysis (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994) showed that Peter's problem behavior was maintained by attention, access to tangible items, and escape from demands (data available from the third author). Only problem behavior maintained by attention was treated during this study. Prior to treatment generalization, sessions were conducted in a large classroom on the inpatient unit. Peter had access to a bag with high-preference toys during all phases, including treatment generalization.

Response Measurement and Interobserver Agreement

Trained observers collected data on laptop computers. Data were collected on appropriate communication (saying "excuse me" during nonbusy activities) and inappropriate communication (saying "excuse me" during busy activities). The "excuse me" response was selected because it was already in Peter's verbal repertoire but occurred too frequently in the natural environment. Two observers independently collected data during 29% of treatment sessions. Agreement was calculated by dividing each session into 60 intervals (10 s each), dividing the smaller number of responses by the larger number of responses within each interval, averaging these scores across all intervals, and converting the resulting product to a percentage. Mean appropriate and inappropriate communication agreement coefficients were 98% (range, 92% to 100%) and 99.0% (range, 93% and 100%), respectively.

Procedure

Prior to the initiation of this study, we determined that a baskethold time-out procedure resulted in near elimination of Peter's problem behavior. Therefore, problem behavior resulted in a 30-s baskethold time-out in all phases of this study (i.e., baseline, treatment, and treatment generalization). The focus of this study was solely on discrimination of communication between busy and nonbusy periods.

All sessions were 10 min in duration and were divided into two 5-min periods based on experimenter behavior. Busy and nonbusy activities were paired into two sets. Pair 1 consisted of busy periods in which the experimenter simulated doing work with paperwork and writing utensils (i.e., pen or pencil) and nonbusy periods in which the experimenter sat down without doing anything. Pair 2 consisted of busy periods in which the experimenter was engaged in conversation with someone else and nonbusy periods in which the experimenter simulated reading a magazine (no writing utensils present). Busy and nonbusy periods were selected based on caregiver report of situations in which requests for attention could or could not be reinforced. The order of busy and nonbusy periods within a session was selected randomly prior to each session. (The sequence of busy and nonbusy periods did not

affect the rate at which Peter requested attention within the session.) Three experimenters alternated throughout the baseline and discriminated functional communication (DFC) conditions (excluding treatment generalization sessions). Experimental control was demonstrated using a concurrent multiple baseline design across pairs.

Baseline. The experimenter engaged in the busy and nonbusy activities listed above throughout each 10-min session. If Peter communicated for attention at any point during the session by saying "excuse me," the experimenter delivered 30 s of verbal attention. That is, the experimenter reinforced communication regardless of whether he or she was busy or not busy during baseline.

Discriminated functional communication. During this condition, the experimenter reinforced communication (i.e., 30 s of attention) on a fixed-ratio (FR) 1 schedule only during nonbusy activities. Communication during busy activities was placed on extinction. Due to persistent communication during the busy periods, an instruction was added starting at Session 103 with Pair 1 and Session 81 with Pair 2. Therefore, at the beginning of each busy period, the experimenter told Peter, "I will be busy for five minutes. We can talk after that." If Peter communicated during the busy period, the experimenter responded to the first request by saying, "I am busy now. I will talk to you later." All requests for attention thereafter were placed on extinction for the remainder of the busy period. The experimenter gave this instruction only when moving from nonbusy to busy periods. The experimenter did not give instructions when moving from busy to nonbusy periods.

After discriminated responding was observed with the initial training, treatment generalization sessions were conducted with novel experimenters ($n = 8$), settings ($n = 2$), and situations ($n = 3$). Only one of these three variables was manipulated at a time. For example, in the novel experimenter sessions, the setting and activity pairs were identical to those used throughout the initial evaluation (the only difference was a new experimenter). Novel settings consisted of the main living unit and a hallway. Novel busy situations were the experimenter working on a laptop, reading new books while writing, and talking on a cell phone. The nonbusy periods during treatment generalization were similar to the nonbusy periods during the DFC phase except for novel situations that involved leaving the room. Treatment contingencies continued to be in effect during treatment generalization sessions.

RESULTS AND DISCUSSION

Figure 1 depicts the percentage of communication, which was calculated by dividing appropriate communication or inappropriate communication by the sum of appropriate and inappropriate communication that occurred during busy or nonbusy activities across baseline and treatment phases and converting to a percentage. During baseline, Peter requested experimenter attention at similar levels during both experimenter busy and nonbusy activities. The implementation of differential reinforcement during nonbusy activities resulted in an increase in appropriate responding during nonbusy activities in Pair 1 (top panel; $Ms = 60\%$, 72%, 95%, and 95% for baseline, DFC, DFC plus instruction, and treatment generalization, respectively). However, some variability was observed in Pair 2 (bottom panel). Peter communicated at much higher levels during the busy activities ($Ms = 44\%$, 25%, 83%, and 96% for baseline, DFC, DFC plus instruction, and treatment generalization, respectively). After the experimenter provided Peter with instructions about the busy period, he limited his communication to periods in which the experimenter engaged in nonbusy activities. This discriminated responding continued during the treatment generalization sessions (Figure 2). Finally, problem behavior rarely occurred throughout the evaluation, resulting in implementation of the
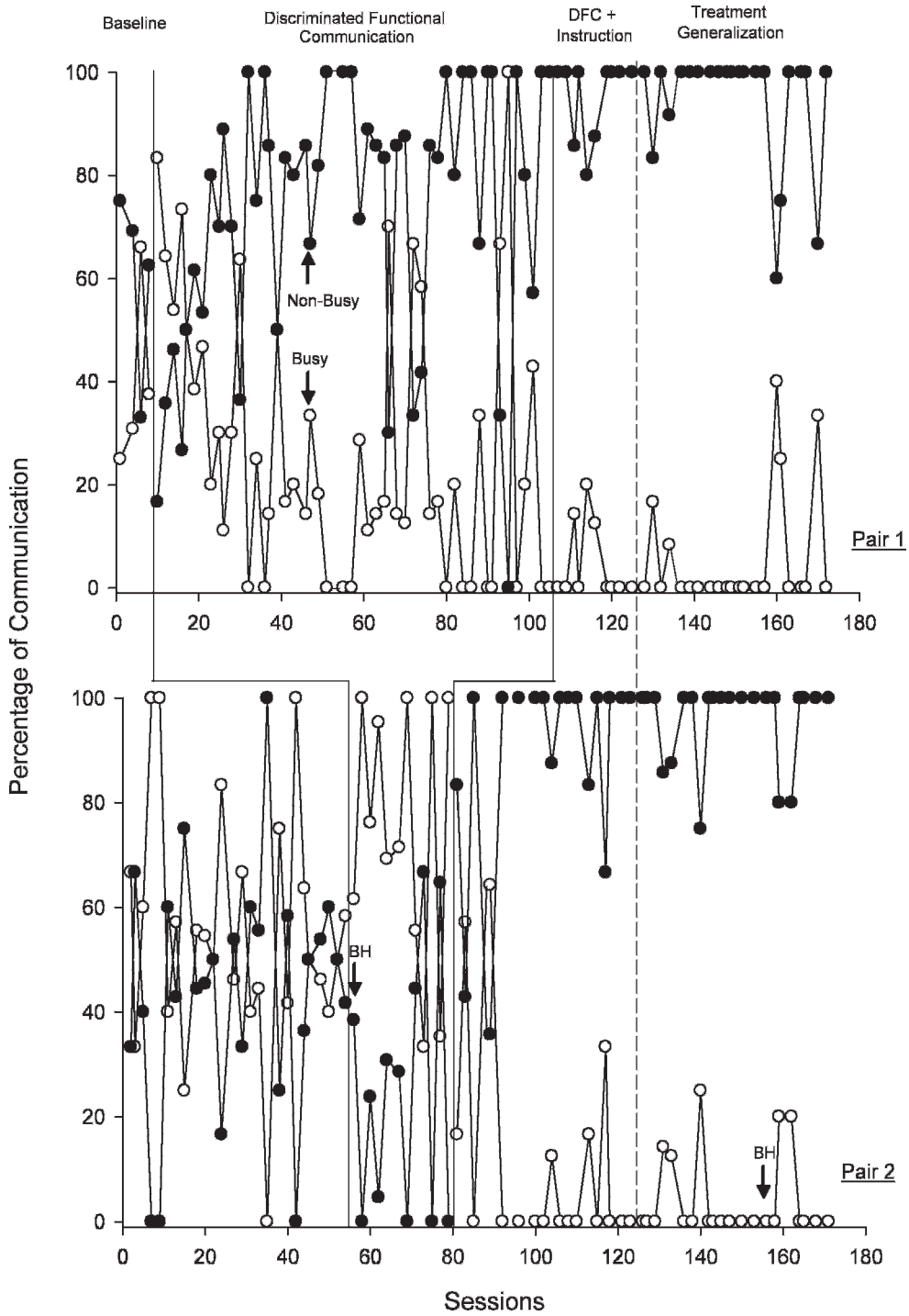
Figure 1.   Percentage of appropriate and inappropriate requests for attention during baseline, DFC, DFC plus instruction, and treatment generalization phases. BH represents sessions in which the 30-s baskethold time-out was implemented.
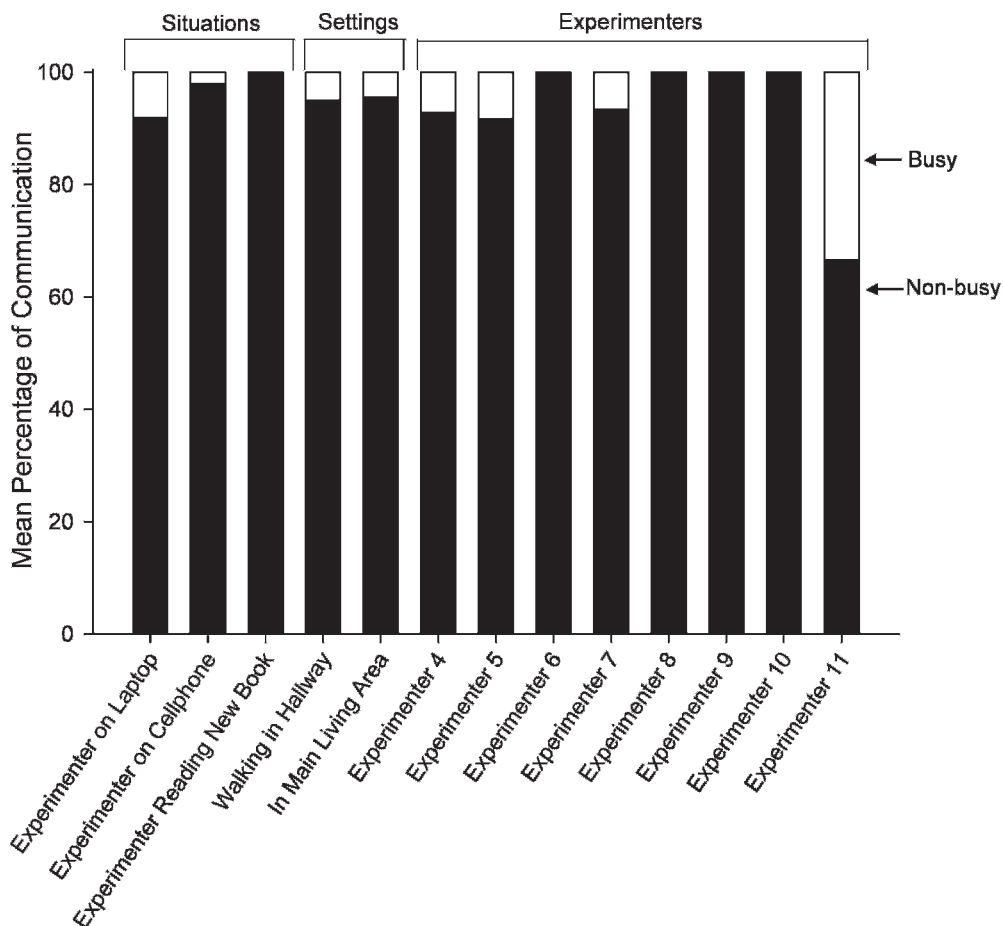
Figure 2. Mean percentage of appropriate and inappropriate requests for attention in the presence of each novel setting, situation, or experimenter during treatment generalization sessions. Data presented in Figure 2 are separated into categories and are the same as those in the treatment generalization phase of Figure 1.

baskethold time-out only twice. Furthermore, there were no differences in the level of problem behavior observed across experimental phases. The results of this study demonstrated that differential reinforcement of communication paired with an instruction can lead to discriminated responding based on experimenters' behavior that represented a range of common busy and nonbusy activities. More important, results indicated that the discriminated communication that was taught during training continued to occur under novel stimulus conditions.

These data lend additional support to those reported by Kuhn et al. (2010), in that participants were taught to attend to naturally occurring, overt experimenter behavior as discriminative stimuli for the availability of reinforcement. Furthermore, this study extends previous research by demonstrating the generality of responding across multiple novel situations, settings, and experimenters. One potential limitation of the current study is that the use of instruction was not examined before the differential reinforcement procedure was implemented. It is possible that instruction alone would have been sufficient. However, much of the applied research on multiple-schedule control of behavior has included

similar instructions (e.g., Tiger & Hanley, 2004; Tiger, Hanley, & Larson, 2008). Furthermore, given that this evaluation was part of a multicomponent treatment aimed to reduce Peter's problem behavior and to provide a structured manner in which he could request attention from his caregivers, the decision to introduce the instruction into Pair 1 coincided with the initiation of caregiver training and was designed to simplify the treatment for caregivers. Future research could examine the effect of instruction without other treatment components in similar situations.

Given the observed wide-ranging treatment effects, one advantage of DFC is that it may promote better generality of treatment effects across different stimulus conditions compared to a single arbitrary stimulus that is correlated with the availability of reinforcement. Future research should compare the generalization-facilitating effects of both procedures. In addition, future research could also examine the generalization of treatment effects to the natural environment by conducting pre- and posttraining probes under nontraining conditions. A final area of future research is to examine the use of unpredictable schedules, because the schedules of reinforcement used in the current study alternated in a highly predictable manner (i.e., 5 min FR 1, 5 min extinction). Future research could examine varied schedules of reinforcement and their effect on DFC.

REFERENCES

Hagopian, L. P., Contrucci-Kuhn, S. A., Long, E. S., & Rush, K. S. (2005). Schedule thinning following communication training: Using competing stimuli to enhance tolerance to decrements in reinforcer density. *Journal of Applied Behavior Analysis, 38*, 177–193.

Hagopian, L. P., Fisher, W. W., Sullivan, M. T., Acquisto, J., & LeBlanc, L. A. (1998). Effectiveness of functional communication training with and without extinction and punishment: A summary of 21 inpatient cases. *Journal of Applied Behavior Analysis, 31*, 311–235.

Hanley, G. P., Iwata, B. A., & Thompson, R. H. (2001). Reinforcement schedule thinning following treatment with functional communication training. *Journal of Applied Behavior Analysis, 34*, 17–38.

Iwata, B. A., Dorsey, M. F., Slifer, K. J., Bauman, K. E., & Richman, G. S. (1994). Toward a functional analysis of self-injury. *Journal of Applied Behavior Analysis, 27*, 197–209. (Reprinted from *Analysis and Intervention in Developmental Disabilities, 2*, 3–20, 1982)

Kuhn, D. E., Chirighin, A. E., & Zelenka, K. (2010). Discriminated functional communication: A procedural extension of functional communication training. *Journal of Applied Behavior Analysis, 43*, 249–264.

Tiger, J. H., & Hanley, G. P. (2004). Developing stimulus control of preschooler mands: An analysis of schedule-correlated and contingency-specifying stimuli. *Journal of Applied Behavior Analysis, 37*, 517–521.

Tiger, J. H., Hanley, G. P., & Larsen, K. M. (2008). A practical variation of a multiple-schedule procedure: Brief schedule-correlated stimuli. *Journal of Applied Behavior Analysis, 41*, 125–130.