

VARIABLE-TIME REINFORCEMENT IN MULTIPLE AND CONCURRENT SCHEDULES¹

DONALD M. WILKIE

UNIVERSITY OF MANITOBA

Experiment I examined the role of a reduced rate of responding in the occurrence of behavioral contrast. Four rats and a pigeon were exposed to a two-component multiple schedule in which one component was always a variable-interval schedule. The second component was, at different times, either a variable-time schedule in which food was delivered independently of responding, or extinction. Both extinction and the variable-time schedule reduced the rate of responding in the second component. Behavioral contrast was observed, however, only when extinction was scheduled in the second component. Experiment II examined preference, as measured by time allocation in concurrent schedules for a variable-interval schedule relative to a variable-time schedule. Two rats displayed a lack of preference between the two schedules. The results of these experiments support a preference interpretation of behavioral contrast, which holds that behavioral contrast is the result of the introduction of a less-preferred condition in one component of a multiple schedule.

An increased rate of responding in one component of a two-component multiple schedule reliably occurs when the frequency of reinforcement in the other component is reduced. This increased rate of responding is called behavioral contrast (*cf.* Reynolds, 1961). Behavioral contrast has also been observed in situations in which response rate, but not necessarily reinforcement frequency, in one component of a multiple schedule has been reduced. Behavioral contrast has been observed when the rate of responding in one component of a multiple schedule was reduced by punishment (*e.g.*, Brethower and Reynolds, 1962), signalled reinforcement (*e.g.*, Reynolds and Limpo, 1968; Brownstein and Hughes, 1970), or

by differential-reinforcement-of-low-rate (DRL) schedules (*e.g.*, Terrace, 1968; Weisman, 1969). However, there is evidence to suggest that not all procedures that reduce response rate in one component of a multiple schedule produce behavioral contrast. For example, Reynolds (1961) did not observe behavioral contrast when the rate of responding in one component of a multiple schedule was reduced by differential-reinforcement-of-other-behavior (DRO) schedule.

The present research sought to examine further the role of a reduced rate of responding in the occurrence of behavioral contrast. Experiment I attempted to determine if reducing response rate by a variable-time (VT) schedule (*cf.* Zeiler, 1968) that delivered the reinforcer independently of responding would produce behavioral contrast.

EXPERIMENT I²

METHOD

Subjects

Four adult male albino rats, obtained from the Holtzman Co., and an adult female homing pigeon, obtained locally, served. The pi-

¹This research is based on portions of a dissertation submitted to the Faculty of Graduate Studies and Research at the University of Manitoba in partial fulfillment of the requirements for the Ph.D. Degree. The author wishes to acknowledge his indebtedness to Joseph J. Pear, under whose direction the research was conducted. The advice of G. L. Martin and M. F. Halasz is also acknowledged. W. Stevens assisted in running the subjects. The research was supported by National Research Council of Canada Grant APA 7461 to J. J. Pear and was conducted while the author was supported by a National Research Council of Canada Postgraduate Scholarship. Preparation of this manuscript was partially supported by Grant 26-9947 from the University of British Columbia Committee on Research. Reprints may be obtained from the author: Department of Psychology, University of British Columbia, Vancouver 8, Canada.

²A similar experiment has been conducted by Weisman (1970), whose findings were similar to those reported here.

geon and two of the rats (W3 and W4) were experimentally naive. Rats W7 and W8 had served in an experiment involving fixed-ratio schedules. Before the start of the experiment, the subjects were reduced to 80% of their free-feeding body weights by food deprivation.

Apparatus

The experimental space used for the rats was an operant conditioning chamber (Lehigh Valley Electronics Model 1568 test cage and Model 1642 cubicle). On one wall of the test cage was mounted a 7-w lamp, a lever requiring about 6.5 g (0.064N) of force to operate, and a dispenser that delivered 45-mg Noyes food pellets. The experimental space used for the pigeon was a BRS-Foringer Model PH-004 pigeon chamber. On one wall of the chamber was mounted a response key and a grain feeder. Operation of the key required a force of about 20 g (0.196N). Stimuli were projected on the response key by an Industrial Electronics Engineers' One Plane Readout Cell. During the 4-sec reinforcement period, stimuli on the response key were turned off and a small light illuminated the grain in the feeder tray. Fans provided ventilation and a partial masking noise in both experimental spaces. Experimental contingencies and events were arranged with standard relay-type equipment. Data were recorded on counters and cumulative recorders.

Procedure

After a short period of preliminary training in which lever pressing was conditioned, Subjects W3 and W4 were exposed to a two-component multiple schedule. Subjects W7 and W8 were exposed to the same multiple schedule after 14 sessions under a variable-interval 30-sec (VI 30-sec) schedule. The components of the multiple schedule were correlated with light (C1) and darkness (C2) in the experimental space. Each component lasted for 5 min. The components alternated with each other throughout the session. Originally, both C1 and C2 were correlated with a VI 30-sec schedule of reinforcement. Later, the schedule in C2 was changed to either (1) a non-contingent schedule in which food was delivered independently of lever pressing after variable-time (VT) periods averaging 30 sec (VT 30-sec), or (2) extinction in which reinforcement did not occur. In addition, Subjects W7 and W8 re-

ceived two sessions in which a differential-reinforcement-of-other-behavior (DRO) schedule and the VT 30-sec schedule were combined in C2. Under this combined schedule of reinforcement in C2, food was delivered irrespective of lever pressing on the VT 30-sec schedule. However, in addition, any period of 10 sec in which no lever presses occurred also produced food.

The pigeon was first exposed to a *mult* VI 60-sec VI 60-sec schedule following a short period of preliminary training, during which key pecking was conditioned. The components of the multiple schedule were correlated with a white line on a black background (C1) and a yellow-green light (C2) which were projected on the response key. The 5-min components occurred in strict alternation. After 16 sessions under *mult* VI 60-sec VT 60-sec, the schedule was changed to *mult* VI 60-sec VT 60-sec. Under this schedule, key pecking during C1 was reinforced, as before, according to a VI 60-sec schedule. In C2, however, food was presented independently of key pecking once every 60 sec on the average (VT 60-sec).

With the exception of the response contingency, the variable-interval and variable-time schedules for both the pigeon and rat subjects were identical. Both schedules consisted of a rectangular distribution of inter-reinforcement intervals ranging from 0 to 60 sec (VI 30-sec and VT 30-sec) or 120 sec (VI 60-sec and VT 60-sec).

All subjects received seven sessions per week. The sessions occurred at about the same time each day. Session duration for the rat subjects was 50 min; sessions for the pigeon were 1 hr.

Details of the procedure for the different subjects are summarized in Table 1. The table shows the order in which the different multiple schedules were presented and the number of sessions on each schedule.

Table 1
Summary of Procedure: Experiment I

Schedule	Number of Sessions				
	Subject: W3	W4	W7	W8	P3
multiple VI VI	18	18	14	14	16
multiple VI VT	15	15	21*	21*	11
multiple VI Extinction	13	13	9	9	—
multiple VI VT	7	7	6	6	—

*The fifteenth and sixteenth sessions on the multiple VI VT schedule had DRO scheduled conjointly with the VT schedule.

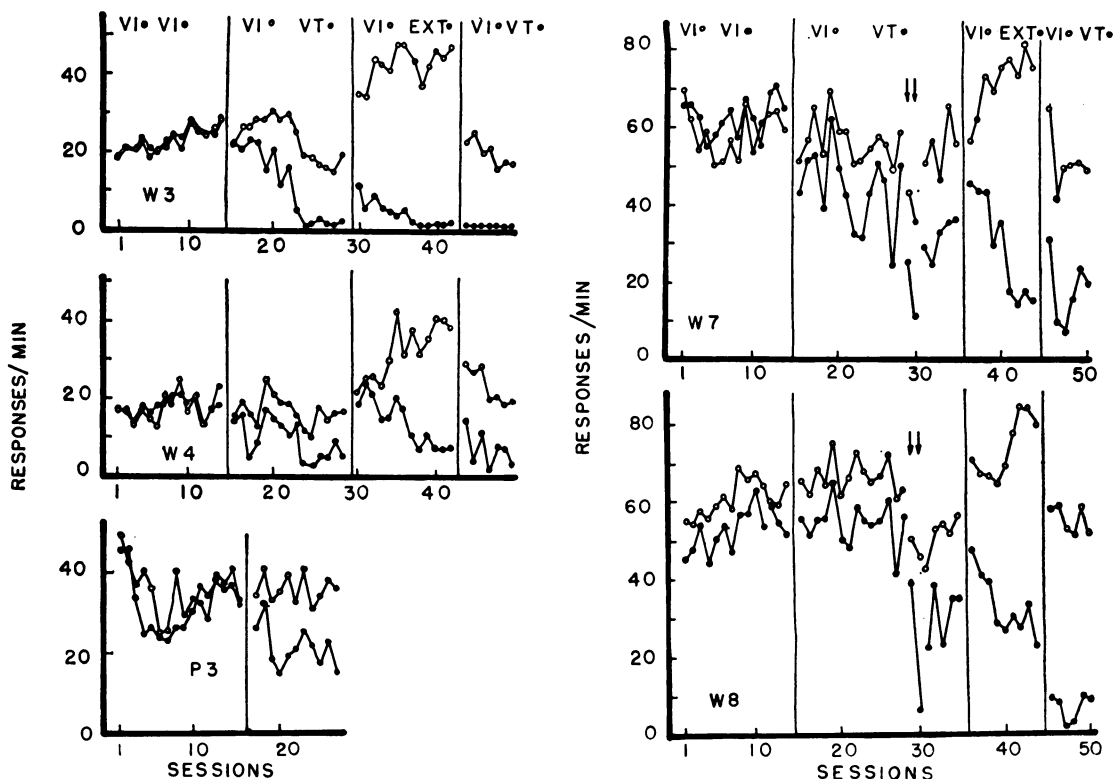


Fig. 1. The rate of responding, in responses per minute, in both components of the multiple schedule. The schedule in C1 of the multiple schedule was always VI. The schedule in the C2 was either VI (first panel), VT (second panel), extinction (third panel), or VT (fourth panel). The sessions indicated by arrows had a DRO schedule superimposed on the VT schedule.

RESULTS

The rate of responding in each component of the different multiple schedules is shown for each subject in Figure 1.

Shift from mult VI VI to mult VI VT. The shift from VI to VT reinforcement in C2 of the multiple schedule reduced the rate of responding in this component for Subjects W3, W4, and P3. The decrease for Subjects W7 and W8 was equivocal. This is particularly true for subject W8 which responded at a lower rate during C2 in the original baseline sessions. To establish a greater degree of differential responding under the *mult VI VT* schedule for these subjects, a DRO 10-sec schedule was arranged simultaneously with the VT 30-sec schedule in C2 for the two sessions indicated by the arrows in Figure 1. This schedule combination, under which food was delivered irrespective of lever pressing on the VT 30-sec schedule and also whenever a period of 10 sec passed without a lever press, had the desired

effect of reducing C2 response rate. The rate in C2 remained low after the DRO contingency was removed.

During the period when C2 response rate was reduced by the VT schedule, no evidence of an increased rate of responding (*i.e.*, behavioral contrast) was observed in C1 for any subject. On the contrary, at least two of the subjects (W3 and W8) showed a decreased rate of responding in the unchanged VI component.

Shift from mult VI VT to mult VI EXT. The change from the VT schedule to extinction in C2 of the multiple schedule produced behavioral contrast in all cases. The increased rate of responding in C1 of the multiple schedule emerged in spite of the fact that the extinction schedule controlled about the same rate of responding as did the previous VT schedule. Only in the case of one subject (W7) did the extinction schedule clearly control a lower rate of responding than the previous VT schedule.

Shift from mult VI EXT to mult VI VT. The shift from *mult VI EXT* to *mult VI VT*

eliminated the behavioral contrast in the VI component of the multiple schedule. In all cases, the rate of responding in the VI component returned to approximately the same rate as had been occurring under the first *mult* VI VT schedule.

DISCUSSION

The results indicate that a reduction in the rate of responding in one component of a multiple schedule is not a sufficient condition for the occurrence of behavioral contrast. Rather, the results appear to implicate a reduction in reinforcement frequency as the determinant of behavioral contrast. Behavioral contrast in the constant VI component of the multiple schedule was observed only when extinction was scheduled in the other component. When reinforcement frequency in the two components was equal, as was the case under the *mult* VI VT schedule, no behavioral contrast was observed in spite of the fact that the VT schedule controlled about the same rate of responding as did the extinction schedule.

The present results, and those of Reynolds (1961) raise questions concerning the role of a reduced rate of responding in the occurrence of behavioral contrast. Clearly, certain procedures such as DRL schedule, signalled reinforcement, and punishment, which reduce response rate while at the same time maintaining reinforcement frequency, do produce behavioral contrast. On the other hand, other procedures such as DRO and VT schedules, which reduce response rate while maintaining reinforcement frequency, do not produce behavioral contrast. How can these apparently conflicting findings be reconciled? Bloomfield (1969) suggested that behavioral contrast results from the introduction of a "worse" or less-preferred condition in one component of a multiple schedule. In terms of this hypothesis, different procedures that reduce response rate in one component of a multiple schedule may (or may not) be less preferred to the previous condition in that component and thus may (or may not) produce behavioral contrast in the unchanged component of the multiple schedule. Since the introduction of the VT schedule in one component of a multiple schedule did not produce behavioral contrast in the present experiment, this hypothesis would predict that subjects would not prefer a

VI to a VT schedule. This prediction was tested in Experiment II. Preference for a VI schedule relative to a VT schedule that provided an equal frequency of reinforcement was measured by time allocation with concurrent schedules.

EXPERIMENT II

METHOD

Subjects

Two adult male albino rats, obtained from the Holtzman Co., served. Both subjects were experimentally naive. Before the start of the experiment, the subjects were reduced to 80% of their free-feeding body weights by food deprivation.

Apparatus

The experimental space was an operant conditioning chamber (Lehigh Valley Electronics Model 1316 test cage and Model 1316C cubicle). The chamber contained a dipper feeder for delivering the reinforcer, a 7-w houselight, and two identical levers that required a force of about 24 g (0.235N) to operate. The reinforcer consisted of 0.01 ml of a 1:1 mixture of sweetened condensed milk and water.

Procedure

Before the experiment proper began, the two rats were given a short period of preliminary training in which lever pressing was conditioned. Following this preliminary training, the subjects were exposed to concurrent VI 60-sec VI 60-sec schedules which were arranged by a changeover lever technique (cf. Findley, 1958). The two VI 60-sec schedules were correlated with different stimuli (light and darkness in the experimental space). Two levers were used. Responses on one lever, the changeover lever, changed the prevailing stimulus from light to dark and *vice versa*. Responses on the second lever, the schedule lever, were reinforced under the schedule associated with the prevailing stimulus condition. Responding on the schedule lever was never reinforced immediately after a response on the changeover lever. Instead, a response on the changeover lever initiated a changeover delay period of 2 sec, during which time reinforcement was not available for responding on the schedule lever.

To ensure an equal rate of reinforcement in the two stimulus conditions, a procedure similar to one described by Stubbs and Pliskoff (1969) was used. A two-channel tape reader assigned the VI reinforcements. One channel assigned reinforcements in the light stimulus; the other channel assigned reinforcements in the dark stimulus. Once a reinforcement was assigned in either stimulus condition, the tape drive was stopped until that reinforcement occurred. Reinforcements in both stimulus conditions were assigned at irregular intervals averaging one assignment per minute. Interreinforcement intervals on both channels were distributed rectangularly and ranged from 0 to 120 sec.

After 28 sessions under the *conc* VI 60-sec VI 60-sec schedules the subjects were exposed to *conc* VI 60-sec VT 60-sec schedules. These latter schedules were similar to the *conc* VI 60-sec VI 60-sec schedules in all respects except that food during the light stimulus was no longer contingent upon lever pressing. The 2-sec delay between responses on the change-

over lever and the availability of reinforcement were maintained in both stimulus conditions.

The rate of responding of one subject, W13, during the VT 60-sec component did not decrease even after 10 sessions under the *conc* VI 60-sec VT 60-sec schedules. This appeared to be due to this subject's high rate of responding (about 70 responses per minute) in both the VI and VT components. To establish clearer differential responding under the *conc* VI 60-sec VT 60-sec schedules for this subject, assigned reinforcements in the light stimulus occurred only after a short period (5 to 10 sec) of non-responding for three sessions. Following these sessions, the regular *conc* VI 60-sec VT 60-sec schedules were reinstated. The subjects were exposed to the *conc* VI 60-sec VT 60-sec schedules for a total of either 13 (W12) or 17 (W13) sessions.

Following the *conc* VI 60-sec VT 60-sec sessions, the subjects were again exposed to the *conc* VI 60-sec VI 60-sec schedules. Throughout the experiment, 45-min sessions were

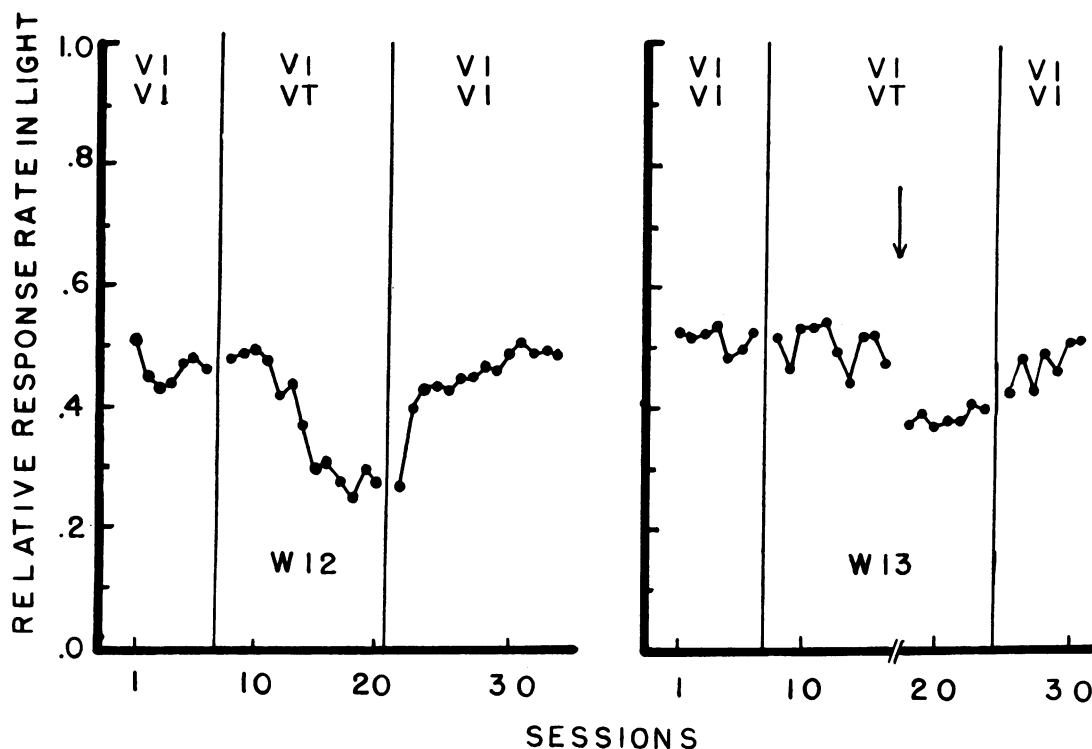


Fig. 2. The relative rate of responding in the light stimulus. The first panel shows the last seven sessions on *conc* VI VI. The middle panel shows the sessions on the *conc* VI VT schedules. The third panel shows the final sessions on *conc* VI VI. The arrow indicates the three sessions for Subject W13 in which not responding was reinforced. These three sessions are omitted from the figure.

scheduled seven days per week. Sessions occurred at about the same time each day.

RESULTS

Conc VI 60-sec VI 60-sec. The sessions on the *conc VI 60-sec VI 60-sec* schedules were used as a baseline against which to assess the effects of introducing the *conc VI 60-sec VT 60-sec* schedules. The last seven sessions on *conc VI 60-sec VI 60-sec* are shown in the first panels of Figures 2 and 3. Figure 2 shows the relative rate of responding in the light stimulus, defined as:

Relative response rate in light equals response rate in light divided by response rate in light plus response rate in dark. This measure is of relevance in determining if the introduction of the *conc VI 60-sec VT 60-sec* schedules reduced the rate of responding in the VT 60-sec component. If the rate of responding in the two stimuli were equal, the relative response rate in light would equal 0.50. The different panels shown for each subject correspond to the three stages of the experiment: *conc VI 60-sec VI 60-sec* (first

panel), *conc VI 60-sec VT 60-sec* (second panel), and *conc VI 60-sec VI 60-sec* (third panel). Figure 3 shows the relative amount of time spent by the subjects in the presence of the light stimulus, defined as:

Relative time in light equals time spent in light divided by time spent in light plus time in dark. This measure indicates the degree of preference for a stimulus condition in the concurrent schedules. If this ratio equals 0.50 (*i.e.*, the subjects spend an equal amount of time in light and dark) no preference exists. The panels of Figure 3 are arranged as in Figure 2. The original data from which the relative measures of Figures 2 and 3 were derived are presented in Table 2.

The relative rate of responding in light for the *conc VI 60-sec VI 60-sec* sessions was approximately 0.5 for both subjects. This indicates a more-or-less equal rate of responding in the light and dark stimulus conditions. The relative time spent in light for Subject W13 was about 0.50, indicating that this subject spent an equal amount of time in the light and dark conditions. The relative time spent in

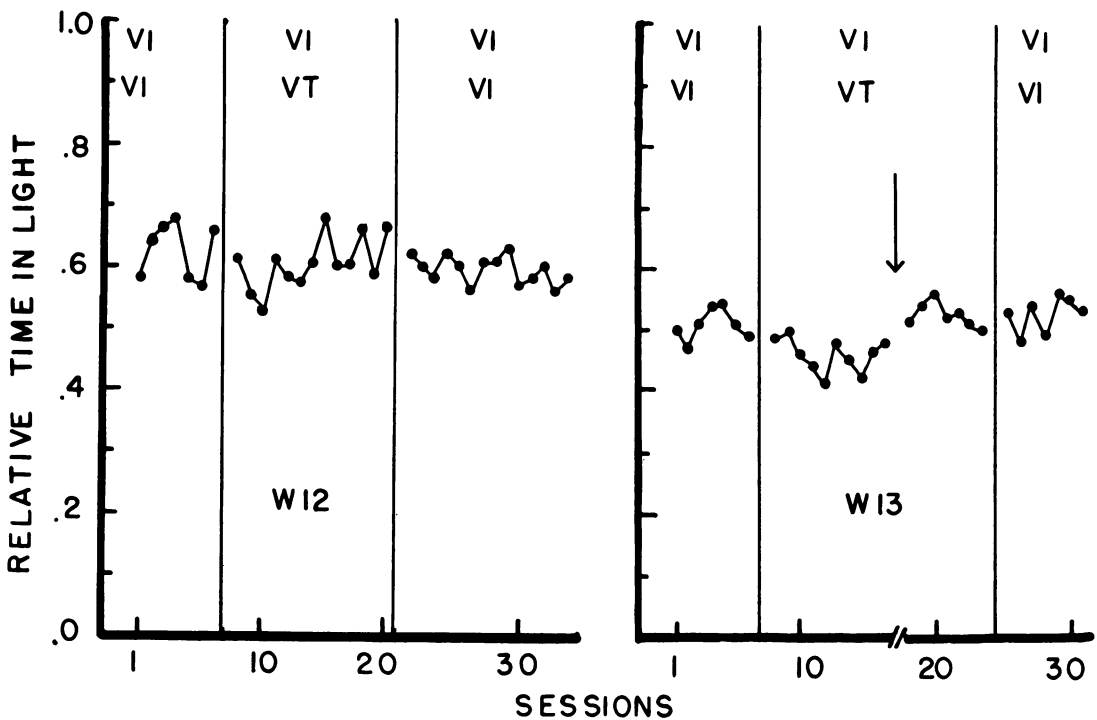


Fig. 3. The relative amount of time spent in the light stimulus. The first panel shows the last seven sessions on the *conc VI VI* schedules. The second panel shows the sessions on the *conc VI VT* schedules. The third panel shows the final sessions on *conc VI VI*. The arrow indicates the three sessions for Subject W13 in which not responding was reinforced. These three sessions are omitted from the figure.

Table 2

Original data from which relative measures of Figures 2 and 3 were derived. Each row represents a session. The last seven sessions of Concurrent VI 60-sec VI 60-sec and all sessions for succeeding schedules are shown.

Subject W12						Subject W13					
Schedule		Response Rate (Rs/sec)		Time (sec)		Schedule		Response Rate (Rs/sec)		Time (sec)	
Light	Dark	Light	Dark	Light	Dark	Light	Dark	Light	Dark	Light	Dark
VI 60-sec	VI 60-sec	0.59	0.53	1561	1139	VI 60-sec	VI 60-sec	1.56	1.44	1338	1362
"	"	0.46	0.56	1730	970	"	"	1.25	1.21	1270	1430
"	"	0.47	0.62	1776	924	"	"	1.30	1.22	1380	1320
"	"	0.52	0.67	1823	877	"	"	1.64	1.48	1455	1245
"	"	0.53	0.60	1571	1129	"	"	1.42	1.53	1450	1250
"	"	0.50	0.55	1552	1148	"	"	1.32	1.40	1380	1320
"	"	0.56	0.66	1777	923	"	"	1.51	1.39	1333	1367
VT 60-sec	VI 60-sec	0.37	0.40	1644	1056	VT 60-sec	VI 60-sec	1.56	1.47	1315	1385
"	"	0.39	0.41	1485	1215	"	"	1.06	1.24	1359	1341
"	"	0.53	0.52	1407	1293	"	"	1.38	1.21	1247	1453
"	"	0.30	0.33	1655	1045	"	"	1.32	1.16	1200	1500
"	"	0.36	0.49	1565	1135	"	"	1.27	1.06	1105	1595
"	"	0.37	0.46	1527	1173	"	"	1.02	1.08	1306	1394
"	"	0.28	0.47	1627	1073	"	"	1.17	1.51	1200	1500
"	"	0.23	0.54	1823	877	"	"	0.95	0.87	1144	1556
"	"	0.17	0.38	1608	1092	"	"	1.16	1.05	1255	1445
"	"	0.24	0.62	1613	1087	"	"	1.24	1.42	1284	1416
"	"	0.21	0.62	1774	926	DRO	VI 60-sec	0.63	0.81	1564	1136
"	"	0.27	0.62	1574	1126	"	"	0.52	0.85	1666	1034
"	"	0.25	0.65	1788	912	"	"	0.37	0.72	1714	986
VI 60-sec	VI 60-sec	0.21	0.57	1674	1026	VT 60-sec	VI 60-sec	0.39	0.66	1375	1325
"	"	0.34	0.51	1607	1093	"	"	0.52	0.81	1448	1252
"	"	0.43	0.57	1559	1141	"	"	0.49	0.83	1520	1180
"	"	0.49	0.62	1674	1026	"	"	0.73	1.18	1410	1290
"	"	0.49	0.65	1617	1083	"	"	0.52	0.85	1432	1268
"	"	0.43	0.52	1517	1183	"	"	0.55	0.77	1367	1333
"	"	0.41	0.51	1651	1049	"	"	0.59	0.89	1351	1349
"	"	0.48	0.55	1655	1045	VI 60-sec	VI 60-sec	0.77	1.04	1423	1277
"	"	0.47	0.55	1700	1000	"	"	0.98	1.05	1283	1417
"	"	0.72	0.74	1526	1174	"	"	0.98	1.28	1459	1241
"	"	0.66	0.64	1552	1148	"	"	1.12	1.15	1331	1369
"	"	0.49	0.50	1629	1071	"	"	0.71	0.83	1499	1201
"	"	0.57	0.53	1521	1179	"	"	0.78	0.75	1486	1214
"	"	0.60	0.63	1553	1147	"	"	0.91	0.87	1435	1265

light for Subject W12 was about 0.60, which indicates some preference for the light stimulus.

Conc VI 60-sec VT 60-sec. When the *conc VI 60-sec VT 60-sec* schedules were introduced (middle panels of Figures 2 and 3), the relative rate of responding in the light stimulus decreased for Subject W12. This decrease reflects a lower rate of responding on the VT 60-sec schedule. The other subject did not show this effect until after non-responding was reinforced for three sessions. The relative amount of time spent by the subjects in the light stimulus did not change appreciably after the *conc VI 60-sec VT 60-sec* schedules were introduced.

Conc VI 60-sec VI 60-sec. The right-hand panels of Figures 2 and 3 show performance on the *conc VI 60-sec VI 60-sec* schedules following the sessions on the *conc VI 60-sec VT 60-sec* schedules. The relative response rate in light for both subjects increased to approximately 0.50. There was little, if any, change in the relative amount of time spent in the light stimulus.

DISCUSSION

The major finding of the present experiment was that there was no preference, as measured by time allocation, for the VI 60-sec schedule during the sessions on the *conc VI 60-sec VT 60-sec* schedules. The subjects tended

to spend an equal amount of time in the light stimulus in all three stages of the experiment. The lack of preference between the VI 60-sec schedule and the VT 60-sec schedule supports Bloomfield's hypothesis concerning the determinants of behavioral contrast. Since no behavioral contrast was observed on the *mult* VI VT schedule of Experiment I, no preference for the VI schedule, relative to the VT schedule, would be predicted. A definite preference for the VI schedule in *conc* VI EXT schedules would be predicted because behavioral contrast was observed on the *mult* VI EXT schedule in Experiment I. Preference for a VI schedule in *conc* VI EXT schedules has, of course, been observed in numerous experiments (e.g., Catania, 1966).

Whether or not Bloomfield's hypothesis can account for other behavioral contrast findings is an empirical question. However, the hypothesis appears to be able to account for the observance of behavioral contrast in multiple schedules in which reinforcement frequency in one component is reduced; studies of concurrent schedules have found that animals prefer frequent to infrequent reinforcement (e.g., Catania, 1966). Similarly, the hypothesis appears to be able to account for some experiments in which contrast was observed when response rate, but not necessarily reinforcement frequency, is reduced in one component of a multiple schedule. Since animals show preference for non-punishment over punishment, the hypothesis predicts behavioral contrast in experiments such as that of Brethower and Reynolds (1962) in which response rate in one component of a multiple schedule was reduced by punishment. There is also some evidence that Bloomfield's hypothesis can account for the behavioral contrast observed on the *mult* VI DRL used by Weisman (1969) and Terrace (1968). Fantino (1968) found some evidence that pigeons prefer schedules that do not require a low rate of responding. In this experiment, three pigeons were trained under a two-link concurrent-chains schedule. Both first links were variable-interval schedules. The second links were a fixed-interval schedule and a differential-reinforcement-of-low-rate schedule. The rates of reinforcement in the

second links were equal. One bird showed preference, as indexed by response rate in the first links, for the fixed-interval rather than the differential-reinforcement-of-low-rate schedule. Neither of the other birds showed a similar preference. However, the rate of responding of these subjects on the differential reinforcement of low rate schedules was not lower than their rates on the fixed-interval schedule.

REFERENCES

- Bloomfield, T. M. Behavioral contrast and the peak shift. In R. M. Gilbert and N. S. Sutherland (Eds.), *Animal discrimination learning*. New York: Academic Press, 1969. Pp. 215-241.
- Brethower, D. M. and Reynolds, G. S. A facilitative effect of punishment on unpunished behavior. *Journal of the Experimental Analysis of Behavior*, 1962, 5, 191-199.
- Brownstein, A. J. and Hughes, R. G. The role of response suppression in behavioral contrast: Signaled reinforcement. *Psychonomic Science*, 1970, 18, 50-52.
- Catania, A. C. Concurrent operants. In W. K. Honig (Ed.), *Operant behavior: areas of research and application*. New York: Appleton-Century-Crofts, 1966. Pp. 213-270.
- Fantino, E. Effects of required rates of responding upon choice. *Journal of the Experimental Analysis of Behavior*, 1968, 11, 15-22.
- Findley, J. D. Preference and switching under concurrent scheduling. *Journal of the Experimental Analysis of Behavior*, 1958, 1, 123-144.
- Reynolds, G. S. Behavioral contrast. *Journal of the Experimental Analysis of Behavior*, 1961, 4, 57-71.
- Reynolds, G. S. and Limpo, A. J. On some causes of behavioral contrast. *Journal of the Experimental Analysis of Behavior*, 1968, 11, 543-547.
- Stubbs, D. A. and Pliskoff, S. S. Concurrent responding with fixed relative rate of reinforcement. *Journal of the Experimental Analysis of Behavior*, 1969, 12, 887-895.
- Terrace, H. S. Discrimination learning, the peak shift, and behavioral contrast. *Journal of the Experimental Analysis of Behavior*, 1968, 11, 727-741.
- Weisman, R. G. Some determinants of inhibitory stimulus control. *Journal of the Experimental Analysis of Behavior*, 1969, 12, 443-450.
- Weisman, R. G. *Determinants of inhibitory stimulus control*. Paper read at the Thirty-first Annual Convention of the Canadian Psychological Association, Winnipeg, Manitoba, 1970.
- Zeiler, M. D. Fixed and variable schedules of response-independent reinforcement. *Journal of the Experimental Analysis of Behavior*, 1968, 11, 405-414.

Received: 22 February 1971.

(Final Acceptance: 26 August 1971.)