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ENHANCING THE EFFECTS OF EXTINCTION ON ATTENTION-MAINTAINED BEHAVIOR THROUGH NONCONTINGENT DELIVERY OF ATTENTION OR STIMULI IDENTIFIED VIA A COMPETING STIMULUS ASSESSMENT

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Recent research has shown that the noncontingent delivery of competing stimuli can effectively reduce rates of destructive behavior maintained by social-positive reinforcement, even when the contingency for destructive behavior remains intact. It may be useful, therefore, to have a systematic means for predicting which reinforcers do and do not compete successfully with the reinforcer that is maintaining destructive behavior. In the present study, we conducted a brief competing stimulus assessment in which noncontingent access to a variety of tangible stimuli (one toy per trial) was superimposed on a fixed-ratio 1 schedule of attention for destructive behavior for individuals whose behavior was found to be reinforced by attention during a functional analysis. Tangible stimuli that resulted in the lowest rates of destructive behavior and highest percentages of engagement during the competing stimulus assessment were subsequently used in a noncontingent tangible items plus extinction treatment package and were compared to noncontingent attention plus extinction and extinction alone. Results indicated that both treatments resulted in greater reductions in the target behavior than did extinction alone and suggested that the competing stimulus assessment may be helpful in predicting stimuli that can enhance the effects of extinction when noncontingent attention is unavailable.

DESCRIPTORS: attention-maintained problem behavior, competing stimuli, extinction, functional analysis, noncontingent reinforcement

Since the emergence of functional analytic methods, treatment of severe behavior disorders using extinction has become considerably more precise (Iwata, Pace, Cowdery, & Miltenberger, 1994). That is, by identifying the specific reinforcers for problem behavior, functional analysis also specifies the contingency that must be discontinued for extinction to occur. Nevertheless, extinction implemented in isolation has a variety of potential limitations.

One limitation of extinction is that it is sometimes associated with a rather gradual decline in rates of the target behavior (e.g., Goh & Iwata, 1994). Another important limitation of implementing extinction in isolation is that it sometimes removes the individual's primary means of obtaining reinforcement without providing an alternative; this may result in a substantial decrease in the amount of reinforcement received. A related limitation is that when extinction produces reinforcement deprivation, negative side effects like bursts of the target response, extinction-induced aggression, and emotional behavior are more likely (Goh & Iwata; Lerman & Iwata, 1996; Lovaas, Freitag,

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Gold, & Kassorla, 1965; Piazza, Patel, Gulotta, Sevin, & Layer, 2003).

One approach that has been used to offset these limitations has been to combine extinction with delivery of the consequent stimulus that historically reinforced problem behavior on a response-independent or time-based schedule, a treatment sometimes referred to as *noncontingent reinforcement* (NCR; Vollmer, Iwata, Zarcone, Smith, & Mazaleski, 1993). Although this term has been criticized for being inaccurate and imprecise (for discussions of the terminology issues, see Poling & Normand, 1999; Vollmer, 1999), we use it here to maintain contact with the literature most relevant to the current investigation.

In contrast to extinction (implemented alone), NCR often results in rapid and large reductions in problem behavior, and the individual is not deprived of access to the stimulus that historically reinforced problem behavior (e.g., Hagopian, Fisher, & Legacy, 1994; Lalli, Casey, & Kates, 1997). In addition, Vollmer et al. (1998) compared the effects of extinction with and without NCR and found that extinction, when implemented alone, was associated with bursts of behavior for 2 of the 3 participants, whereas extinction with NCR was not.

One potential difficulty of using NCR to enhance the reductive effects of extinction is that it may not always be possible or feasible to deliver the reinforcer that maintains the problem behavior. For example, problem behavior reinforced by attention is most likely to occur when a parent's (or caregiver's) attention is diverted away from the child (Vollmer, Borrero, Wright, Van Camp, & Lalli, 2001). Thus, this sometimes creates a conflict in which we ask parents to deliver dense, time-based schedules of attention to a child at times when they are busy with other activities (e.g., taking an important phone call; balancing the checkbook; closing windows at the start of a storm).

One approach that has been proposed to address this potential conflict has been to deliver alternative (Hanley, Piazza, & Fisher, 1997), arbitrary (Fischer, Iwata, & Mazaleski, 1997), or competing reinforcers or stimuli (Fisher, O'Connor, Kurtz, DeLeon, & Gotjen, 2000) at times when it is impossible or impractical to deliver the reinforcer that maintains the problem behavior. The terms *alternative, arbitrary,* and *competing* reinforcers have been used in the studies cited above to label preferred stimuli that may compete with the reinforcer for problem behavior but that do not reinforce that behavior (either because a contingency between the response and the stimulus has not previously existed or because a contingency existed but failed to maintain the response). The terms, however, are not interchangeable, because arbitrary reinforcers do not necessarily compete with the behavior of interest. Therefore, for the remainder of this article, we will use the term *competing* to describe stimuli that compete with the reinforcer for problem behavior, because this term seems to clearly describe its relation to the target response and the reinforcer that maintains that response.

A variety of methods have been used to identify competing stimuli, but in most studies, the accuracy of those methods has not been evaluated. Both Hanley et al. (1997) and Fischer et al. (1997) used the paired-choice preference assessment described by Fisher et al. (1992) in selecting the competing reinforcers. Fisher et al. (2000) replicated and extended these findings by showing that a competing stimulus assessment, based on methods used to treat automatic reinforcement (e.g., Piazza et al., 1998; Shore, Iwata, DeLeon, Kahng, & Smith, 1997), could be used to predict which stimuli would and would not effectively compete with attention-maintained destructive behavior.

Although competing stimuli have sometimes reduced problem behavior to low lev-

els without extinction (Fischer et al., 1997; Fisher et al., 2000), from a clinical perspective it may make intuitive sense to combine the two procedures (competing stimuli plus extinction) whenever it is feasible. For example, Hanley et al. (1997) compared the effects of competing stimuli (noncontingent tangible [NCT]) combined with extinction to noncontingent attention (NCA) combined with extinction with 2 participants who displayed destructive behavior reinforced by attention. Both treatments were effective with each participant. However, for 1 participant, destructive behavior decreased gradually (similar to what might be expected if extinction were implemented alone). For the other participant, destructive behavior decreased to zero in the first NCT plus extinction session (before the participant contacted nonreinforced responding or extinction). Thus, in the Hanley et al. study, it appeared that extinction was the primary operative mechanism for 1 participant (the one who showed the gradual decline in responding), whereas the competing stimulus appeared to be the essential operative mechanism for the other participant (the one who showed an immediate reduction in responding). That is, competing stimuli appeared to enhance the effects of extinction with 1 participant but not the other.

Our interpretation of Hanley et al.'s (1997) results (that competing stimuli contributed substantially to the treatment effects in one case but not the other) remains somewhat speculative because the enhancing effects of the competing stimuli were not isolated in that investigation. To isolate the enhancing effects of competing stimuli, it would be necessary to evaluate the effects of competing stimuli with extinction relative to a condition in which extinction was implemented alone, just as Vollmer et al. (1998) evaluated the enhancing effects of NCR by comparing NCR plus extinction with extinction alone. In the current investigation, we extended the results of Hanley et al. and replicated the results of Vollmer et al. by comparing the effects of (a) extinction implemented alone, (b) extinction implemented with noncontingent delivery of the reinforcer that maintained destructive behavior (attention), and (c) extinction implemented with noncontingent delivery of competing stimuli (those identified through the competing stimulus assessment). A secondary purpose of the current investigation was to further evaluate the usefulness of a competing stimulus assessment for destructive behavior reinforced by social contingencies, because the Fisher et al. (2000) study addressed this issue with only 1 participant.

METHOD

Participants and Setting

Four individuals participated in the study. Jill was a 9-year-old girl who had been diagnosed with mild mental retardation. Sally was a 33-year-old woman who had been diagnosed with severe mental retardation and intermittent explosive disorder. Katy was a 5-year-old girl who had been diagnosed with moderate to severe mental retardation. Jill, Sally, and Katy displayed destructive behavior consisting of aggression, self-injury, and disruptive behavior. Carl was a 7-year-old boy who had been diagnosed with severe mental retardation. His destructive behavior included aggression and self-injury. All sessions were conducted in a hospital specializing in the treatment of behavior disorders.

Data Collection and Interobserver Agreement

During all assessment and treatment sessions, trained observers used laptop computers to record the frequency of destructive behavior and the duration of item interaction. A second observer independently collected data on 62% of functional analysis sessions, 38.3% of the competing stimulus assessment trials, and 69.1% of treatment

analysis sessions. For duration measures, the smaller number of seconds per 10-s interval (30-s intervals for Jill's competing stimulus assessment) was divided by the larger number of seconds and multiplied by 100%. For frequency measures, exact agreement coefficients were calculated by comparing observer agreement on the exact number of occurrences of a response during each 10-s interval of a session (30-s interval for Jill's competing stimulus assessment). An agreement was scored if both observers recorded exactly the same number of responses in an interval. Agreement coefficients were computed by dividing the number of intervals with agreements by the total number of intervals in a session and multiplying the quotient by 100%. Average agreement coefficients for Jill were, for aggression, 93.1%; self-injury, 98.2%; disruptive behavior, 93.3%; and item interaction, 88.8%. Average agreement coefficients for Sally were, for aggression, 99.4%; self-injury, 99.9%; disruptive behavior, 99.9%; and item interaction, 97.9%. Average agreement coefficients for Katy were, for aggression, 99.0%; self-injury, 97.8%; disruptive behavior, 77.5%; and item interaction, 96.5%. Average agreement coefficients for Carl were, for aggression, 92.8%; self-injury, 99.9%; and item interaction, 97.9%.

Procedure and Experimental Design

Phase 1: Functional analysis. A functional analysis of destructive behavior was conducted with each participant using procedures similar to those described by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994). The conditions included for each participant varied slightly as a function of caregiver information or initial informal observations. For example, tangible conditions were included if parents reported that toy removal sometimes set the occasion for problem behavior. For Jill, the functional analysis included social attention, demand, tangible, and toy play conditions. In the social attention condition, the therapist read a magazine while Jill was instructed to play quietly with low to moderately preferred toys. Contingent on destructive behavior, the therapist provided a brief verbal reprimand on a fixed-ratio (FR) 1 schedule of reinforcement. In the demand condition, the therapist used three-step guided compliance to instruct Jill to complete educational tasks. Contingent on destructive behavior, Jill was allowed to escape the task for 30 s. The tangible condition was conducted to determine if Jill's destructive behavior was maintained by access to preferred stimuli. In this condition, Jill was given 2-min access to a highly preferred item prior to the session. At the start of the session, the therapist removed the item. Contingent on destructive behavior, Jill was given access to the item for 30 s. The toy play condition was included as a control condition in which no demands were placed on Jill, she received noncontingent access to attention and highly preferred stimuli, and destructive behavior was ignored. All sessions were 10 min in length and were conducted using a multielement design.

Carl's functional analysis was run similarly with the addition of an alone condition. In the alone condition, Carl was placed in an empty session room while one or two data collectors observed through a one-way mirror. Sally's functional analysis was run similarly in that she also was exposed to an alone condition; however, the tangible condition was not included in her functional analysis. For Carl and Sally, all sessions were 10 min in length.

Katy was exposed to social attention, demand, tangible, toy play, ignore, and mands conditions in her functional analysis. The mands condition was based on the test condition of the mand analysis described by Bowman, Fisher, Thompson, and Piazza (1997). In this condition, prior to the be-

ginning of the session the therapist asked Katy, "What do you want to do?" Then the therapist complied with any mands the child emitted (unless the requested activity was dangerous). After 2 min, the session began. The therapist then told Katy, "Now we are going to play my way," and chose a different activity. Contingent on target maladaptive behavior, Katy was given access to 30 s of playing her way. The purpose of this condition was to determine the extent to which Katy's destructive behavior was maintained by compliance with her requests and was conducted as part of a different investigation. In addition, each condition was conducted with one of three different therapists across sessions. This was arranged to confirm anecdotal observations that the majority of her destructive responses occurred in the presence of a specific therapist. For Katy, all sessions were 20 min in length. Finally, the analysis was conducted using a pairwise comparison design (Iwata, Duncan, Zarcone, Lerman, & Shore, 1994) to help Katy discriminate among the different conditions.

Phase 2: Competing stimulus assessments. Phase 2 was then conducted for each participant. A variety of stimuli and activities were selected for the assessment based on caregiver interviews and the results of a prior paired-choice preference assessment (Fisher et al., 1992). Fifteen stimuli were identified for Jill (three of which included interactive play with the therapist), and 11 stimuli were identified for Sally (three with interactive play), Katy, and Carl. In addition, for Sally and Carl, a control condition (in which no stimuli were available) and an NCA condition (in which the therapist verbally interacted with the participant) were evaluated. Finally, Carl's competing stimulus assessment also included an NCA condition in which physical attention (i.e., tickling, rubbing his back) was provided.

In the competing stimulus assessments, each item or condition was presented three times for Carl, Sally, and Katy and four times for Jill. During each trial, an item was presented by itself (no other toys or stimuli were present) and destructive behavior continued to produce attention on an FR 1 schedule. Trials lasted 30 s for Jill, 3 min for Carl, and 4 min for Sally and Katy. Trial length varied across participants partly as a pilot effort to identify the trial duration that best predicted long-term competition effects, again as a prelude to a different investigation. During each trial, observers recorded the frequency of destructive responses and the percentage of the trial time that the participant interacted with the available item. The frequency of destructive behavior was summed across trials for each item and was then converted to rate (responses per minute). The interaction percentages were averaged across trials for each item. Stimuli that competed effectively with destructive behavior (ones with low rates of destructive behavior and high percentages of item interaction) were then evaluated in treatment sessions.

Phase 3: Treatment analysis. All sessions during the treatment analyses lasted 10 min. The baseline conditions were identical to the attention conditions of the functional analysis. That is, at the start of the session, the participant was instructed to play quietly with low to moderately preferred toys (the ones that were present during the attention condition of the functional analysis). These toys were present during all baseline and treatment sessions. Thereafter, the therapist read a magazine in the treatment room and delivered a brief verbal reprimand each time the participant displayed a target response. Rates of behavior during the baseline phases were compared to rates during a treatment phase using an ABAB design.

During the treatment phases, three conditions were alternated in a multielement design, with one exception. Because NCT plus extinction was the primary treatment of in-

terest, we implemented this condition first with each of the 4 participants. We did this so that we could better evaluate the rapidity with which this treatment produced effects on destructive behavior. This eliminated the possibility that reductions observed in the first NCT plus extinction were due, in part, to prior exposure to extinction or NCA plus extinction (i.e., carryover effects).

During extinction, the therapist did not interact with the participant and simply ignored all instances of destructive behavior. During NCA plus extinction, the therapist provided continuous interaction throughout the session, but did not respond differentially to destructive behavior. During NCT plus extinction, the therapist again did not interact with the participant and ignored destructive responses, but stimuli selected on the basis of the competing stimulus assessments (listed below for each participant in the results for Phase 2) were continuously available along with the low to moderately preferred toys that were available across all sessions in Phase 3.

RESULTS

Phase 1. Results of the functional analyses conducted in Phase 1 are presented in Figure 1. Jill's functional analysis suggested that her destructive behavior was maintained by positive reinforcement in the form of access to adult attention (social attention, $M = 7.1$ responses per minute; toy play, $M = 0.05$; demand, $M = 0.8$; tangible, $M = 0.9$). The functional analysis suggested that Sally's destructive behavior was maintained by access to adult attention and escape from instructional tasks (social attention, $M = 1.0$ responses per minute; alone, $M = 0.06$; toy play, $M = 0.2$; demand, $M = 1.2$).

Carl displayed high and variable rates of destructive behavior across the attention, demand, and tangible conditions (social attention, $M = 3.2$ responses per minute; alone, $M = 1.6$; toy play, $M = 0.1$; demand, $M = 1.7$; tangible, $M = 1.3$). Extended evaluation of the social attention and toy play conditions revealed clear differential responding in the attention condition (social attention, $M = 4.3$; toy play, $M = 0.2$). The data from Katy's functional analysis suggested that her destructive behavior was maintained by positive reinforcement in the form of access to adult attention (attention, $M = 16.7$ responses per minute; ignore, $M = 3.4$; tangible, $M = 0.7$; toy play, $M = 0.02$; demand, $M = 2.4$; mands, $M = 1.1$). However, close examination of these data suggested that Katy's destructive behavior was maintained by positive reinforcement with only one of the three therapists. Due to the therapist-specific nature of Katy's destructive behavior, all subsequent treatment evaluation sessions were conducted with this therapist.

Phase 2. Results of the competing stimulus assessment are presented in Figure 2. Jill displayed the lowest rates of destructive behavior when either the make-believe item or the crayons (both interactive play items) were available noncontingently and displayed higher levels of interaction with the former stimulus ($M = 96\%$) than with the latter stimulus ($M = 45\%$). However, these stimuli involved the delivery of both the tangible item and attention. The stimuli that did not involve interactive play that competed best with contingent attention (i.e., produced the lowest rates of destructive behavior) were a Walkman® with a tape (item interaction, $M = 86\%$; destructive behavior, $M \cong 3$ reponses per minute) and a keyboard (item interaction, $M = 76\%$; destructive behavior, $M \cong 2$ responses per minute). These two stimuli were included in the noncontingent tangible condition in Phase 3.

During Sally's competing stimulus assessment, the headphones (with music) were associated with high levels of item interaction ($M = 95\%$) and zero rates of destructive

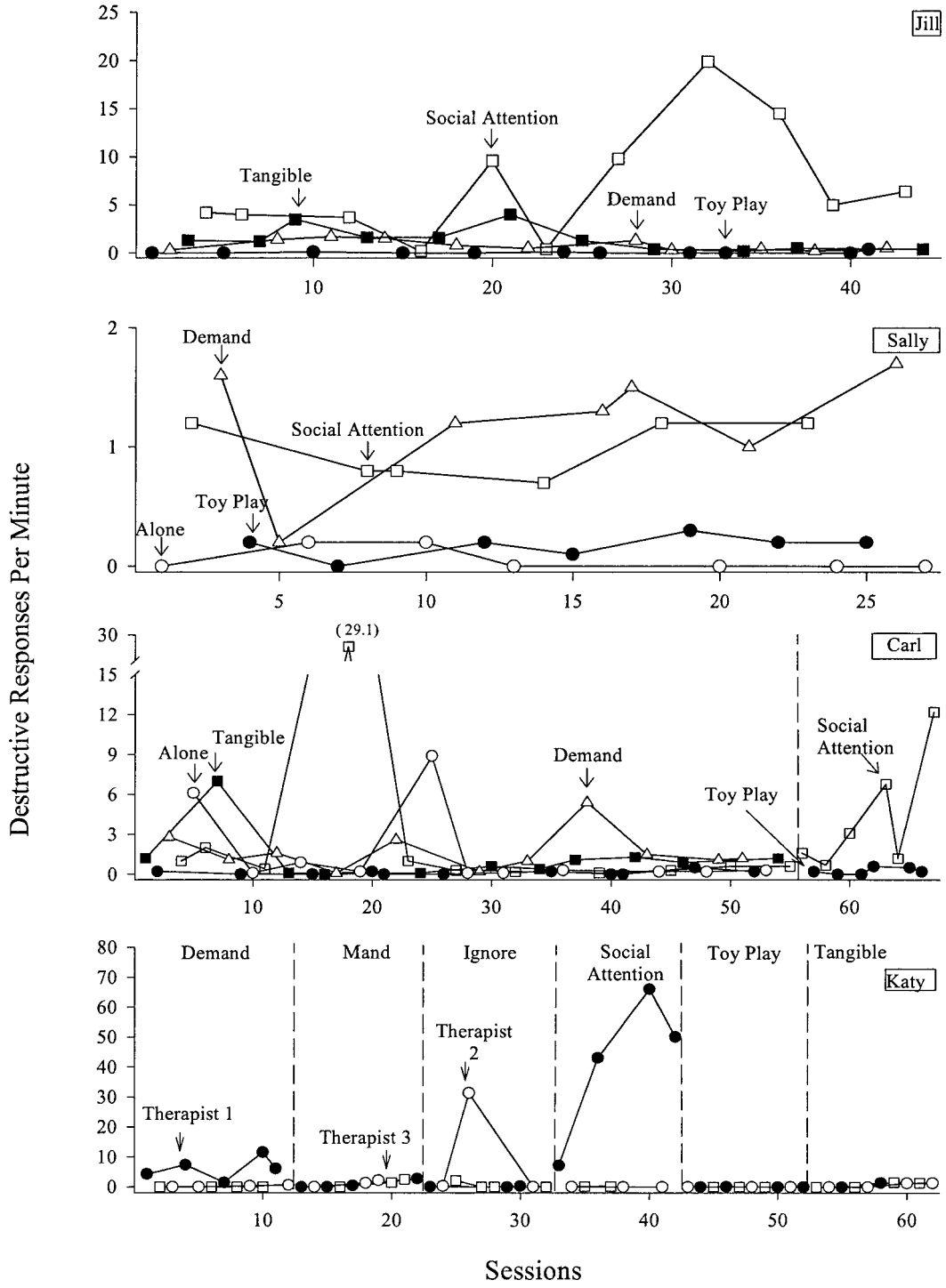

Figure 1. Rates of destructive behavior during functional analysis conditions for Jill, Sally, Carl, and Katy.

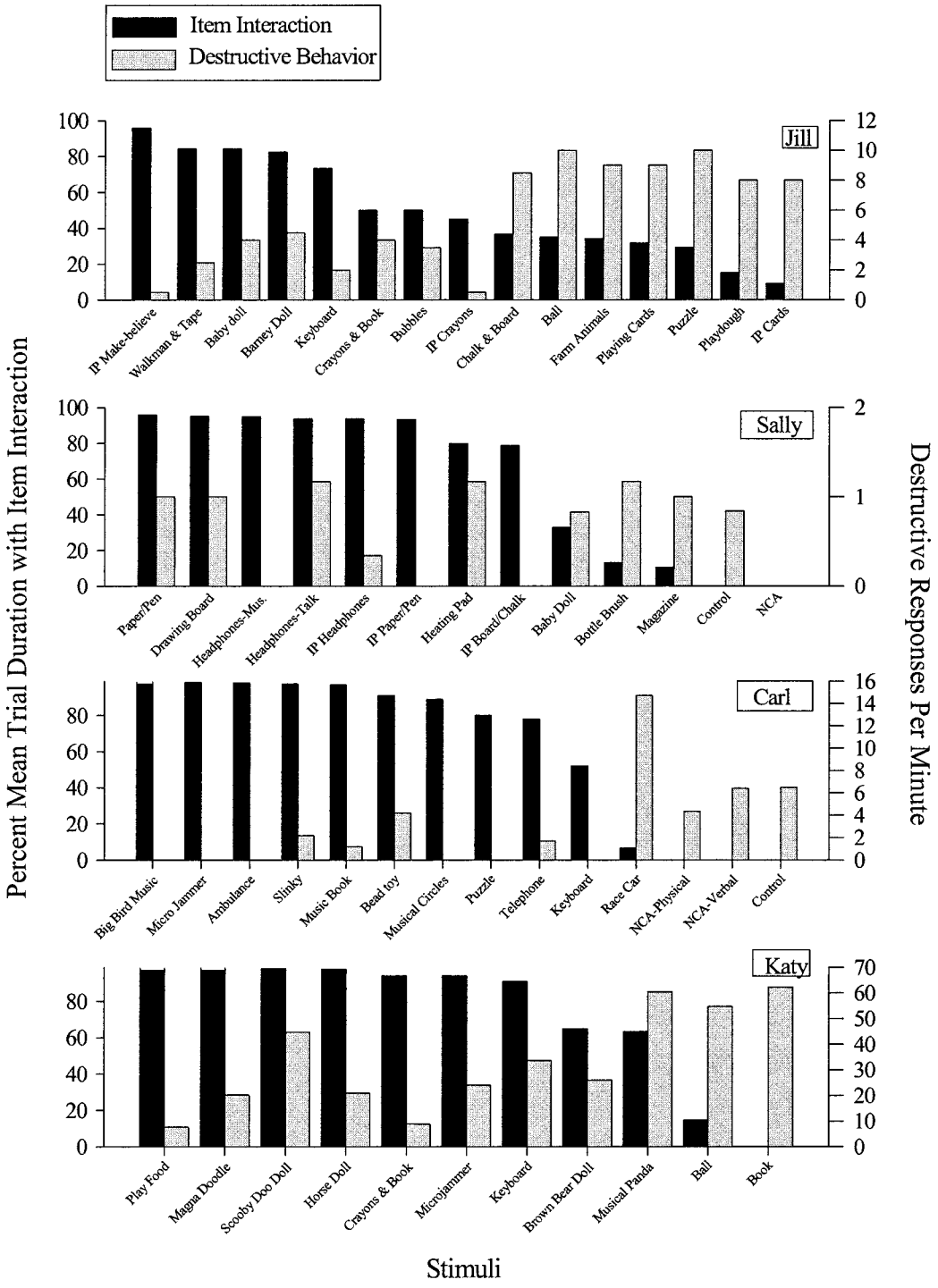

Figure 2. Rates of destructive behavior and mean duration of item interaction during the competing stimulus assessments for Jill, Sally, Carl, and Katy. IP = interactive play.

behavior, and this item was included in the treatment evaluation in Phase 3. During Carl's competing stimulus assessment, a Big Bird® musical toy (item interaction, M = 99.0%; destructive behavior, M = 0) and musical circles (item interaction, M = 89.5%; destructive behavior, M = 0) were identified as stimuli that could compete with attention-maintained behavior. These two stimuli were used in the treatment evaluation in Phase 3.

During Katy's competing stimulus assessment, play food (item interaction, M = 99%; destructive behavior, $M \cong 7.7$ responses per minute), a coloring book with crayons (item interaction, M = 94.2%; destructive behavior, $M \cong 8.8$ responses per minute), and a horse doll (item interaction, M = 97.8%; destructive behavior, $M \cong 20.9$ responses per minute) were stimuli that competed at least to some extent with contingent attention, although rates of destructive behavior were unacceptably high in these sessions. These three stimuli were used in the treatment evaluation in Phase 3.

Phase 3. Results from Phase 3 are depicted in Figure 3. Rates of destructive behavior for Jill averaged about 11 across the two baseline phases. During the treatment analysis, rates of destructive behavior were considerably lower than baseline in all three treatment conditions, with NCA plus extinction producing the lowest rates (M = 0) followed closely by NCT plus extinction (M = 0.5) and extinction (M = 2.1). In addition, NCT plus extinction reduced destructive behavior to zero in 6 of 10 sessions.

Baseline rates of destructive behavior averaged 1.0 for Sally. All three treatment conditions reduced destructive behavior to zero (NCA plus extinction and NCT plus extinction) or almost zero (extinction, M = 0.04). It should be noted that Sally's destructive behavior decreased to zero in the first three treatment sessions, which were NCT plus extinction, extinction, and NCA plus extinction, respectively. This suggests that the noncontingent delivery of the competing stimuli and attention may have decreased destructive behavior in the extinction condition (carryover effects), because Sally did not come in contact with nonreinforced responding in the first extinction session.

Baseline rates for Carl averaged about 4.2 across phases. As with the other participants, all three treatments reduced destructive behavior substantially; however, the lowest rates were observed during NCT plus extinction (M = 0.3), followed by NCA plus extinction (M = 1.1) and extinction (M = 1.9). In addition, extinction was associated with a large burst of destructive behavior in the fourth session.

For Katy, rates of destructive behavior averaged 46.6 across the two baseline phases. Extinction produced a relatively slow and gradual reduction in destructive behavior (M = 9.5). By contrast, both NCA plus extinction (M = 0.1) and NCT plus extinction (M = 0.3 RPM) immediately reduced destructive behavior to almost zero.

Across the 4 participants, NCT plus extinction was always the first treatment implemented so that we could evaluate the rapidity with which it produced effects on destructive behavior. NCT plus extinction reduced destructive behavior to near zero in the first session for Sally, Katy, and Carl and in the second session for Jill. In the one case in which a burst of destructive behavior occurred (Carl), it occurred in extinction but not in NCA plus extinction or NCT plus extinction.

DISCUSSION

In the current investigation, 4 individuals with mental retardation displayed destructive behavior that was shown to be sensitive to attention as reinforcement during the functional analyses conducted in Phase 1. In Phase 2, a competing stimulus assessment

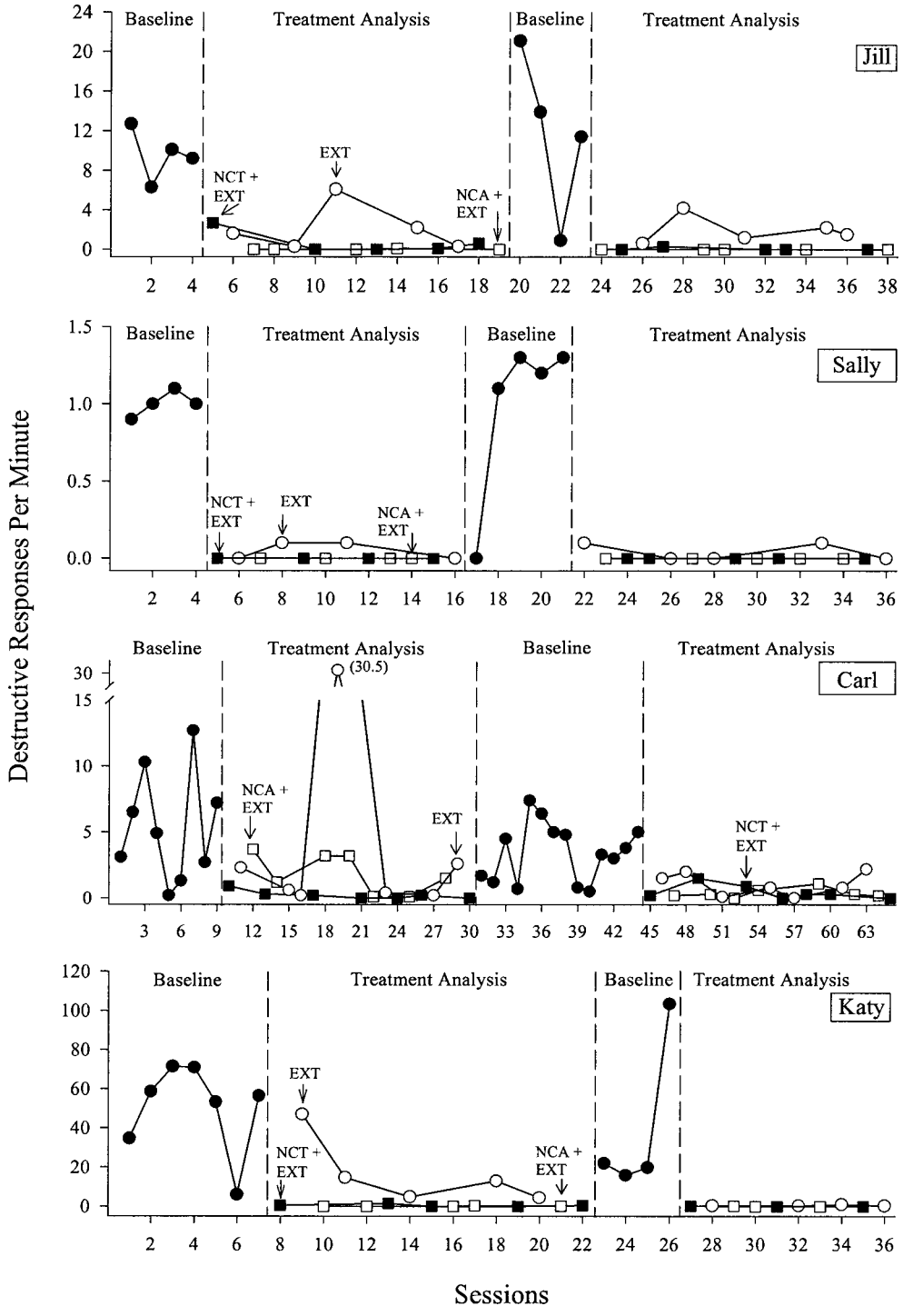

Figure 3. Rates of destructive behavior during baseline and during the extinction (EXT), noncontingent attention plus extinction (NCA + EXT), and noncontingent tangible items plus extinction (NCT + EXT) conditions of the treatment analyses.

(Piazza et al., 1998) was used to identify stimuli (e.g., toys, music) that, when presented noncontingently during brief assessment trials, reduced rates of destructive behavior, even though this response continued to produce its reinforcer (attention) on an FR 1 schedule. In Phase 3, we evaluated whether the stimuli that competed effectively with attention in Phase 2 would enhance the effectiveness of extinction by comparing extinction implemented (a) alone, (b) in combination with NCA, and (c) in combination with the stimuli identified in Phase 2 (NCT plus extinction). In general, results indicated that NCT plus extinction and NCA plus extinction produced rapid and dramatic reductions in destructive behavior (i.e., they were approximately equally effective), and both were more effective than when extinction was implemented alone.

The current investigation adds to the literature on treatment of destructive behavior using competing stimuli in several ways. First, previous investigations have shown that noncontingent presentation of the reinforcer that maintained problem behavior (Vollmer et al., 1998) or competing stimuli (Hanley et al., 1997) in combination with extinction can produce rapid reductions in destructive behavior; however, the current investigation is the first one to directly compare these two approaches relative to the effects of extinction alone. The fact that the competing stimuli were effective substitutes for attention is encouraging.

From a clinical perspective, being able to substitute competing stimuli for the maintaining reinforcer permits greater flexibility in how and when each procedure (NCA or NCT) might be implemented with extinction. NCA plus extinction might be most relevant to situations involving naturally occurring exchanges of social interaction (e.g., meals, games, discussions). During these types of situations, NCA would not require much additional effort on the part of caregivers. For example, a parent might be taught to deliver frequent verbal attention to the child as a routine component of such activities (e.g., including the child in the conversation, periodically talking about topics the child prefers), as well as delivering intermittent physical attention (e.g., pats on the back). In these types of social situations, the amount of additional effort required from the caregiver to implement NCA would be minimal. By contrast, NCT plus extinction might be more relevant to situations in which parents or caregivers are too busy to deliver frequent attention to the child (e.g., preparing for an important meeting at work, intimacy time for the parents). Alternately implementing NCA plus extinction (during naturally occurring social activities) and NCT plus extinction (when it is difficult or inconvenient for caregivers to deliver attention) allows parents and other caregivers more flexibility in planning their daily schedules. For example, if a child displays problem behavior reinforced by attention, the parent could schedule a period of NCA when the child first returns home from school followed by a period of NCT when the parent needs to prepare dinner.

A second contribution of the current investigation is that it showed that the competing stimuli enhanced the effects of extinction about as well as NCA did. That is, in the two cases in which extinction produced a relatively slow and gradual reduction in destructive behavior (Jill and Katy), NCT plus extinction produced an immediate and sustained reduction in the target behavior to near zero (as did NCA plus extinction). Similarly, in the one case in which an extinction burst occurred (Carl), no bursting occurred in NCT plus extinction (or in NCA plus extinction), and rates of destructive behavior were lower in NCT plus extinction than in NCA plus extinction.

A third contribution is that the current results provide further evidence supporting

the utility of the competing stimulus assessment. The purpose of the competing stimulus assessment is to identify stimuli that are effective substitutes for the reinforcer that maintains the target behavior. Reinforcers are said to be substitutable when consumption of one reinforcer is associated with a decrease in consumption of a concurrently available reinforcer (Green & Freed, 1993; Shore et al., 1997). Most previous studies that have used competing stimuli have done so to treat problem behavior purportedly maintained by automatic reinforcement, because it is often difficult or impossible to implement extinction for behavior thus maintained (e.g., Piazza et al., 1998; Piazza, Roane, Keeney, Boney, & Abt, 2002; Shore et al., 1997). The current results show that using a competing stimulus assessment can be useful even with responses reinforced by social consequences, for which extinction can be implemented.

Although the competing stimulus assessment identified stimuli that enhanced the effects of extinction, one limitation of this study is that it remains unclear whether the same result could have been produced with a less time-consuming preference assessment (e.g., DeLeon & Iwata, 1996). However, results of the competing stimulus assessment in this investigation and in the Piazza et al. (1998) study suggest that this approach to identifying competing stimuli provides information not available with other preference assessments. Perhaps the best example of this is the results obtained for Sally in Phase 2. During Sally's competing stimulus assessment, there were multiple stimuli with high levels of item interaction (suggesting that they were highly preferred) and high rates of destructive behavior (suggesting that they were not effective substitutes for attention). In fact, for all of the participants, there were stimuli that appeared to be similar in terms of item interaction (i.e., how much they were preferred) but were different in terms of how well they competed with the reinforcer for destructive behavior (i.e., how well they substituted for attention). Participants in the study by Piazza et al. (1998) showed similar patterns when a competing stimulus assessment was used to identify stimuli that competed with pica. Moreover, in a previous investigation we showed that a competing stimulus assessment accurately identified which stimuli would and would not compete with destructive behavior reinforced by attention (Fisher et al., 2000).

Despite these findings, a better test of the usefulness of the competing stimulus assessment would be to compare it directly with a more efficient preference assessment that does not evaluate substitutability (e.g., DeLeon & Iwata, 1996; Fisher et al., 1992). That is, one could identify items chosen through a different preference assessment that are associated with high levels of problem behavior in the competing stimulus assessment to show that the knowledge obtained in the competing stimulus assessment provides utility beyond that provided by the other format.

Another potential limitation of the current investigation is that the reinforcers used in the NCT conditions were not tested to determine whether they maintained the target response. This approach has been used in other studies as a means of ensuring the arbitrary nature of the stimuli employed (e.g., Fischer et al., 1997). Thus, it remains possible that NCT plus extinction suppressed behavior because it attenuated the motivation to gain access to tangible reinforcers.

Finally, the rates of destructive behavior were not dramatically lower during NCA plus extinction or NCT plus extinction relative to extinction alone. Furthermore, only 1 participant displayed an extinction burst, and in just one session. Although this was not surprising given the prevalence of extinction bursts (24%; Lerman & Iwata,

1996), NCT plus extinction would need to be implemented with many more participants before one could determine the extent to which the presence of competing stimuli help to prevent extinction bursts. However, it is possible that the effects of NCA and NCT would have been more pronounced had the three treatments been compared using a reversal design rather than a multielement design. For example, Sally's destructive behavior decreased to zero in the first treatment session, which was an NCT plus extinction session, and remained at zero during the second treatment session, which was extinction. Thus, Sally's destructive behavior decreased to zero in the first extinction session without contacting extinction (or nonreinforced responding). This raises the possibility that rates of destructive behavior during extinction were lower than they would have been if this intervention had not been alternately implemented in close temporal proximity to NCA plus extinction and NCT plus extinction. Future studies should evaluate the potential benefits of implementing NCA or NCT in combination with extinction (e.g., prevention of bursting, more rapid reductions in problem behavior) with a larger cohort of participants using alternative experimental designs.

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STUDY QUESTIONS

1. What undesirable effects are sometimes associated with the use of extinction?

2. What potential difficulty did the authors describe in attempting to supplement extinction with noncontingent reinforcement, and what alternative approach did they illustrate in the present study?

3. How did Katy's functional analysis differ from those for the other participants?

4. Describe the competing stimulus assessment and how its results were used to identify stimuli used in the current study.

5. Describe the three treatment conditions and how they were compared.

6. Why were the interactive play toys not used in Jill's NCT plus extinction condition even though they produced the lowest rates of problem behavior and highest percentages of item manipulation during her assessment?

7. Summarize the results of the treatment comparison.

8. What is the main practical implication of the present results?

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