

*EFFECTS OF EQUAL AND UNEQUAL REINFORCER DURATION
DURING FUNCTIONAL ANALYSIS*

WAYNE W. FISHER, CATHLEEN C. PIAZZA, AND CHRISTY L. CHIANG

KENNEDY KRIEGER INSTITUTE AND
JOHNS HOPKINS UNIVERSITY SCHOOL OF MEDICINE

In the functional analysis described by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994), reinforcer duration varied across conditions (e.g., brief attention vs. 30 s of escape); this may result in unequal exposure to the establishing operations for aberrant behavior. In this study, we compared the effects of unequal and equal reinforcer duration during a functional analysis. The results showed that reinforcer duration affects the rate of aberrant behavior and may potentially alter functional analysis interpretation.

DESCRIPTORS: functional analysis, behavioral assessment, establishing operation, reinforcement duration

A growing body of research has shown the value of designing behavioral treatments for self-injurious behavior (SIB) and other problem behaviors based on the results of the functional analysis methodology described by Iwata et al. (1982/1994). With this methodology, three analogue test conditions (attention, demand, and alone) and one control condition (play) were alternated within a multielement design. A fifth condition (tangible) was introduced to test the hypothesis that SIB was maintained by positive reinforcement in the form of access to toys or other items. In each test condition, an establishing operation was presumed for problem behavior (i.e., nonpreferred tasks in demand, restricted access to attention or toys in attention and tangible, respectively). When the problem behavior occurred, the presumed reinforcer was presented, and for the duration of the reinforcement interval, the presumed establishing operation was removed (e.g., 30-s cessation of demands).

Problem behavior is much less probable during reinforcer presentation, when the establishing operation is removed (Vollmer, Iwata, Zarcone, Smith, & Mazaleski, 1993). Thus, it is possible that differences in reinforcer duration may differentially affect the rates of problem behavior in the various functional analysis conditions, independent of behavioral function. For example, reinforcement typically lasts 30 s in the demand condition but just a few seconds in the social attention condition. When reinforcement lasts 30 s, the client can gain all potential reinforcement with the least amount of effort by emitting one target response immediately following each reinforcement interval, resulting in a response rate of about two per minute. In contrast, when reinforcement lasts a few seconds, a much higher response rate would be required to obtain a similar amount (duration) of reinforcement. In this case study, we assessed the effects of reinforcer duration by comparing unequal and equal reinforcement intervals during a functional analysis.

This investigation was supported in part by Grant MCJ249149-02 from the Maternal and Child Health Service of the U.S. Department of Health and Human Services.

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

METHOD

Rob, an 11-year-old male with moderate retardation, was hospitalized for the treat-

ment of aggression (hitting, kicking, pinching, pulling hair, biting, or throwing objects at others) and destruction (banging, kicking, ripping, breaking, or overturning objects). All sessions were conducted in a treatment room (3 m by 3 m) equipped with a one-way mirror, behind which a trained observer recorded each observed occurrence of a given target response by pressing a specific key on a laptop computer. Reliability was assessed during 63% of sessions. These sessions were partitioned into 60 10-s intervals to calculate interobserver agreement. Exact agreement coefficients, calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100%, averaged 99% for aggression and 91% for destruction. An agreement was defined as both observers recording the same number of responses in a given 10-s interval.

Four to six 10-min sessions were conducted per day, with at least a 5-min interval between sessions. A combination multielement reversal design was used in this investigation. During the first and third phases, four functional analysis conditions were alternated within a multielement design, and the durations of the reinforcement intervals were brief (lasting about 3 s) in two conditions (attention and play) and longer (30 s) in the other two conditions (demand and tangible). During the second and fourth phases, the same four conditions were conducted according to a multielement design, but the duration of reinforcement was equal across conditions (30 s in all conditions).

During the demand condition, the therapist presented nonpreferred tasks to Rob using sequential verbal, gestural, and physical prompts. If Rob completed the task following either the verbal or the gestural prompt, the therapist provided brief praise and then began the next task. If Rob displayed aggression or destruction, the therapist immediately removed the task and discontinued prompts for 30 s. During the at-

tention condition, Rob was given free access to toys while the therapist read a magazine. Contingent upon either aggression or destruction, the therapist presented Rob with either (a) brief attention in the form of a social reprimand (e.g., "Don't do that; it hurts") during the unequal reinforcer duration phases or (b) 30 s of similar attention (i.e., a longer reprimand) during the equal reinforcer duration phases. For 1 min prior to each tangible session, Rob was given free access to the toys used in the session. This was done to better equate this condition with other test conditions in which the client had access to the presumed reinforcer prior to the session (e.g., Rob typically had access to social interaction prior to attention sessions). At the start of the session, the therapist removed the toys and subsequently returned them to Rob for 30 s contingent upon either aggression or destruction. During play, Rob and the therapist played with toys, and the therapist presented either (a) brief praise (e.g., "You're playing nicely") once every 30 s following a 5-s interval in which aggression and destruction were absent during the unequal reinforcer duration phases or (b) continuous noncontingent attention (i.e., interactive play) during the equal reinforcer duration phases.

RESULTS AND DISCUSSION

As can be seen in Figure 1, during all four phases the rates of destructive behavior were higher in attention, demand, and tangible conditions than in play, indicating that Rob's destructive behavior was sensitive to multiple reinforcers. In the unequal reinforcer duration phases (which were conducted in a manner typical of experimental functional analyses), the rates of destructive behavior were markedly higher in attention ($M_s = 24.17$ and 25.83) than in either demand ($M_s = 4.10$ and 5.70) or tangible ($M_s = 2.33$ and 6.17). Taken alone, the results ob-

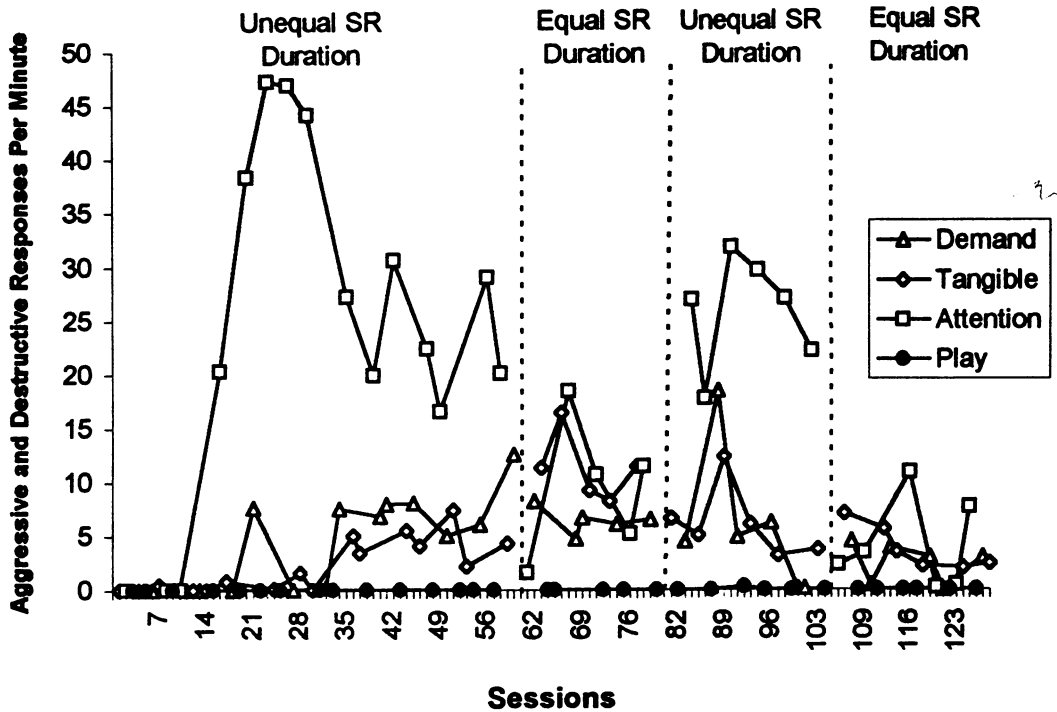


Figure 1. The effects of equal and unequal reinforcer duration on the rates of aggressive and destructive behavior.

tained in the unequal reinforcer duration phases could be interpreted as indicating that Rob's destructive behavior was more sensitive to attention as a reinforcer than to either escape or access to tangible items. However, in the equal reinforcer duration phases, the rates of destructive behavior were more similar in attention ($M_s = 9.44$ and 4.12), demand ($M_s = 6.44$ and 2.47), and tangible ($M_s = 11.30$ and 3.78). Taken together, these results indicate that the differences between attention and the other two test conditions observed in the unequal reinforcer duration phases resulted primarily from differences in the duration of the reinforcement interval, rather than from increased sensitivity to attention as a reinforcer.

We believe that the most parsimonious explanation of these results is that during the reinforcement interval, aberrant behavior was less likely to occur because (a) the client was occupied with consumption of the re-

inforcer and (b) the establishing operation for the behavior was absent. This would explain why longer reinforcement intervals were associated with less aberrant behavior than were briefer intervals. Thus, when reinforcer duration varies across functional analysis conditions, differential rates of aberrant behavior may occur that are independent of behavioral function.

These results suggest that it may be important to consider both the length of the reinforcement interval and the duration of exposure to the establishing operation when interpreting functional analysis results. In the current study, these two variables were inversely correlated (whenever reinforcement was presented, the establishing operation was removed, and vice versa). Future investigators might consider varying the duration of exposure to the establishing operation while holding reinforcer duration constant to evaluate the independent contributions of these

two variables. From a clinical perspective, one way to control for both reinforcer duration and length of exposure to the establishing operation during functional analyses is to standardize the reinforcement interval across conditions, as was done in the equal reinforcer duration phases in the current study.

REFERENCES

- 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)
- Vollmer, T. R., Iwata, B. A., Zarcone, J. R., Smith, R. G., & Mazaleski, J. L. (1993). The role of attention in the treatment of attention-maintained self-injurious behavior: Noncontingent reinforcement and differential reinforcement of other behavior. *Journal of Applied Behavior Analysis, 26*, 9–21.

Received April 24, 1995

Final acceptance October 12, 1995

Action Editor, Brian K. Martens