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SUPERIOR-SUBORDINATE DYADS: DEPENDENCE OF LEADER EFFECTIVENESS ON MUTUAL REINFORCEMENT CONTINGENCIES

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Task contingencies were modeled from bureaucratic organizations in which vague job descriptions provide incomplete contingency specifications. Response rates within dyads were examined using two nonsocial, two social, and two control contingencies. In the first social contingency, responses by the superior produced monetary reinforcement for a subordinate while the superior received no reinforcement from his subordinate. A second social contingency was identical to the first except that the subordinate's rate of responding determined the rate of reinforcement delivered to his superior. Within this contingency, mutual reinforcement occurred whenever rates of superior and subordinate responding were correlated. Two control contingencies were identical to the second social contingency except that either the superior or the subordinate received a rate of response-independent reinforcement virtually identical to the rate received during the second social contingency. Leadership, in this context, was the difference between rates of subordinate responding produced by a nonsocial contingency and rates produced by each of the two social contingencies. The two nonsocial contingencies supported almost no responding among subjects. The first social contingency produced minimal levels of leadership within every dyad. The second social contingency produced high levels of leadership. Response-independent reinforcement generally reduced or eliminated responding.

Key words: leadership, cooperation, instructions, self-instructions, rule-governed behavior, organization, button pressing, trigger squeezing, adults

Formal organizations are pervasive controlling agencies (Skinner, 1953) in industrialized cultures. They are characterized by stated goals and structured interactions among people, and their tasks are specifically designed to increase the probability of goal achievement. Goal achievement typically requires that many specialized jobs be performed by people whose behavior must be coordinated and controlled by nonsocial and social contingencies of reinforcement. Task requirements change with time, however, and such nonsocial factors as job descriptions and wage and salary schedules typically fail to support the rates of performance required by organizational environments. Therefore, the people who design formal organizations often create a superior position to supplement weak, changing, and incomplete nonsocial bureaucratic contingencies.

The functions of the superior position are many. Describing and creating contingencies associated with subordinates' job descriptions and then monitoring and socially mediating reinforcements to obtain subordinates' compliance with their job descriptions are fundamental elements of the typical superior's own job description (Mawhinney & Ford, 1977). In this context, *effective leadership* is the difference between rates of subordinate responding under nonsocial bureaucratic contingencies and under social contingencies administered by a superior.

Task requirements change with time. Therefore, no job description can encompass all job contingencies to which a job holder might be required to respond (Dubin, 1958). Thus, superiors and their subordinates typically respond to job descriptions that include only incomplete contingency specifications. They are confronted with what Cerutti (1989) has called an "informal occasion for problem solving" that "appear[s] whenever the avail-

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ability of reinforcement is discriminable but the form of responding is unspecified" (p. 272). Once the subordinate's task has been defined, effective leadership, in accordance with the law of effect (Baum, 1973), requires establishing and maintaining a correlation between the superior's rate of reinforcer delivery and the rate of the subordinate's performances (Mawhinney & Ford, 1977). Reinforcing task performances by a subordinate should not, however, present the superior with an informal occasion for problem solving unless the superior's reinforcers also depend upon subordinate task performances. Thus, mutual responding for mutual reinforcement is an essential ingredient of contingencies that produce effective leadership.

The empirical question here concerns identification of contingencies that reliably precipitate leadership within superior–subordinate dyads and demonstration of the crucial role of mutual reinforcement in the leadership process. Four models of bureaucratic contingencies were constructed. Each model contained all of the experimenter-controlled contingencies of the previous models plus one other experimenter-controlled contingency. The first model was a nonsocial baseline contingency in which superiors and subordinates received feedback from their own responses (button presses and trigger squeezes, respectively) and noncontingent monetary payments. The second model was a nonsocial chance contingency in which every button press by the superior produced a point worth $\frac{1}{20}¢$ on the subordinate's bonus pay counter. No social responding whatsoever was possible within these two contingencies. Adventitious reinforcement of subordinate responding could occur in the second contingency, however, if by chance a superior's response occurred simultaneously with or immediately after a subordinate's response. The third model was a minimal leadership contingency in which the superior might receive reinforcement by controlling a subordinate's responses that appeared on the superior's counter labeled "OTHER'S BEHAVIOR." Under this contingency, the superior and subordinate were expected to respond at higher rates than in previous contingencies only if the superior derived reinforcement value from the subordinate's responding per se. Because the subordinate would receive monetary reinforcement if a relationship developed but the superior would not, the subordinate was expected to respond at a higher rate than the superior. The fourth model was a superior's leadership contingency identical to the third contingency except that the superior received a point worth 1¢ for every 19th trigger squeeze by the subordinate. This contingency was expected to produce large elevations of subordinate responding across all dyads compared to responding under any of the other contingencies (i.e., large leadership effects). Finally, in conditions of superior response-independent reinforcement and subordinate response-independent reinforcement, the superior's and subordinate's respective rates of reinforcement obtained from their partners were arranged by a fixed-time schedule. Neither of these contingencies was expected to support any appreciable rates of superior or subordinate responding.

METHOD

Subjects

Eight undergraduate men were recruited from a subject pool of students majoring in business at Indiana University. The 8 men were grouped into four dyads.

Apparatus

The apparatus included two subject panels labeled A (the superior's panel) and B (the subordinate's panel) (see Figure 1). Each panel was mounted in a box, and each box was placed on a table in separate rooms. The button, a trigger operandum (joystick), and all counters and interactions among counters were controlled by switch settings, ratio programmers, and interval programmers on a master panel in a separate control room. Blinds over the window between subjects' rooms were drawn so that no visual contact was possible. No auditory exchanges between rooms were possible.

Each panel contained three colored (red, yellow, and green) lamps near the top edge of the panel. One or more lights were lit during each experimental and control contingency. A clear lamp that flashed each time the counter operated was associated with each counter on each panel (see circled Ls in Figure 1).

Panel A (the superior's panel) contained four operative counters and one operative button. (Another button and counter on the panel were inoperative and covered with black plastic

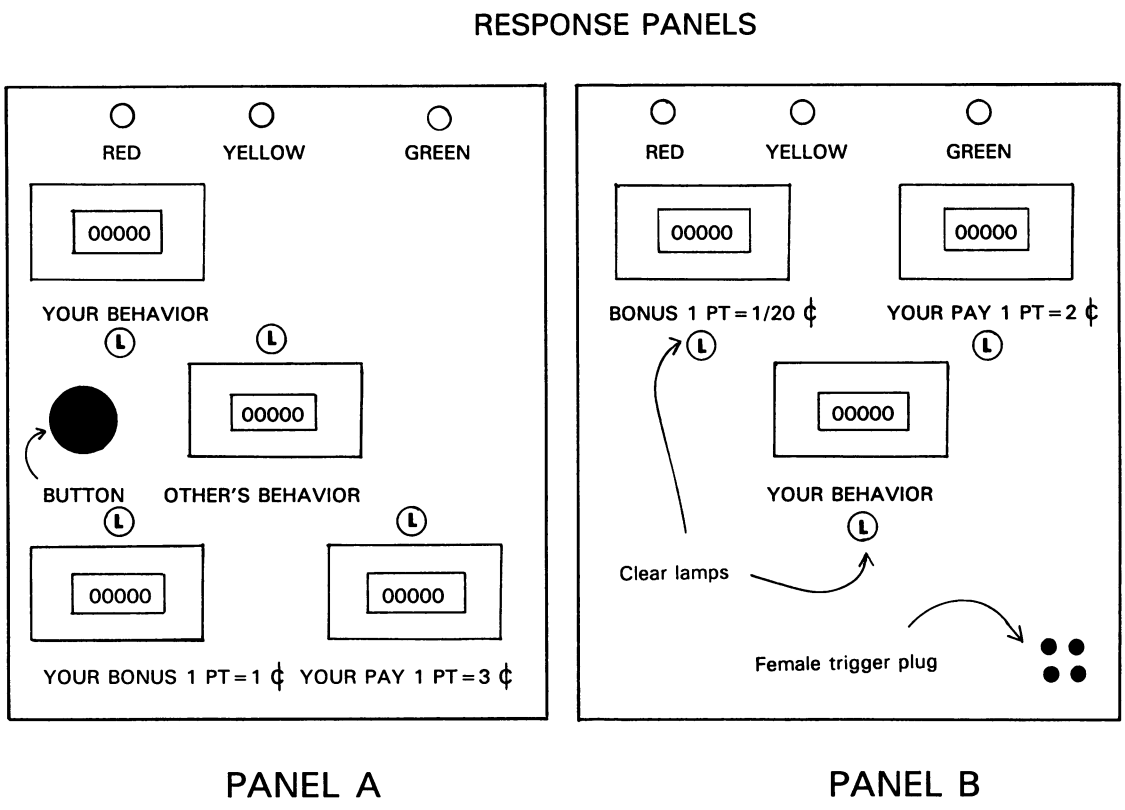

Fig. 1. Superior and subordinate response panels. The superior's panel is Panel A, and the subordinate's is Panel B.

tape.) A press on the button added one point to the counter directly above it. Each button press by the superior added one point to the subordinate's (Panel B) counter, which was labeled "BONUS 1 PT = $\frac{1}{20}$¢" whenever the experimenters switched it on at the control panel. Another control-room panel switch permitted experimenters to make every subordinate trigger squeeze add one point to the superior's "OTHER'S BEHAVIOR" counter (center of Panel A). A control room panel switch permitted experimenters to route the output of either ratio or interval scheduling mechanisms to the counter labeled "YOUR BONUS 1 PT = 1¢." The counter labeled "YOUR PAY 1 PT = 3¢" was advanced by a fixed-time program every 30 s during every experimental and control session.

Panel B contained three operative counters (see Figure 1). (One inoperative counter was covered with black plastic tape.) Each button press by the superior added one point to the counter labeled "BONUS 1 PT = $\frac{1}{20}$¢" whenever switched on at the control panel. It could also be operated by output from a ratio or interval programmer. The counter labeled "YOUR PAY 1 PT = 2¢" was advanced by a fixed-time programmer every 30 s during every experimental and control session. At the bottom of the panel was a female four-pin receptacle into which a plug wired to a trigger operandum (airplane joystick) was inserted (see cluster of four circles bottom right of panel in Figure 1). The joystick was mounted at one end of a piece of wood 35 cm long by 5 cm high by 10 cm wide. The length of wood was immobilized by clamping it at a right angle to the side of the table top nearest where the subject sat facing the table; it pointed inward toward Panel B from the clamp. At the other end of the wood (which was near the response panel), and rising vertically from that end of the wood, was the joystick. Immobilizing the joystick prevented subjects from employing

novel methods of squeezing or otherwise operating the trigger. For example, a subject might, with one hand, hold the joystick trigger against the table top or his knee and rapidly tap the joystick against the table or knee with his other hand to operate the trigger instead of the more difficult response of squeezing it. If some subjects discovered these novel methods of rapid responding and others did not, the subordinate task per se would not be constant across dyads. Each pull or squeeze on the trigger added one point to the counter labeled "YOUR BEHAVIOR," providing performance feedback during every session.

The two panels were connected to a master panel in the control room. From this panel experimenters could monitor each subject's performance from moment to moment, alter reinforcement contingencies within and between subjects and within and between sessions, and send artificial feedback (see descriptions of Conditions 5 and 6) through any of the feedback or bonus counters.

Procedure

Subjects were scheduled to arrive at the behavioral laboratory 10 min apart. When the 1st subject arrived at the reception area, the experimenter introduced himself and asked that the subject follow him. The subject was then given a brief tour of the two subject rooms and told, "This is an experiment involving 2 persons who are located 1 in each of these rooms." This permitted each subject to see that the panels differed between rooms and that the trigger operandum was located in only one room.

The 1st subject to arrive was then escorted to a waiting room, where he was told he would have to wait until the other person arrived. When the 2nd subject arrived, he was given the same tour and information as the 1st subject and then was immediately seated in the room to which he had been assigned. He was told that the experiment would begin as soon as the other subject, who had already arrived and was waiting, was seated in the other room. The subject who had arrived first was then told that the experimenter was ready, and he was then seated in the other room and was told that the experiment would soon begin. The subjects never met before the experiment.

All subjects arrived at the lab between 8:45 a.m. and 9:05 a.m. on their appointed days. Dyads A, B, and C completed the experiment in a single day with a snack or lunch break between Sessions 12 and 13. Superior and subordinate departures from the lab were staggered in time, and subjects were observed briefly to ensure that they were not on a path that would bring them in contact with one another. Dyads A, B, and C participated on August 28, August 11, and August 23, 1977, respectively. Dyad D participated in Sessions 1 through 12 on August 9, 1977, Sessions 13 through 23 on August 10, 1977, and Sessions 24 through 42 on August 19, 1977. As the subsequent data analyses will reveal, Dyad D differed from the other dyads in important aspects of its behavior; however, the anomalous patterns were evident in the first 12 sessions before any contact between subjects outside the lab was possible.

The following taped message was played over ceiling speakers into the two rooms after the subjects had been seated in their respective rooms:

> In a few minutes you will be participating in a study designed to help learn how people behave in several situations. During the course of the study, you will be interacting with another person from time to time. The study also gives you an opportunity to obtain some money while participating in it, but this opportunity will be available only during certain periods of time which we call a "session." The time between sessions we call a "break." In this study there are a number of sessions with breaks between them. No money will be obtained during breaks. The various lights and counters will provide you with all the information you need about when you may obtain money, how it is obtained, and how much of it you have accumulated at any given time.
>
> Now, if you look at each of the counters on your panel, you should find that at least two indicate some amount of money for each point or for some number of points. One or both of these counters may operate during each session of the study. To verify the amount of money you are receiving, you might like to check the counters from time to time.
>
> If you are at Panel A, there are four counters which might operate during the various sessions of the study. Each counter is labeled, and you should read each label at this time. If you have read each label, you noticed that one of them said "Button." It is on the left-hand side of your panel next to a black button. If you press the button with enough force and release it, the

counter above it will advance and a light will flash at the same time. Presses on the button will not advance the counter during breaks between sessions.

If you are at Panel B, there are three counters which might operate during the various sessions of the study. Each counter is labeled and you should read each at this time. On your table is a black handle with a red trigger mechanism and a button on it. If you squeeze the trigger with enough force and release it, the counter in the middle of your panel will advance and a light will flash at the same time. Presses on the button on top of the handle will never advance any of the counters. The button does nothing. Also, squeezes on the trigger will not advance the counter during breaks between sessions.

Whenever any of the counters on either panel operate during the session, you will hear the counter advance and may see a light flash at the same time. If you would like to see how the button and trigger work, you may push the button or squeeze the trigger a few times.

It is important that you know that the counters may be reset by pressing in the little gray bar under the counter window. But you should never reset any of the counters for two reasons. First, you may lose money if you reset the counter for any reason. Second, if you are resetting a counter when it's about to operate, it may strip the gears on the counter and ruin it. We hope that you will cooperate with us by not resetting the counter at any time during the study. After each session someone will come into your room, read each of the counters, and leave you a sum of money on your table based upon the readings on your counters. That person will be in your room in just a moment to reset your counter if you tried your panel earlier. If you have a question at this time, speak up and instructions may be read again. A glass of water and an ashtray have been placed on your table so that you may smoke at any time if you wish and take a drink if you get thirsty. Remember, the first session begins when one or more of the colored lights come on, and at that time you can squeeze the trigger or press the button as often as you want.

The need to replay the taped instructions never arose.

Each session was 10 min in length with a few exceptions (see Appendix). This session duration was selected based on results of pilot sessions indicating that sessions of this length would not produce fatigue effects in either member of the dyad. At the end of each session the experimenter entered each subject's room and gave him his earnings based upon readings from his counters. The counters were then reset to zero. Changes in treatment conditions were made by setting switches on the control panel in the control room.

Four experimental and two control conditions were examined in a multiple element baseline design (Sidman, 1960). Whether the behavior of a dyad had passed through a learning phase and achieved steady state for each condition was based on visual inspection of cumulative records generated during the experiment. Steady state was considered to have occurred when the behavior patterns of both members of the dyad were reproduced following reversals of conditions.

Nonsocial baseline contingency (Condition 1). Trigger squeezes by the subordinate and button presses by the superior advanced their respective counters labeled "YOUR BEHAVIOR." Response-independent fixed-time (analogues of hourly wages) pay counters, labeled "YOUR PAY 1 PT = 3¢" and "YOUR PAY 1 PT = 2¢" for the superior and subordinate, respectively, advanced every 30 s. In this experiment, excluding the time to deliver cash payments between sessions, superiors and subordinates could earn about $3.00 and $2.00 per hour, respectively, by simply sitting in their rooms without interacting. No other feedback was provided during this condition. The green discrimination lamp was lit on both panels during this condition (See Table 1).

Nonsocial chance contingency (Condition 2). This condition was a replication of the first model with the following additions: (a) Each superior button press added one point to the subordinate's counter labeled "BONUS 1 PT = $\frac{1}{20}$¢." (b) The green lamp was lit on the superior's panel, and the green and yellow lamps were lit on the subordinate's panel.

Minimal leadership contingency (Condition 3). This model was a replication of the second model with the following additions: (a) Each subordinate trigger squeeze now registered on the superior's panel labeled "OTHER'S BEHAVIOR." (b) The yellow and green lamps were lit on the superior's panel, and the red and green lamps were lit on the subordinate's panel.

Superior's leadership contingency (Condition 4). This contingency was a replication of the third model with the following additions: (a) Every 19th response of the subordinate ad-

Table 1

Summary of contingencies.

Description of contingency components[a]	Experimental conditions					
	Nonsocial baseline	Nonsocial chance	Minimal leadership	Superior's leadership	Superior control	Subordinate control
Discrimination lights: R = Red; Y = Yellow; G = Green	Superior: G Subordinate: G	Superior: G Subordinate: YG	Superior: YG Subordinate: RG	Superior: RYG Subordinate: RYG	Superior: RG Subordinate: RG	Superior: RY Subordinate: YG
Superior responses advance subordinate's bonus point counter; one point = $\frac{1}{20}¢$	No	Yes	Yes	Yes	Yes	No
Superior's "OTHER'S BEHAVIOR" counter operative	No	No	Yes	Yes	Yes	Yes
Every 19th subordinate response advances superior's bonus point counter one point; one point = 1¢	No	No	No	Yes	No	Yes
FT-t schedule operates bonus counter; t = interval required to duplicate rate in superior's leadership condition	No	No	No	No	Yes: superior	Yes: subordinate

[a] The FT 30-s (3¢ to superior, 2¢ to subordinate) counters were operative during all sessions.

vanced the superior's counter labeled "YOUR BONUS 1 PT = 1¢." (b) The red, yellow, and green lamps were lit on both panels during this condition.

Superior's response-independent contingency (Condition 5). Red and green discrimination lights were lit on both the superior's and subordinate's panels during this condition. In this condition a timing device reproduced the rate of reinforcements the superior received on his bonus counter during the steady-state phase of the superior's leadership contingency (Condition 4) but independently of the actual rate of the subordinate's responses; however, coincidentally they could be the same. The interreinforcement interval, in numbers of seconds, was determined by dividing the number of reinforcements received by the superior in the most recent session of the superior leadership contingency into 600 s (i.e., 10 min). Equipment and time limitations did not permit us to simulate any local variations in the response-independent reinforcement. With the timing equipment set at an interreinforcement interval required to reproduce the rate from the superior's leadership contingency (Condition 4), we then watched the control panel counter and stopped the session when the number of reinforcements required to match the number of the superior's leadership contingency had accumulated on the control-room counter. Thus, the response-independent reinforcement rates essentially matched the rates from the prior sessions but were presented without any local variations. Absence of local variations should have reduced the difficulty of detecting the response-independent reinforcements.

Subordinate's response-independent contingency (Condition 6). Red and yellow and yellow and green combinations of discrimination lights were lit on the superior's and subordinate's panels, respectively, during this condition. This condition was the same as the superior's leadership contingency except the procedure described above (and method of selecting the interreinforcement interval) reproduced the rate of reinforcement the subordinate received on his bonus counter during the steady-state phase of his most recent superior's leadership contingency session.

Logic of color patterns. Color patterns were chosen to function as discrimination lights. Thus, with the exception of the subordinate's response-independent (control) condition (in which the superior's behavior was of no real concern), every condition was associated with a green light that signified the presence of fixed-time pay and feedback from one's own behavior. In the nonsocial chance condition, the superior's light was the same as in the nonsocial baseline, whereas the yellow light was added to the subordinate's side. In other words, conditions remained the same on the superior's side while the subordinate would see something different (occasional bonus points). The

Table 2

Sequence of conditions experienced by each dyad.

	Dyads			
Session	A	B	C	D
1	4	1	1	1
2	1	4	4	1
3	2	2	2	1
4	2	3	3	1
5	1	1	4	2
6	4	3	4	1
7	2	4	2	3
8	3	2	3	1
9	4	4	4	4
10	3	1	1	1
11	4	3	3	1
12	3	2	2	1
13	4	1	4	3
14	5	4	5	2
15	5	3	3	1
16	3	2	2	4
17	4	4	4	2
18	5	4	3	4
19	6	3	4	1
20	4	4	6	4
21	6	3	4	1
22	5	4	5	4
23		6	5	2
24		6	4	1
25		5	6	4
26		5	5	2
27				3
28				4
29				1
30				3
31				4
32				4
33				3
34				4
35				3
36				4
37				5
38				6
39				4
40				2
41				5
42				6

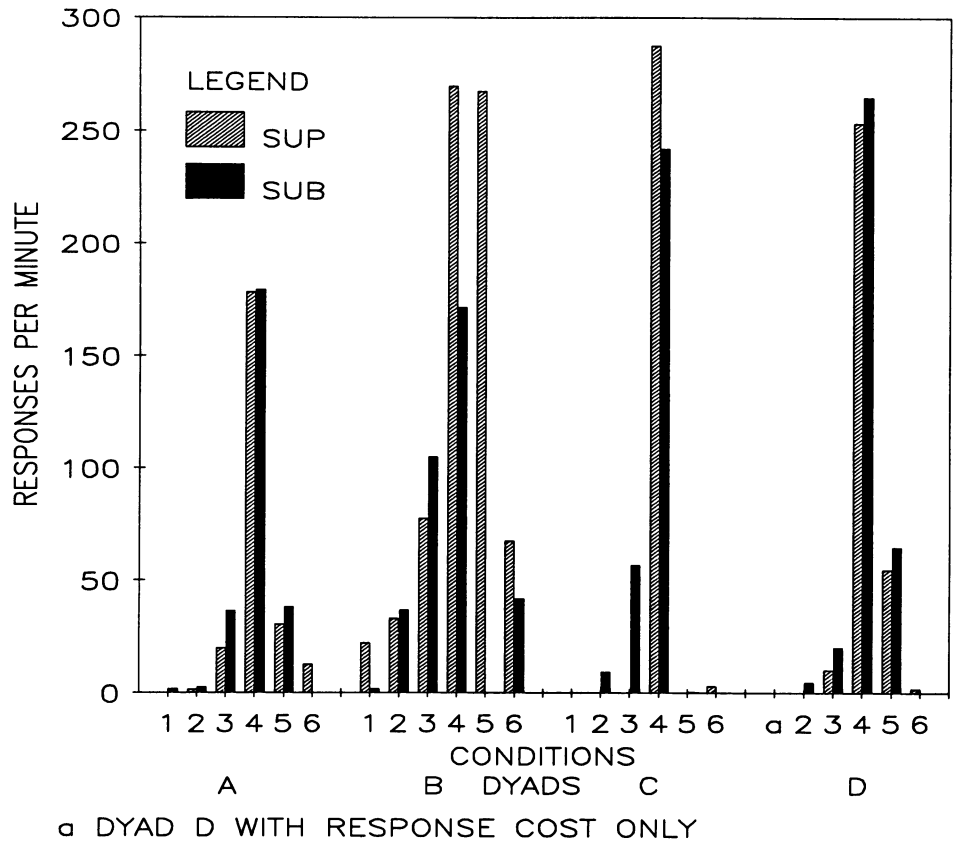

Fig. 2. Superiors' (shaded bars) and subordinates' (solid bars) response rates during the last 10-min session of Conditions 1 through 6. Data for Condition 5 for Dyad B are from the last 10 min of a continuous 20-min session. Dyad D's data for the nonsocial baseline contingency (Condition 1) are omitted and, for all other conditions, response costs were in effect for the superior.

three colored lights used together in the superior's leadership contingency permitted this condition to share some stimulus properties with all other conditions while ensuring that the other conditions provided discriminable differences in light combinations. The treatment sequences for the four dyads appear in Table 2.

RESULTS

Overall Contingency Effects

The data used to construct Figures 2 and 3 appear in the Appendix. The overall response rates within superior–subordinate dyads during the last session of each of the six contingencies (Conditions 1 through 6) appear in Figure 2. Little or no responding by either superiors or subordinates occurred in the final sessions of the two nonsocial contingencies (Conditions 1 and 2). Minimal superior and subordinate responding occurred in the minimal leadership contingency (Condition 3) across all dyads. The subordinates in Dyads A, B, and D responded at higher rates than did their superiors during the final session of the minimal leadership contingency. Within all four dyads, the highest rates of superior and subordinate responding were maintained by the superior's leadership contingency (Condition 4). In Dyads B and C, the superior responded at a higher rate than did the subordinate in all of the last four sessions of the superior's leadership contingency. In Dyads A and D, the differences between superior and subordinate response rates were smaller and less consistent. The superior in Dyad D differed from the superiors in the other dyads in

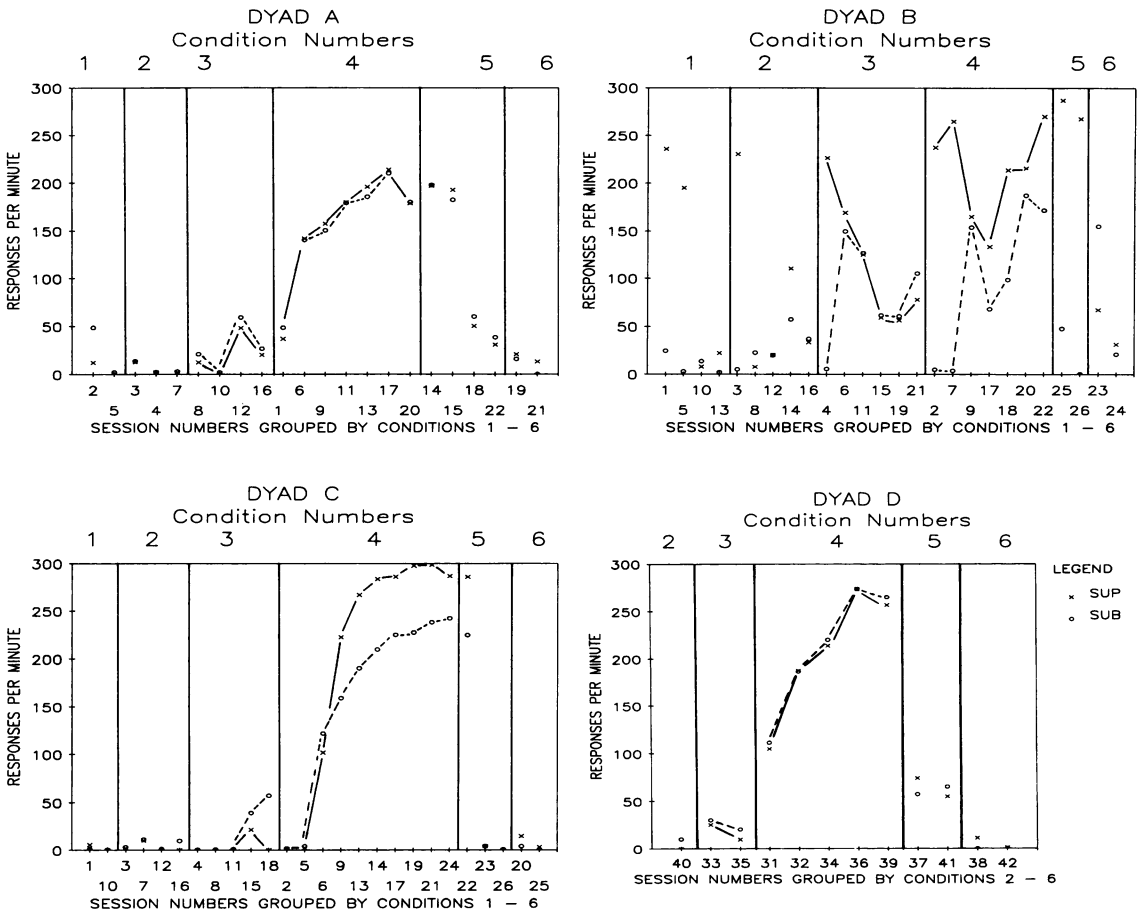

Fig. 3. Rates of superior and subordinate responding for each dyad across Conditions 1 through 6. Condition numbers appear above the data panels within each graph. Data panels are divided by vertical lines. Session numbers within a condition appear under the abscissa. Condition 1 is omitted for Dyad D, and all data for this dyad are with response costs in effect for the superior. Data for superiors are connected by solid lines and for followers by dashed lines in Conditions 3 and 4 only.

that he responded at a high and undifferentiated rate across the first four contingencies for the first 30 consecutive sessions. Beginning with Session 31, therefore, a response cost of 1¢ for every 50 of his own responses was assessed against his earnings in each session (Weiner, 1962). As the data for Dyad D (Figure 2) confirm, their responding was well differentiated and similar to responding of the other dyads. With the exception of the superior in Dyad B, all subjects discriminated the response-independent reinforcements in their respective control conditions, and their response rates under these contingencies fell to low rates compared to those maintained by the superior's leadership contingency (Condition 4). Thus, the overall pattern of results conformed with expectations.

Learning and Maintenance of Leadership

Superior and subordinate response rates in Dyads A, B, and C, for the entire experiment and for the 12 sessions during which response costs were assessed for Dyad D appear in Figure 3. The data are divided into six sections corresponding to the four experimental contingencies (Conditions 1 through 4) and two control conditions (Conditions 5 and 6) for Dyads A, B, and C. The data are similarly divided for Dyad D, except that only five sections appear. The nonsocial baseline contingency (Condition 1) was not examined with

Table 3

Correlations between superior's and subordinate's response rates within dyads across sessions of the superior's leadership contingency.

Dyad	r	Last n sessions
A	.997	7
B	−.130	7
B	.632	5
B	.774	4
C	.926	7
D	.997	5

Table 4

Correlations between superior's and subordinate's response rates within dyads within the last session and last two sessions of the superior's leadership contingency.

Dyad	r	Last session n	r	Last two sessions n
A	1.000	4	1.000	8
B	1.000	4	.869	8
C	1.000	4	.995	8
D[a]	.998	4	.993	8

[a] For Dyad D the last session was 5 min in length, and a technical problem precluded collection of data at 2.5-min intervals during Session 36; the data above are from Session 34 (last session column) and Sessions 32 and 34 (last two sessions column).

response costs in effect for Dyad D, so data for that condition are not presented. Dyads A, C, and D exhibited orderly development of leadership across sessions of the superior's leadership contingency (Condition 4). The least orderly pattern of leadership development occurred within Dyad B. Clearly, the superior's leadership contingency repeatedly produced the anticipated effects upon subordinates' performances.

Leadership Reliability and Correlated Superior–Subordinate Responding

Superior and subordinate response rates (Figure 3) appear to be correlated across sessions of the superior's leadership contingency for all dyads, albeit more weakly for Dyad B. Correlations across sessions and within sessions were computed to provide a quantitative evaluation of these data. The between-sessions correlations appear in Table 3. With the exception of Dyad B, the simple linear correlations between superior and subordinate response rates within dyads across sessions of the superior's leadership contingency were high. The lower correlations for Dyad B are suggested by the data in Figure 3. However, it is clear that superior and subordinate response rates in Dyad B were becoming better correlated with repeated exposures to the superior's leadership contingency (Condition 4). This progression is suggested by the growing r values in the later sessions (Table 3). The within-sessions correlational data are preferable to between-sessions data because the across-session correlations can occur in the absence of within-session correlations. Although we did not intend for them to serve as primary data, we collected readings of the cumulative number of responses on the superiors' and subordinates' control-room counters every 2.5 min during every session of the experiment. This procedure did not require the experimenter to enter the experimental rooms because control room counters and those on subjects' panels were operated by the same electrical impulses from each operandum. Data from these within-sessions observations for the last session and last two sessions of the superior's leadership contingency (Condition 4) appear in Table 4. The correlations are all very high. Leadership as we defined it was produced as a consequence of mutual responding and reinforcement exchanges between the superior and subordinate within every dyad.

Response-Independent (Control) Contingencies (Conditions 5 and 6)

Subordinate responding in every dyad ceased almost immediately during the first session of the subordinate's response–independent contingency (Condition 6). Similarly, responding by superiors in Dyads A, C, and D decreased markedly during the superior's response-independent contingency. The superior in Dyad B did not exhibit a reduction in responding during the two sessions administered under this condition.

DISCUSSION

Results of this research indicate that a model of vaguely and incompletely specified bureaucratic contingencies for superiors and subordinates can produce the kind of elevated response rates among subordinates that are indicative of effective leadership. The critical element responsible for this effect was mutual

reinforcement contingencies established by superiors and their subordinates. This is an important finding in view of other potential sources of subordinate responding that might have obscured the effects of reciprocal reinforcement. For example, adventitious reinforcement resulting from the fixed-time pay counters might have supported responding. High response rates might also have arisen from rule-governed behavior resulting from the interaction between bureaucratic contingencies and histories of reinforcement associated with a "work ethic" (Merrens & Garrett, 1975) or a rule of equity in which responses are "given" to the experimenter in exchange for wages "earned" (Matthews, 1977). The virtual absence of responding under the two nonsocial contingencies and highly elevated responding to the superior's leadership contingency across all dyads ruled out the possibility that behavior under all contingencies was governed by some common rule of conduct. Additional potentially complicating factors include variations in task content, which can elevate or lower response rates (Berlyne, 1972); contingencies among tasks, which can have similar effects (Welsh, Bernstein, & Luthans, in press); and the presence or absence of other people and information concerning the behavior of another person, which can increase response rates via competition or social facilitation (Hake, Vukelich, & Kaplan, 1973; Vukelich & Hake, 1974; Zajonc, 1965). The low and unreliable subordinate response-rate increases observed under the minimal leadership contingency (Condition 3) ruled out the possibility that highly elevated responding within the superior's leadership contingency was a product of competition or racing between superiors and their subordinates or a social facilitation effect on the superior's side of the dyad. Both phenomena were possible once the superior was provided with simultaneous access to his own and his subordinate's responding on his "YOUR BEHAVIOR" and "OTHER'S BEHAVIOR" counters.

The rapid cessation of responding by subordinates when their reinforcement was made response independent (Condition 6) clearly shows that contingent reinforcement was responsible for the enhanced responding under the superior's leadership contingency. Similarly, the large response-rate reductions among superiors when their reinforcement was made response independent (Condition 5) demonstrate the importance of reciprocal contingent reinforcement from the subordinate. Further evidence for the role of mutual reinforcement contingencies was provided by the correlation analyses, which revealed high linear correlations between superior and subordinate response rates both within and across sessions. Thus, we have experimentally isolated from a myriad of elements the factor of reciprocal reinforcement in the establishment of leadership within a particular model of bureaucratic social structures.

There are two major reasons why the superior's response rates might have fallen during the control contingencies. The absence of a correlation between changes in the superior's responding and changes on the superior's bonus counter may have eliminated a contingency that directly supported performance. The absence of a correlation between changes on the "OTHER'S BEHAVIOR" counter and changes on the bonus counter may have provided information about the contingencies that influenced performance through self-instruction (Cerutti, 1989; Mawhinney, 1982; Navarick, 1985; Ragotzy, Blakely, & Poling, 1988). For example, the rule might be: "Getting the partner to respond more does not gain me anything, so why bother pressing my button?" A procedure might have been used in which increments on the "OTHER'S BEHAVIOR" counter and the bonus counter were correlated but operated independently of the superior's behavior. This contingency might function to preserve adherence to the rule, "I've got to get the partner to respond more because then I earn more" while preventing access to the means of producing the partner's behavior change. The resulting effect might be to produce less of a response-rate decrease than by removing both factors (i.e., rules and contingencies).

Despite the measures taken to avoid dominance of behavior by individuals' reinforcement histories, the behavior of the subordinate and superior in Dyad D suggests that some attention should be focused on the issue of individual differences (Bernstein & Michael, 1990; Harzem, 1984) as well as on the homogenizing power of social contingencies of reinforcement involving response costs. Although response costs can be used to produce sensitivity to contingencies, the relative strength

of reinforcement histories might be estimated when examined in a systematic way. For example, subjects exhibiting insensitivity because of a common individual difference could be exposed to a titration schedule of response costs, and the costs required to produce sensitivity could serve to measure the strength of the individual difference suggested by response insensitivity.

Correlational analyses suggest that care should be taken when drawing inferences from such analyses. Inferring the existence of correlations between dyad members' behavior rates within sessions from correlations computed from their rates across sessions of the same contingency may be invalid. The across-sessions correlations can be spurious and either over- or understate the strength of the associations among responses within sessions. For example, correlations across sessions within Dyad B ranged from $r = -.13$ (last $n = 7$ sessions) to $r = +.77$ (last $n = 4$ sessions). The correlations within the last sessions ($n = 4$) and last two sessions combined ($n = 8$), on the other hand, were $r = 1.00$ and $r = .87$, respectively. What appear to be spurious across-sessions correlations, however, can be valid. Consider an exchange pattern in which either the superior or subordinate produced a certain number of responses during the first 5 min of a session and the other dyad member matched that number of responses by responding during the last 5 min of a 10-min session. If this pattern were repeated several times, with some variation in number of responses exchanged across sessions so that restriction of range effects on the correlation coefficient (Nunnally, 1967) were avoided, a near-perfect positive correlation would be produced across sessions. Analyzed at 2.5-min intervals within sessions, on the other hand, these data would produce an almost perfect negative correlation. If subjects' behavior on a molar level were guided by a rule of exchange equity, molar equity could be achieved in the absence of tit-for-tat equitable responding at a molecular level (e.g., Matthews, 1977). Such responding could produce low or spuriously negative correlations at a molecular level within sessions, and valid positive correlations across sessions at the molar level. Temporally lagged correlations might be recognizable at the molecular level if these exchanges were patterned in tit-for-tat fashion and spaced at fairly equal intervals. Although our paradigm permitted subjects to respond freely with respect to interactions with one another, their responding was well correlated at both molecular and molar levels. The validity of correlational analyses within an experimental analysis of social exchange behavior should be judged within the context of the experimental procedures employed. Care should be taken to avoid potential bias-inducing transformations of data subjected to correlational analyses within an experimental analysis of behavior (e.g., Heth, Pierce, Belke, & Hensch, 1989).

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APPENDIX

Superior and subordinate cumulative responses per 10-min session.

	Dyad A			Dyad B			Dyad C			Dyad D		
Session	Condition	Superior	Subordinate	Condition	Superior	Subordinate	Condition	Superior	Subordinate	Condition	Superior	Subordinate
1	4	369	485	1	2,357	246	1	56	10	1	0	1,701
2	1	122	25	4	2,374	50	4	11	18	1	2,086	1,500
3	2	128	137	2	2,302	53	2	20	31	1[a]	2,933	3,146
4	2	20	24	3	2,263	56	3	0	5	1	995	2,195
5	1	3	21	1	1,952	30	4	23	40	2[b]	875	1,120
6	4	1,417	1,405	3	1,693	1,499	4	1,018	1,218	1[b]	833	1,150
7	2	20	30	4	2,649	38	2	100	110	3[b]	1,355	1,399
8	3	125	210	2	77	227	3	0	8	1	2,393	3,017
9	4	1,574	1,505	4	1,651	1,539	4	2,227	1,590	4[b]	1,514	1,735
10	3	0	20	1	78	138	1	0	6	1[b]	1,143	1,555
11	4	1,796	1,790	3	1,252	1,266	3	0	10	1[b]	1,096	1,610
12	3	482	592	2	201	200	2	0	13	1[b]	1,267	1,684
13	4	1,960	1,854	1	223	21	4	2,669	1,903	3	2,740	2,690
14	5	1,972	1,977	2	1,105	573	4	2,837	2,098	2	2,361	2,721
15	5	1,926	1,822	3	591	614	3	211	390	1	2,455	1,586
16	3	202	266	2	333	371	2	0	96	4	2,694	2,690
17	4	2,136	2,099	4	1,335	679	4	2,861	2,252	2	2,575	267
18	5	500	599	4	2,135	986	3	0	570	4	2,300	2,163
19	6	207	157	3	563	605	4	2,977	2,276	1	2,691	0
20	4	1,785	1,799	4	2,155	1,871	6	145	40	4	2,081	2,081
21	6	130	1	3	777	1,053	4	2,986	2,381	1	2,412	0
22	5	307	383	4	2,701	1,719	5	2,859	2,250	4	2,774	2,774
23				6	670	1,550	5	39	41	2	2,376	0
24				6[b]	314	210	4	2,867	2,422	1	2,369	63
25				5	2,868	477	6	32	2	4	2,672	2,670
26				5	2,676	5	5	0	8	2	2,110	0
27										3	2,355	2,398
28										4	2,450	0
29										1	2,511	0
30										3	2,881	1,533
31										4	1,049[c]	1,116
32										4	1,873[c]	1,863
33										3	250[c]	300
34										4	2,138[c]	2,201
35										3	97[c]	203
36										4	2,739[c]	2,739
37										5	741[c]	573
38										6	112[c]	0
39										4[b]	1,269[c]	1,326
40										2[b]	0[c]	50
41										5	550[c]	651
42										6[b]	11[c]	0

[a] Session length 15 min.
[b] Session length 5 min.
[c] Response costs of 1¢ per 50 responses in effect.