*DIFFERENTIAL REINFORCEMENT OF OTHER BEHAVIOR
AND NONCONTINGENT REINFORCEMENT AS CONTROL
PROCEDURES DURING THE MODIFICATION OF A
PRESCHOOLER'S COMPLIANCE¹*

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Differential reinforcement of other behavior (DRO) and noncontingent reinforcement were compared as control procedures during the modification of a 3-yr-old preschooler's compliance. The recorded reinforcer was teacher proximity (within 3 ft (0.9 m) of the subject for at least 5 sec) which was often accompanied by positive verbal comments that varied in content across experimental conditions. The verbal content during contingent reinforcement might have been: "Thank you for picking up the blocks"; during noncontingent reinforcement: "You're wearing a pretty dress"; and during DRO: "I don't blame you for not picking up because it isn't any fun". Contingent reinforcement increased compliance in all manipulation conditions. Noncontingent reinforcement decreased compliance during two reversal conditions. However, the behavior was variable and did not decrease to the low levels reached during the two DRO reversals.

DESCRIPTORS: compliance, DRO, noncontingent reinforcement, operant, reversals, teacher behavior

In addition to extinction, both noncontingent reinforcement and differential reinforcement of other behavior (DRO) have been used as control procedures for evaluating reinforcement-based behavior-modification techniques. For example, Azrin, Rubin, O'Brien, Ayllon, and Roll (1968), Buell, Stoddard, Harris, and Baer (1968), Miller and Miller (1970), Phillips (1968), Siegel, Lenske, and Broen (1969), and Wahler (1969) used noncontingent reinforcement as a reversal control procedure; Guess, Sailor, Rutherford, and Baer (1968), Osborne (1969), Reynolds and Risley (1968), and Semb (1973) used DRO for this purpose. Peterson, Cox, and Bijou (1971), after using noncontingent reinforcement to reverse the study behavior

of special-education students, implemented DRO to decrease further the behavior in the reversal.

These applied studies did not compare the two procedures in terms of how rapidly the response decreased or how durable was its elimination. Although Peterson *et al.* (1971) used both noncontingent reinforcement and DRO for a reversal, they did not directly compare the two as control procedures. Instead, after a baseline and a treatment condition, they first used noncontingent reinforcement for a reversal and then immediately reduced the target behavior even further by implementing DRO. That sequence of two conditions prevents their direct comparison for efficiency, rapidity, or durability of response elimination. DRO may have seemed more effective in these ways because of its interaction with the weakening already produced by the preceding noncontingent reinforcement. That is, DRO was applied to a lower rate of behavior than was noncontingent reinforcement.

In two animal studies, response elimination during DRO was compared with that during extinction. Uhl and Garcia (1969) found that extinction eliminated the response more rapidly

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than did DRO, but that DRO produced greater durability of response elimination. However, Zeiler (1971) found that DRO eliminated the response more rapidly and more durably than did extinction. These studies compared free-operant responding during DRO and extinction, and may have little relationship to the present research, which dealt with a restricted operant, compliance with requests, during DRO and noncontingent reinforcement in an applied setting.

Reinforcement contingencies that increased compliance or request-following have often been investigated. Fjellstat and Sulzer-Azaroff (1973) and Zimmerman, Zimmerman, and Russell (1969) used contingent tokens; Homme, deBaca, Devine, Steinhorst, and Rickert (1963) used contingent high-probability behaviors (running, shouting, *etc.*), Burgess, Clark, and Hendee (1971) and Clark, Burgess, and Hendee (1972) used contingent theater tickets and money; Striefel and Wetherby (1973) used praise, ice cream, and physical guidance. Bucher (1973) found a direct relationship between probability of reinforcement and compliance when a competing activity was available. In general, these studies demonstrated that compliance was readily increased by reinforcement contingencies, thus providing the background from which the present treatment techniques were designed for a noncompliant preschool child.

The primary purpose of the present study was to compare the effect of two reversal control procedures on response decrement, and on reacquisition subsequent to those response-decrement procedures, for a child whose compliance was being systematically improved. One procedure was noncontingent (uncorrelated or response-independent) reinforcement; the second was differential reinforcement of other behavior (DRO). The recorded reinforcer was teacher proximity; the presence of a teacher in the vicinity of the subject. This presence was usually accompanied by positive verbal comments of the teacher that varied in content across experimental conditions. The verbal content during contingent reinforcement might have been:

"Thank you for picking up the blocks", during noncontingent reinforcement: "You're wearing a pretty dress", and during differential reinforcement of other behavior: "I don't blame you for not picking up because it isn't any fun".

METHOD

Subject

Betsy was a normal, 3-yr, seven-month-old girl enrolled in a preschool class of nine boys and seven girls (aged 3 to 5 yr) at the Department of Human Development Edna A. Hill Child Development Laboratories, University of Kansas. During her first few weeks at the preschool, she exhibited little compliance to teachers' requests. For example, she would often not go outside during outdoor time, or would not sit on the floor for large group, or sit at a table for snacks, and often would not participate in clean-up.

Observation

Betsy was observed for the last 30 to 35 min of each preschool day. The activities during this time were clean-up, a group story, song, or discussion, and individual activities.

Requests given by the teacher to the subject, the subject's compliance with these requests, and teacher's presence were recorded by an observer in 10-sec intervals.

Requests were divided into four categories: (1) instruction, *e.g.*, "Do this", "It's your turn", or "We need to"; (2) direction, in which the teacher contacted the subject and physically and verbally directed her into compliance after giving the initial request; (3) suggestion, *e.g.*, "Would you like to" or "How about"; and (4) contingency, *e.g.*, "If you don't do this, you can't ____". Compliance was recorded if the subject complied within 30 sec after a request. Teacher presence (the measure used for teacher reinforcement) was recorded when the teacher was within 3 ft (0.9 m) of the subject, with no intervening person or large object (*e.g.*, a table), and remained there for five consecutive seconds of a 10-sec

interval. Usually, teacher presence was accompanied by verbal statements related to compliance or noncompliance.

Two independent observers provided estimates of reliability, at least once in each condition. Average reliability across all conditions for requests was 88% (range 76 to 89%); for compliance, 89% (range 87 to 97%); and for teacher presence, 93% (range 90 to 97%). Occurrence reliability was calculated by dividing number of 10-sec intervals in which observers agreed by total number of intervals in which behavior was recorded, and multiplying by 100.

Procedure

The experiment utilized a reversal design to evaluate three basic conditions: (A) contingent teacher presence for compliance, (B) noncontingent teacher presence, and (C) contingent teacher presence for noncompliance (differential reinforcement of other behavior). These conditions were implemented in the order ABACABACA.

Contingent teacher presence. During contingent teacher presence for compliance, Betsy received verbal praise. The praise stated why the behavior was being reinforced, e.g., "Thank you for helping to pick up the blocks" or "You're scrubbing the table very well". Teacher presence was recorded according to the 3-ft rule.

Noncontingent teacher presence. During noncontingent teacher presence, Betsy sometimes received verbal praise for compliance with requests in a manner similar to the other preschool children. In this condition, there were also occasions of teacher presence for noncompliance. The verbal content paired with teacher presence that occurred after compliance in this condition was the same as that during contingent teacher presence conditions. The verbal praise after compliance consisted of general pleasantries related to the subject in the preschool environment, e.g., "You're wearing a pretty dress" or "Have you had your turn to feed the gerbil?". Again, teacher presence was recorded according to the 3-ft rule.

DRO. During DRO, if the subject did not comply in the allotted 30-sec time limit after a teacher's request, a teacher moved within 3 ft of her. This DRO procedure was considered a restricted-operant analogy of Reynolds' (1961) free-operant definition with an additional time base in the procedures. Usually, teachers left the subject alone if she complied. Some compliance inadvertently received teacher presence during DRO, but this condition was characterized by more occurrences of teacher presence for noncompliance than occurred during the noncontingent reinforcement conditions. The content of verbal comments that accompanied teacher presence for noncompliance during DRO differed markedly from that given in the noncontingent and contingent conditions. Typical examples were: "I can see that you are too tired, so it's alright if you don't help" and "I don't blame you for not cleaning up because it isn't any fun".

Teacher presence was the independent variable measured during this study. However, two differences in the independent variable occurred during DRO and during the noncontingent teacher presence conditions. One was the difference in the verbal content delivered by the teacher; the other, a difference in the percentage of teacher presence delivered for noncompliance within the two conditions.

The mean number of requests per day during each condition ranged from 14 to 29. The highest number of requests was delivered during the last contingent teacher presence condition.

RESULTS

Each day's percentage of compliance was calculated by dividing the number of times Betsy complied by the number of requests she received. Figure 1 shows that Betsy's percentage of compliance to requests was higher during each contingent teacher presence condition, and decreased during noncontingent teacher presence and DRO conditions. Both DRO conditions markedly decreased compliance, whereas decreases of compliance during noncontingent

Fig. 1. The percentage of requests complied with throughout all the conditions of the study. The final data point represents the average of two postchecks.

teacher presence decreased less and was more variable. Two postchecks (seven and 16 days after the study was completed) showed an average compliance of 97%.

There was little difference between re-acquisitions of compliance following noncontingent reinforcement and following DRO. Figure 2 compares the average of the first four sessions following each response decrement procedure.

Percentage of teacher presence for compliance was calculated by dividing the intervals of teacher presence for compliance by the total intervals of teacher presence. (A similar formula was followed to yield the noncompliance teacher-presence percentage.) As shown in Table 1, (top

Table 1

Total intervals of teacher presence during compliance and noncompliance.*

Conditions	Per Cent
COMPLIANCE	
Total DRO	43%
Total Noncontingent	74%
Total Contingent	86%
NONCOMPLIANCE	
Total DRO	58%
Total Noncontingent	26%
Total Contingent	14%

*Teacher presence intervals during compliance (or noncompliance) = $\frac{\text{Total intervals of teacher presence for compliance and noncompliance}}{\text{Per cent of total intervals of teacher presence during compliance (or non-compliance)}}$

Fig. 2. The percentage of requests complied with during re-acquisitions of compliance after DRO and noncontingent conditions. The first, second, third, and fourth data points after both DRO conditions have been combined. The first, second, third, and fourth data points after both noncontingent conditions have been combined.

half) the highest percentage of teacher presence for compliance, 86%, was during the contingent conditions. The percentage of teacher presence for compliance during the DRO conditions was half that during the contingent conditions: 43%. In Table 1 (bottom half), the highest percentage of teacher presence for noncompliance was 58%, during the DRO conditions; this rate was double the percentage during the noncontingent conditions (26%) and quadruple the rate during contingent conditions (14%).

The different types of requests (instruction, direction, suggestion, and contingency) shown in Table 2 had similar ratios for each condition. The type of request given most frequently in all conditions was instruction, with direction being for the most part second highest and suggestions always higher than contingency. The percentages of each type of request across the 10 experimental conditions are shown in Table 2.

Four other children in the same classroom were observed for comparison. Each complied

Table 2

Per Cent of Each Type of Request over Total Requests per Condition of the Study

<i>Conditions</i>	<i>Instruction</i>	<i>Direction</i>	<i>Suggestion</i>	<i>Contingency</i>	<i>Total Requests</i>	<i>Number of Sessions</i>
Contingent SR+	59% (113)	39% (75)	1% (2)	1% (1)	191	9
Noncontingent SR+	84% (124)	14% (20)	1% (2)	1% (2)	148	12
Contingent SR+	79% (69)	18% (16)	2% (2)	0% (0)	87	6
DRO	89% (47)	4% (2)	4% (2)	4% (2)	53	3
Contingent SR+	70% (128)	28% (51)	2% (4)	0% (0)	183	8
Noncontingent SR+	83% (66)	10% (8)	9% (7)	0% (0)	80	6
Contingent SR+	87% (52)	7% (4)	7% (4)	0% (0)	60	4
DRO	92% (82)	2% (2)	6% (5)	0% (0)	89	6
Contingent SR+	75% (235)	15% (46)	10% (32)	0% (1)	315	11
Fade	66% (82)	21% (26)	11% (14)	2% (2)	124	8

with 100% of the requests given to them. However, these children received only one to three requests per day during their observations, because they voluntarily participated in the preschool schedule and activity routines, and repetitions of requests were rarely necessary.

DISCUSSION

A comparison of the two control procedures (noncontingent teacher presence and DRO), which was the primary purpose of the study, involves consideration of the following questions:

1. How much time did each need to demonstrate control?
2. How much did each reduce behavior?
3. How soon was target behavior recovered after control procedure terminated?

The DRO procedure decreased compliance faster and in fewer sessions than did noncontingent procedures. The first noncontingent condition required 12 sessions to demonstrate a stable decrease in compliance; the second required six. In comparison, DRO yielded a more immediate and dramatic decrease in target behavior.

This result confirms that of Peterson *et al.* (1971) from a stronger viewpoint, in that the DRO behavioral decrease in this instance occurred immediately after a high-rate behavior, rather than a low-rate behavior. Noncontingent

procedures probably did not enhance the discrimination of which behavior was desired; both behaviors (compliance and noncompliance) were reinforced. By contrast, DRO probably enhanced the discrimination, because only one response was reinforced. Thus, a faster decrement in responding during DRO would be reasonable. Interestingly, the re-acquisition of a high-rate compliant behavior was essentially the same after both noncontingent and DRO conditions.

Since the content of the verbal remarks that sometimes accompanied teacher presence during DRO was markedly different from that in noncontingent, it is conceivable that the verbal content of attention itself had an effect on compliance. During DRO, perhaps the subject learned that it was appropriate for her not to comply. Thus, these verbal remarks possibly instructed the child to engage in only noncompliance in the future. Alternatively, during noncontingent conditions, teacher presence for compliance was not systematically accompanied by remarks instructing the child that only compliance was appropriate. This could explain why a 58% reinforcement of noncompliance during DRO could so markedly increase noncompliance (shown in Figure 1 as a decrease in compliance).

In an applied setting, neatly constructed examples of experimental conditions are extremely unlikely to occur. Ideal models of scheduling

reinforcement for compliance and/or noncompliance are merely referents and are modified by the contingencies of the "real" situation. Because the teacher-experimenters had other duties in the preschool than the present experiment, he/she was not always available to deliver reinforcement contingent on the target behavior. In addition, requests were given in relation to normal demands of the ongoing preschool activities. The teaching team was not asked to limit artificially or produce a given number of requests that would not be relevant to the immediate situation. Thus, experimental conditions only approximated predetermined procedures.

The present study indicated impressive behavioral differences between DRO and noncontingent teacher presence as control techniques. The noncontingent condition resulted in a slower, more variable response reversal. The DRO condition, imperfect as it usually is in applied settings, nevertheless resulted in a more rapid and less-variable reversal. This enabled the experimenter to demonstrate control quickly and return to shaping a desirable behavior.

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