EFFECT OF PROXIMITY OF ELEMENTS ON THE FEATURE-POSITIVE EFFECT[1]

R. S. SAINSBURY

THE UNIVERSITY OF CALGARY

Eight groups of pigeons were trained to discriminate between two stimulus displays that could be differentiated only by a single distinctive feature on one of the displays. For half of the pigeons, responses to displays containing the distinctive feature were reinforced (feature-positive), and for the remaining pigeons responses to displays without the distinctive feature were reinforced (feature-negative). The pigeons were further grouped so that half were presented displays in which the distinctive feature was in close proximity to other features (compact displays) and half were presented displays in which the features were not close together (distributed displays). Pigeons in the feature-positive groups localized responses on the distinctive feature of the displays and seldom responded to displays without the distinctive feature. Pigeons in the distributed feature-negative groups localized responses on features common to the two displays and did not learn the discrimination. Compacting the displays facilitated discrimination performance for the subjects in the feature-negative condition. Tests carried out in extinction indicated that responding in the compact feature-negative group was largely controlled by pattern rather than by the individual elements on the display.

Previous work has shown that if two stimulus displays were differentiated only by a single distinctive feature, locating the distinctive feature on the negative display was not comparable to locating it on the positive display, (the display in the presence of which responses were reinforced). Pigeons trained with the distinctive feature on the positive display learned the discrimination far more readily than pigeons trained with the distinctive feature on the negative display (Sainsbury and Jenkins, 1967; Jenkins and Sainsbury, 1969, 1970). When the location of pigeons' pecks on displays were recorded, the feature-positive subjects were found to localize responses on the distinctive feature before the elimination of responses on the negative display. Feature-negative subjects, on the other hand, gradually ceased responding to the distinctive feature and localized responses on the common features of the two displays.

This "feature-positive effect" was described in terms of a simultaneous discrimination theory. According to the theory, the two displays may be viewed as consisting of two parts, and each part may be responded to separately. The distinctive feature (d) is one part, and the common elements (c) of the two displays comprise a second part. Thus, on any distinctive-feature trial the subject may respond to either the distinctive feature or the common features, and the outcome of the trial affects only the response probability to the feature responded to. In the feature-positive case, the probability of reinforcement for a response to d is 1, but the probability of reinforcement for a response to c is less than 1. This difference in reinforcement probability facilitates a simultaneous discrimination between c and d, with d gaining control over the response.

In the feature-negative case, the probability of reinforcement for a response to d is 0, but the probability of reinforcement for a response to c is greater than 0. Therefore, c gains control over the response. As in the feature-positive case, a simultaneous discrimination should also occur within the c, d display. However, since the animal does not differentiate a c response on a c, d trial from a c response on c-only trials, it will not cease responding on c, d trials.

Thus, the theory treats the elements of the

display as completely separate, noninteracting stimuli. Interaction between the elements is not required in the feature-positive case, because the animal need only learn to respond to *d* and not *c*. In the feature-negative case, however, some form of interaction between the elements is required if the appropriate discrimination is to be learned. The response made to *c* on positive trials must be withheld when *c* is accompanied by *d*.

In previous experiments in this series, in which *c* and *d* features were separate geometric figures, the figures appeared at the center of each quadrant of a square display that measured 1.5 in. (3.8 cm) on a side (Fig. 1, top row). In order for the pigeon to peck at, or to avoid pecking at, the distinctive feature, common and distinctive features had to be discriminated from each other within the display. To do that consistently would require that all the features be seen on each trial. Presumably, bringing the elements closer together would facilitate the interaction required by the feature-negative arrangement. Elements in closer proximity would be more likely to remain in view in the final stages of the peck response, and that might allow *d* to exert more effective inhibitory control over the response to *c*. Gestalt concepts of the role of proximity in the perception of patterns provide other grounds for expecting proximity to facilitate interaction.

The purpose of the present experiment was twofold. First, it established whether spatial proximity of features is especially advantageous for the learning of feature-negative as compared with feature-positive discrimina-‘ tions. Second, it made a preliminary assessment of whether proximity leads to a discrimination based on the entire pattern of elements, or to a greater influence of one element on another.

METHOD

Subjects

Thirty-two experimentally naive male White King pigeons, 5 to 6 yr old, were maintained at 80% of their free-feeding weights.

Apparatus

Stimulus displays were projected onto the back of a square surface of translucent plastic that measured 1⅞₆ in. (3.5 cm) on a side.

The plastic surface was further divided into four equal quadrants 1¹⅟₁₆ in. (1.75 cm) on each side. Each quadrant operated as an independent response key so that it was possible to determine the quadrant of the plastic display on which the response was made. The quadrants were separated by a ⅟₁₆-in. (1.6 mm) metal strip to prevent the activation of more than one quadrant by a single peck.

A Kodak Carousel projector with the voltage across a 500-w bulb reduced to 50 v presented the displays. A shutter mounted behind the plastic surface controlled the time of presentation. Two identical Lehigh Valley experimental chambers (model 1519) were connected to one central unit that arranged the trials and recorded the results for both chambers. The control unit serviced the chambers one at a time in a regularly alternating sequence. The chambers were dimly illuminated by a houselight throughout the experiment.

The training and test displays used are shown in Fig. 1. Here, *c* refers to common elements and *d* represents the distinctive feature. In the distributed display, one circle ⅛ in. (3.2 mm) in diameter appeared in each quadrant of the display. The circles in adjacent quadrants were separated by 1²⁄₁₆ in. (1.9 cm), center to center. The circles in diagonally opposed quadrants were ¹⁵⁄₁₆ in. (2.4 cm) apart. In the compact display, the ⅛ in. (3.2 mm) circles all appeared in one quadrant. Vertically and horizontally the circles were separated by ³⁄₁₆ in. (4.8 mm) center to center. Diagonally, the circles were ⁵⁄₁₆ in. (7.9 mm) apart.

The circles were colored either red or green and appeared on a dark surround. The colors were obtained by placing Kodak Wrattan filters over a transparent circle on the slide itself. The red was obtained by using a Kodak Wrattan filter no. 25 plus two neutral density filters with a total value of 1.3. The green circles were produced with a Kodak Wrattan filter no. 58 plus a neutral density filter with a value of 1.0. These combinations were chosen because data obtained with humans (Sainsbury, 1969) had shown them to be approximately equal in subjective brightness.

Four spatial arrangements of the distributed display contained the distinctive feature (*c, d* trials) and one distributed display of only common features (*c*-only trials). A random sequence of these arrangements was used so that
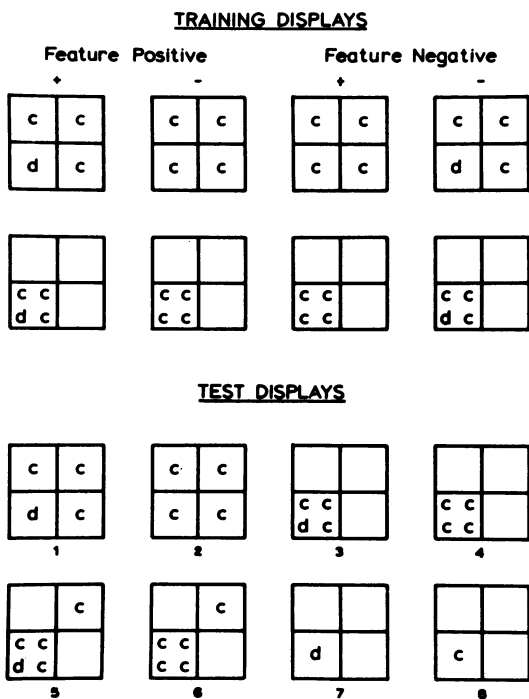
TRAINING DISPLAYS

Feature Positive   Feature Negative

TEST DISPLAYS

Fig. 1. Training and test stimulus displays used in the present experiment. Here, c refers to common features, the distinctive feature is represented by d. In both the feature-positive and feature-negative conditions, four responses anywhere on the positive (+) display were reinforced. The location of d on the distinctive feature display was varied from trial to trial.

the location of the feature varied from trial to trial. Each arrangement appeared equally often during an experimental session. In the compact display, there were four spatial arrangements for each quadrant, and there were four quadrants that could be used. This yielded 16 possible displays containing the distinctive feature and four containing only common elements. These displays were also presented in a random order. Each of the 16 compact displays containing a distinctive feature appeared at least twice during an experimental session; each display appeared nine times within every block of four sessions. Each of the four compact displays consisting of common features appeared equally often during an experimental session. The circles were of equal size, brightness, and color in the distributed and compact displays.

Procedure

Eight groups of subjects were used in a 2 x 2 x 2 factorial design. The factors were

compact-distributed, feature positive-feature negative, and red-green distinctive feature. Each group contained four subjects. The "distributed" groups were a replication of Jenkins and Sainsbury (1969, 1970) with the exception of the change in stimuli used. All conditions were studied equally in each of the two experimental chambers.

A discrete trial procedure (Jenkins, 1965) was used. A trial was initiated by the onset of the stimuli and was terminated by the fourth response or at the end of 7 sec, whichever occurred first. On positive trials, every fourth key peck was followed by 4-sec access to mixed grain (fixed ratio 4). Location of pecks in a particular quadrant was not a prerequisite for reinforcement; the fourth peck was reinforced regardless of its location. An intertrial interval followed reinforcement. On negative trials the fourth response simply terminated the trial and initiated an intertrial interval. The number of responses in each quadrant of the display and the elements in each quadrant were recorded. Peck location data were not available for the compact display because it was contained within one quadrant.

Six sessions of 72 trials each preceded differential training. The first three sessions were used to establish a four-peck sequence to the displays. During the final three sessions of pre-differential training the fixed ratio 4 schedule was in effect. Thirty-six c-only trials and 36 c, d trials comprised each session, and every fourth response was reinforced during each trial. There were no negative trials. The maximum trial duration was 7 sec and the intertrial interval ranged between 44 and 62 sec.

Sixteen sessions comprised differential discrimination training. The trial duration and intertrial intervals were the same as in the pre-differential training sessions. Each of the 16 differential sessions consisted of 36 presentations of the positive display, and 36 presentations of the negative display. The sequence of presentations was random except that there could be no more than three positive or negative trials in succession.

At the completion of discrimination training, the eight types of test displays shown in Fig. 1 (bottom) were presented but responses were not reinforced. The order of presentation during the five sessions of extinction was randomized within blocks of 24 trials. In each block of trials, each of the eight display types

appeared three times. A session consisted of
three blocks, making a total of 72 trials.

RESULTS

Distributed Groups

The discrimination ratios (number of re-
sponses made to the positive display divided
by the total number of responses) for the four
groups that received distributed displays dur-
ing pre-differential and differential training
are presented in Fig. 2, as are the localization
ratios (the number of responses made to the
distinctive feature divided by the total re-
sponses to the distinctive feature display). All
four of the subjects in the red, feature-positive
condition learned the discrimination and three
of the four subjects in the green, feature-posi-
tive condition learned the discrimination.
Without exception, all of the subjects in the
feature-positive condition that discriminated
between the displays, first showed evidence of

localizing responses on the distinctive feature.
The one subject that did not discriminate the
displays also failed to show this localization.

It is clear from Fig. 2 (top) that the group
trained with the red circle as the distinctive
feature on the positive display learned the dis-
crimination more quickly than the group
trained with the green circle as the distinctive
feature on the positive display. The subjects
in the red feature-positive condition had a
discrimination ratio of 0.80 after only three
sessions; subjects in the green feature-positive
condition took between 11 and 12 sessions
to reach the same level. This difference was
related to the color preference evident dur-
ing pre-differential training. During pre-differ-
ential training, 13 of the 16 subjects in the
distributed groups exhibited an above chance
level preference for red circles. A comparison
of the discrimination ratios on the last session
of discrimination training revealed that there
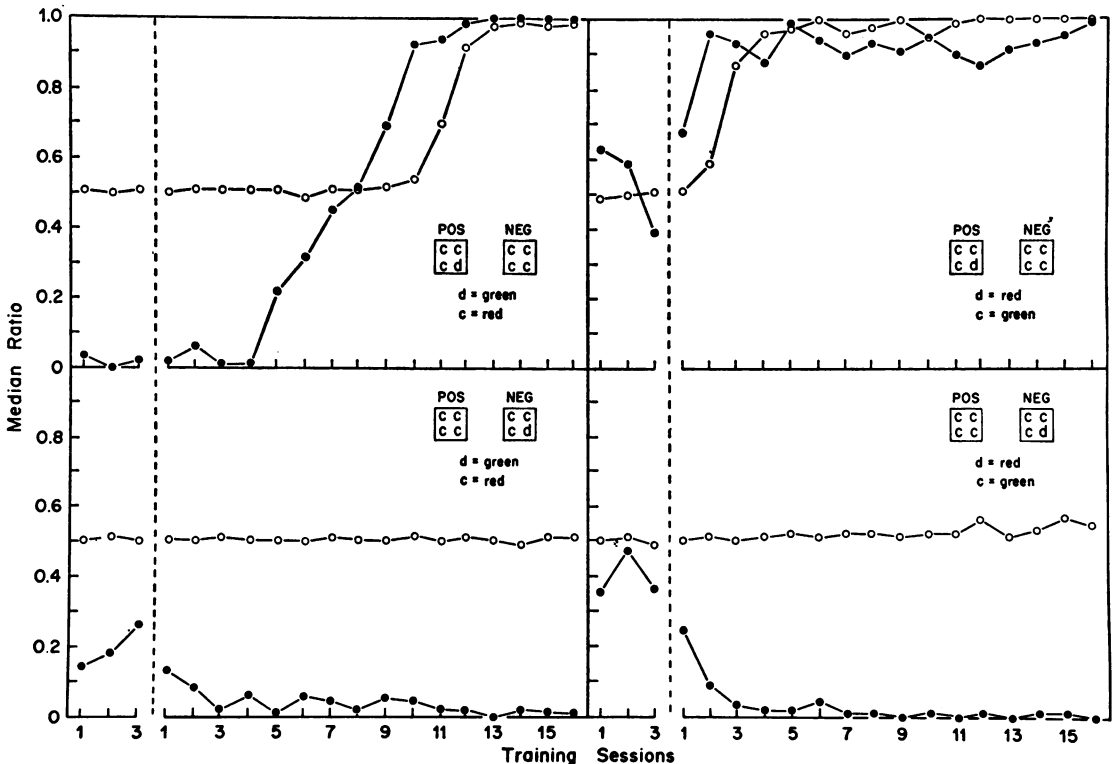were no significant differences between the red

Fig. 2. Median discrimination and localization ratios are shown for the distributed groups. Data for the fea-
ture-positive groups are depicted in the top row and for the feature-negative groups in the bottom row. The open
circles show the median ratio of responses (discrimination ratio) made to the positive display during the last
three sessions before differential training and during 16 training sessions. The filled circles show the median
ratio of responses (localization ratio) made to the distinctive feature during the same sessions.

and green, feature-positive conditions ($U = 4.5$, $p > 0.10$; Mann Whitney U test). Thus, while color affected the rate of learning, it had no effect on the final level of discrimination.

None of the subjects in the feature-negative condition that received distributed displays responded differentially to the displays (Fig. 2, lower). During differential training, the location of responses gradually changed from the distinctive feature toward the common feature. In the red feature-negative condition, the transition was nearly complete after two sessions. Similarly, in the green feature-negative condition, those animals that initially pecked at the distinctive feature ceased doing so after one or two sessions. The results are less clear for those animals that pecked infrequently at the distinctive feature during pre-differential training. Here it was impossible for the response to go below the pre-differential level.

Thus, as seven of the eight subjects trained with the distinctive feature on the positive display developed a discrimination and none of the eight subjects in the feature negative condition did so, a clear feature positive effect was obtained.

Compact Groups

The results for the subjects trained in the red and green feature-positive conditions are plotted in Fig. 3 (top). All eight subjects in the feature positive condition learned the discrimination. Further, there were no significant differences between the red and green feature-positive conditions when the mean discrimination ratios over the 16 training sessions were compared, ($U = 4$, $p > 0.10$). A comparison of the discrimination ratios on the last session of training also proved not to be significant ($U = 7.5$, $p > 0.10$). Thus, unlike the results for the distributed groups, color appeared to have less influence on the rate with which the discrimination was acquired.

The median discrimination ratio for subjects trained in the red and green, compact feature-negative conditions are also plotted in Fig. 3 (bottom). In the red feature-negative condition, all four subjects gave some indication of learning the discrimination. One animal showed a complete discrimination (ratio of 1.0); the remaining three animals had ratios of 0.66, 0.83, and 0.90 on the last session of training. In the green feature-negative con-

dition, three subjects gave evidence of a discrimination (individual ratios were 0.67, 0.80, and 0.92) and the remaining subject reached a maximum ratio of only 0.54 on the sixteenth session of differential training. As in the compact feature-positive condition, the assignment of red or green as the distinctive feature appeared to play no significant role in the formation of the discrimination. There were no significant differences between the mean discrimination ratios of the red and green feature-negative groups over the 16 training sessions ($U = 5$, $p > 0.10$), or on the last session of training ($U = 5$, $p > 0.10$).

Although there was clear evidence of learning in the feature-negative group when the displays were compact, a comparison of the two halves of Fig. 3 indicates that the discrimination achieved by the feature-positive subjects was superior to that achieved by the feature-negative subjects. In the feature-positive condition, a successive discrimination ratio of 0.90 was reached by every subject, and the average number of sessions required was 3.6. On the other hand, only three of the eight subjects in the feature-negative condition reached a value as high as 0.90, and these three did so only after an average of 6.6 sessions. A comparison of the mean discrimination ratios for the 16 training sessions showed a significant difference between the feature-positive and the feature-negative groups ($U = 3.5$, $p < 0.01$). Similarly, a comparison of the discrimination ratios on the last session of training showed a significant difference between these two groups ($U = 8$, $p < 0.01$). A feature-positive effect was, therefore, still evident when the common and distinctive features were presented in clusters.

In the feature-positive condition there were no significant differences attributable to compact as compared with distributed displays. A statistical comparison of the discrimination ratios on the last session of training for the compact and distributed feature-positive groups resulted in a non-significant difference ($U = 19.5$, $p > 0.10$); nor was the difference between the mean discrimination ratios for these groups over the 16 training sessions statistically significant ($U = 0.30$, $p > 0.40$).

A comparison of the final discrimination ratios of the subjects in the compact feature-negative condition and distributed feature-negative condition yielded a significant difference
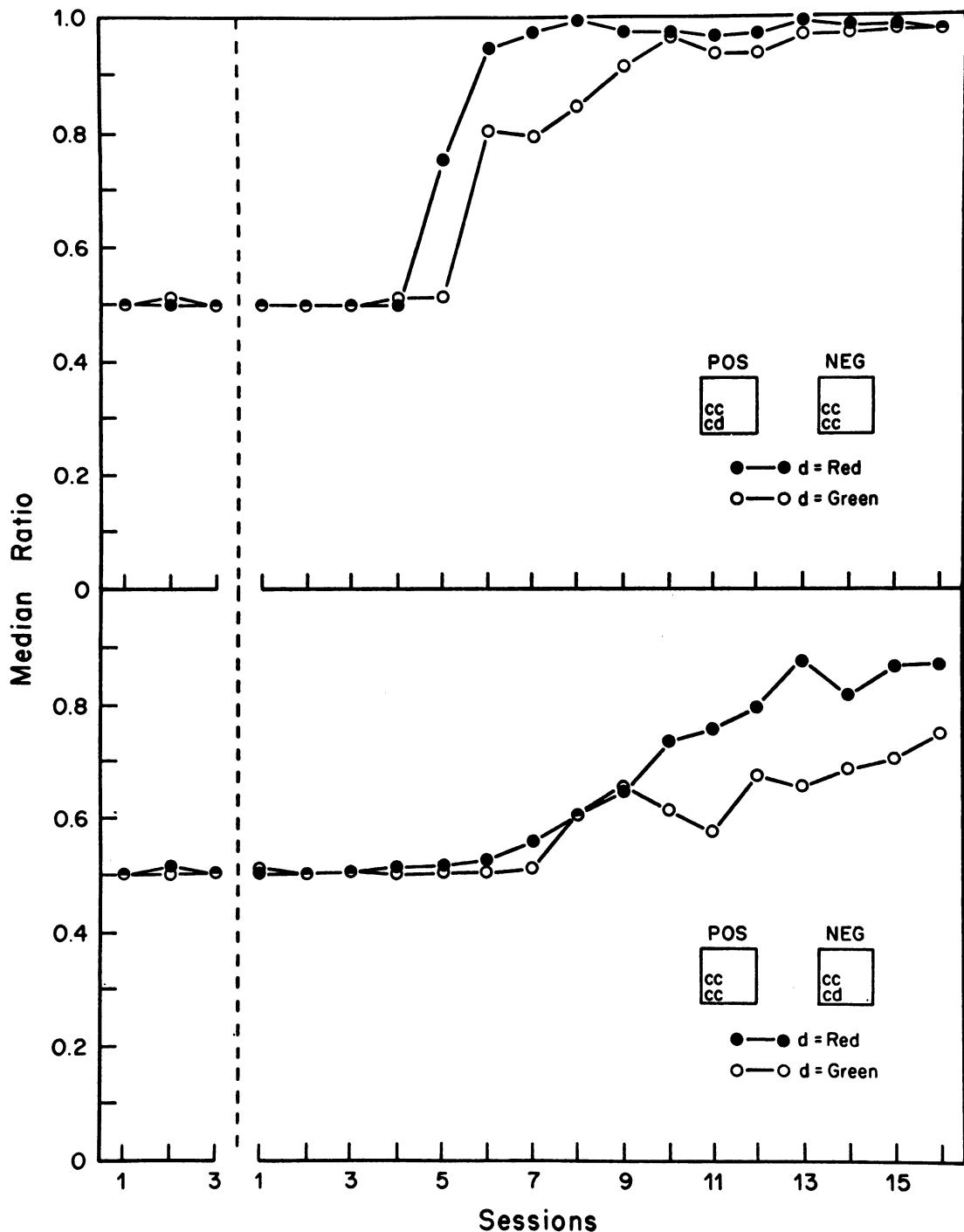
Fig. 3. Median discrimination ratios for the compact groups. The feature-positive groups are located in the top graph and the feature-negative groups in the lower graph.

between the two groups (U = 2, p < 0.001). A similar result was obtained when the mean discrimination ratios over the 16 training ses-sions were compared (U = 8, p < 0.01). The discriminative performance of the subjects in the compact feature-negative condition was

Table 1

Mean discrimination and localization ratio for each subject during the last three training sessions.

	Distributed				Compact	
	Discrimination Ratio Subject		Localization Ratio		Discrimination Ratio Subject	
Red Feature-Positive	A	0.95	0.65		E	0.99
	B	0.99	0.98		F	0.98
	C	1.00	0.96		G	0.97
	D	1.00	0.96		H	0.96
Green Feature-Positive	AA	1.00	1.00		EE	0.96
	BB	0.99	1.00		FF	0.98
	CC	1.00	0.98		GG	0.95
	DD	0.51	0.24		HH	0.93
Red Feature-Negative	I	0.51	0.01		M	0.83
	J	0.57	0.02		N	0.85
	K	0.50	0.01		P	0.98
	L	0.56	0.00		Q	0.63
Green Feature-Negative	II	0.50	0.00		MM	0.51
	JJ	0.50	0.02		NN	0.61
	KK	0.50	0.01		PP	0.90
	LL	0.51	0.04		QQ	0.80

very much superior to that of subjects in the distributed feature-negative condition. It is clear that compacting the display made the discrimination significantly easier when the distinctive feature appeared on the negative display, but did not facilitate discrimination when the distinctive feature appeared on the positive display. The mean discrimination ratios and localization ratios for each subject over the last three sessions of discrimination training for each group are shown in Table 1. It is clear that while the means for the feature-positive groups do not differ, the means for the two compact feature-negative groups are considerably higher than those for the distributed feature-negative groups.

The test displays and the median percentage of responses made to each display by each group may be found in Fig. 4 and 5. The test sequence consisted of the four different displays used in training (distributed and compact, with and without the distinctive feature) and four new displays. Two of the new displays consisted of a single *c* or *d* feature. The remaining two each had a single *c* in one quadrant and a compact cluster, with or without *d*, in another quadrant. From Fig. 4 and 5 it is clear that for both the compact and distributed feature-positive groups, changing the number of elements on the display did not have a great effect. Only one group of subjects in the feature-positive condition (dis-

tributed green feature-positive) showed a deficit in responding when the compact displays were presented. This result does not, however, imply that feature-positive subjects were responding to a pattern on the positive display. This is evident from the fact that subjects responded at a high level to the display containing the single *d* element. This result, then, would indicate that while subjects did not learn to respond to an overall pattern, some were affected by context (*i.e.*, the placing of *d* in close proximity to *c*).

Further, the peck location data obtained for subjects in the compact feature-positive condition are similar to those for the distributed groups. When display C_3 was presented, the median per cent of total responses made to the distinctive feature (localization ratio) was 92.59 (range 75% to 100%). Thus, the evidence suggests strong control by the distinctive feature as a separate element in feature-positive groups whether trained on distributed or compact displays.

DISCUSSION

From the training results it is clear that proximity had an effect in the compact feature-negative condition. However, the nature of this effect is unclear. First, proximity may have resulted in learning on the basis of the overall pattern formed by the cluster of closely
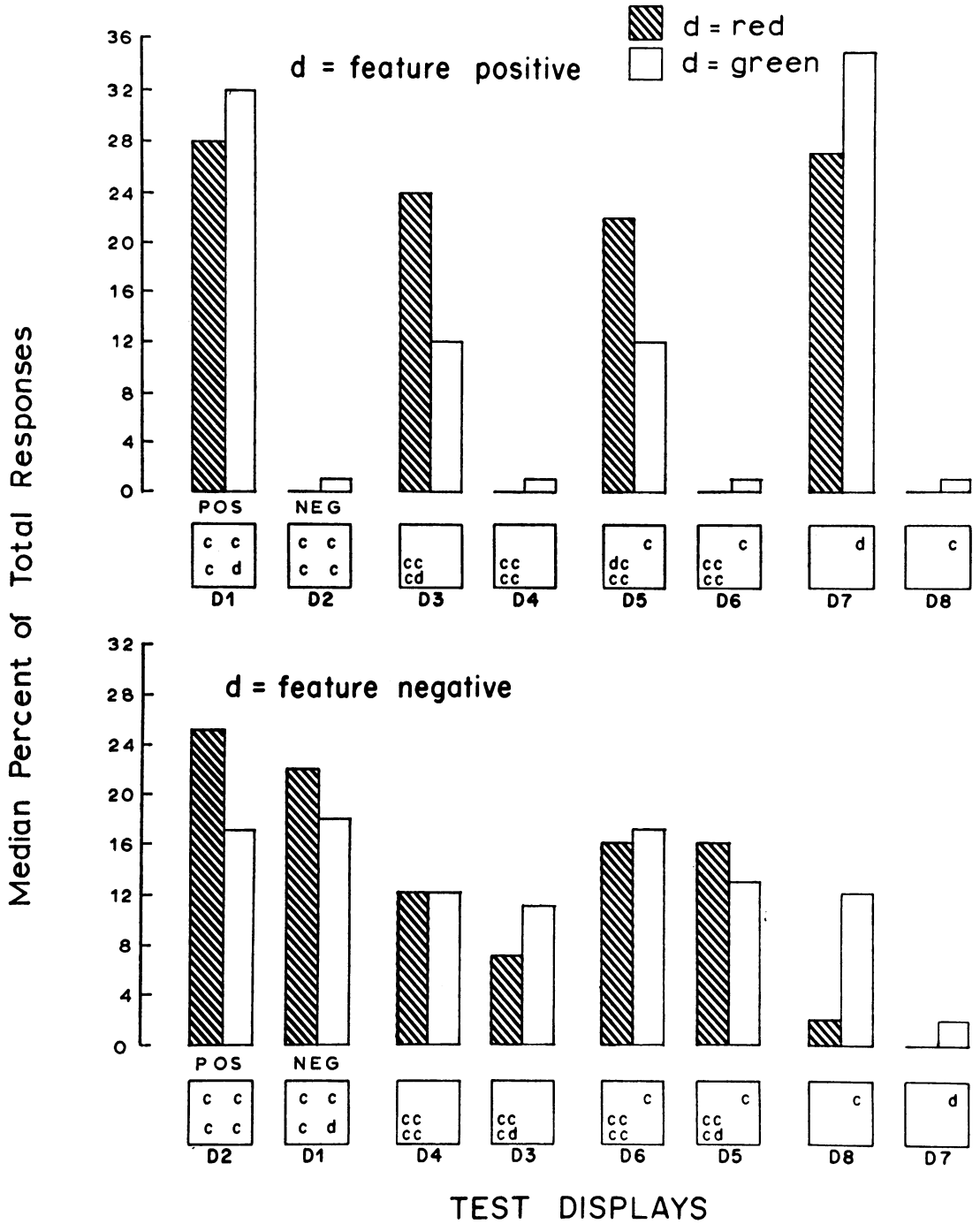
Fig. 4. Extinction test results for each of the four groups trained on distributed displays. Displays labelled positive and negative were the original training displays. Position of features was randomly changed from sector to sector during a test session.

spaced elements. If so, an animal that had learned a feature-negative discrimination with tightly clustered elements would not be expected to respond appropriately to c or d elements presented singly. Second, proximity in the feature-negative case might simply have
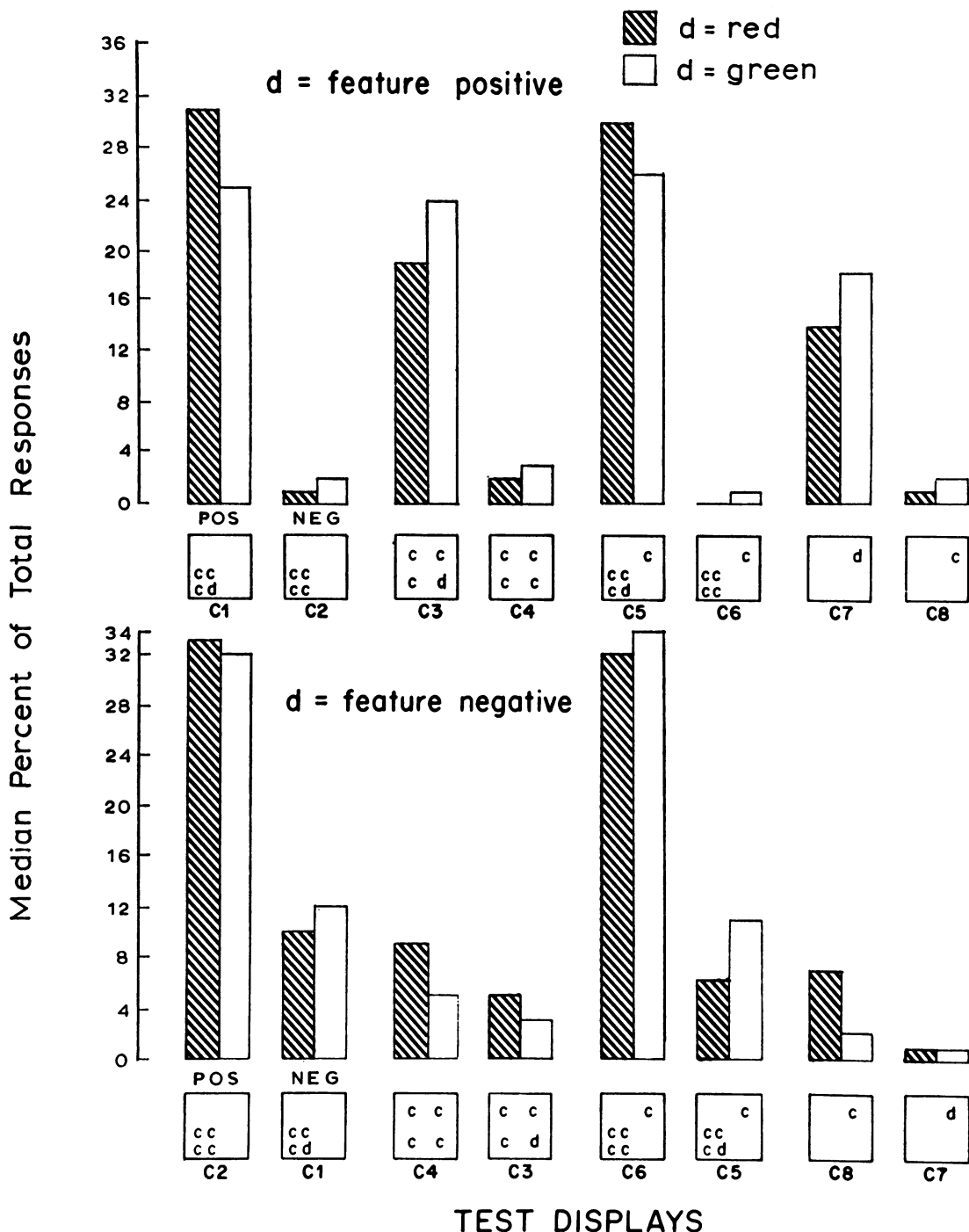
Fig. 5. Extinction test results for each of the four groups trained on compact displays. Displays labelled positive and negative were the original training displays. Position of features was randomly changed from trial to trial during a test session.

allowed the suppressive effects of the *d*-feature to inhibit the tendency to respond to an accompanying *c*-feature, without altering the extent to which these separate elements acquired excitatory and suppressive effects. If so, in contrast to the pattern view, one would

expect that after training with closely spaced clusters, the response to c and d features presented singly would be appropriate to their function in the discrimination. Moreover, if proximity simply permits acquired excitatory and suppressive effects to show an inhibitory interaction in the feature-negative case, then bringing the d feature closer to c features should, without further training on the part of subjects in the distributed feature-negative condition, result in a lower probability of response to a display containing both c and d.

From Fig. 4 it is apparent that subjects in the distributed feature-negative condition responded at a low level when presented with a single c or d (display D_8 or D_7). Similarly, subjects responded significantly less to display D_4 than to display D_2 ($T = 0$, $p < 0.05$; Wilcoxon Matched Pairs Sign Rank Test). As the elements were the same on both displays and only the pattern changed, one must conclude that pattern had an effect on responding.

In the compact feature-negative condition (see Fig. 5) the effect was even more striking. Here, both groups of animals responded at a very low level to the displays containing the single elements (displays C_7 and C_8). Also, subjects responded significantly less to display C_4 than to display C_2 ($T = 0$, $p < 0.05$). Again, as only the pattern differed between the two displays one must conclude that pattern had a great deal of control over responding in the feature-negative condition.

Even though the frequency of responding was not independent of pattern it may still be asked whether, in the feature-negative case, a c that had d as a close neighbour was less likely to be responded to than a c more removed from d (i.e., did d have an inhibitory effect on a response to c?). Consider first the test results after training on the distributed feature-negative discrimination (Fig. 4). If d had an inhibitory effect on c, then the level of responding on D_3, where c and d were close, should have been less than on D_4, where no d was present. The total number of responses to D_3 was not, however, significantly less than to D_4 ($T = 5$, $p > 0.05$). Further, if d had gained inhibitory properties, one might have expected the location of the response to move away from d towards an isolated c. However, results on the location of pecking on test trials with displays D_5 and D_6 showed that subjects did not respond significantly more to the isolated

c element on display D_5 than on D_6 ($T = 8$, $p > 0.10$).

Consider next the test results for subjects trained on the compact, feature-negative displays (Fig. 5). A statistical comparison of the per cent of responses made to the isolated element on display C_5 with the results for display C_6 revealed that the isolated c did not account for a larger proportion of the responses on display C_5 than on display C_6 ($T = 5.5$, $p > 0.10$). Thus, there was no evidence to suggest that d gained any inhibitory control in the feature-negative condition.

The results for the subjects in the feature-positive condition are consistent with the simultaneous discrimination theory postulated by Jenkins and Sainsbury (1969). The simultaneous discrimination theory would predict localization on d by subjects in the feature-positive condition. Further, this localization should precede the formation of the successive discrimination. Both of these predictions were supported by the present experiment. In addition, the theory predicts complete control over responding by a single element on the positive display. The test results indicate this is the case in both the compact and distributed feature-positive conditions. Thus, the theory would seem to be a reliable account of how a single distinctive feature may gain excitatory control over responding, given that the distinctive feature is on the positive display.

In the distributed feature-negative condition, while the subjects obviously differentiated between a c and a d, they did not cease responding on the c, d displays. This result may be regarded as a failure to gain inhibitory control. In order to solve the discrimination it was thought that d would have to gain inhibitory control (i.e., respond to c unless d was present). Further, compacting the displays might facilitate the acquisition of this inhibitory control. However, the test results clearly indicate control by the pattern on the displays rather than inhibitory control by d. One possible reason for this failure to demonstrate inhibitory control is suggested in some early work by Pavlov (1927). As in this experiment, animals were trained on a c, c, d paradigm. Here, the animal was trained to respond to c but not to the compound c, d. Pavlov then demonstrated the inhibitory effects of d by placing it with another positive stimulus. In discussing the conditions necessary for estab-

lishing conditioned inhibition he stated: "The rate of formation of conditioned inhibition depends, again, on the character and relative intensity of the additional stimulus in comparison with the conditioned stimulus, (p. 75)". If one can assume that increasing the relative area of the distinctive feature is the same as increasing its intensity, then it is possible that the lack of inhibitory control in the present experiment may be a function of the small area occupied by the distinctive feature relative to the common features.

One further possibility is that the discrimination may be affected by the modalities from which the features are drawn. In the present experiments, the common and distinctive features were from the same modality. Pavlov, on the other hand, generally used two features from different modalities (*e.g.*, a tone and a rotating visual object). Thus, while in Pavlov's experiments, the two features did not compete in the same modality, the significance of the distinctive feature in the present study may have been reduced by the existence of common features in the same modality.

Nonetheless, it is still surprising that subjects in the feature-negative condition would depend upon an incomplete pattern discrimination rather than a discrimination based on *d*. This might suggest that the acquisition of inhibitory control is indeed more difficult than that of the acquisition of excitatory control based on the positive stimulus (House, Orlando, and Zeaman, 1957; Gardener and Coate, 1965). This result by no means implies that pigeons are unable to form a discrimination based on negative cues. Hearst, Besley, and Farthing (1970) cite several cases where

control by a negative stimulus was clearly demonstrated. These results do indicate, however that mere proximity of cues is not a sufficient condition to induce this inhibitory control.

REFERENCES

Gardener, R. A. and Coate, W. B. Reward *vs.* non-reward in a simultaneous discrimination. *Journal of Experimental Psychology*, 1965, **69**, 579-582.

Hearst, E., Besley, S., and Farthing, G. Inhibition and the stimulus control of operant behavior. *Journal of the Experimental Analysis of Behavior*, 1970, **14**, 373-409.

House, B. J., Orlando, R., and Zeaman, D. Role of positive and negative cues in the discrimination learning of mental defectives. *Perceptual and Motor Skills*, 1957, **7**, 73-79.

Jenkins, H. M. Measurement of stimulus control during discriminative operant conditioning. *Psychological Bulletin*, 1965, **64**, 365-376.

Jenkins, H. M. and Sainsbury, R. S. The development of stimulus control through differential reinforcement. In N. J. Mackintosh and W. K. Honig (Eds.), *Fundamental issues in associative learning*. Halifax, Dalhousie University Press, 1969. Pp. 123-167.

Jenkins, H. M. and Sainsbury, R. S. Discrimination learning with the distinctive feature on positive or negative trials. In D. Mostofsky (Ed.), *Attention: contemporary theory and analysis*. New York, Appleton-Century-Crofts, 1970. Pp. 239-275.

Pavlov, I. P. *Conditioned reflexes*. London: Oxford University Press, 1927.

Sainsbury, R. S. and Jenkins, H. M. Feature-positive effect in discrimination learning, *Proceedings*, 75th Annual Convention, APA, 1967. Pp. 17-18.

Sainsbury, R. S. *The role of distinguishing features in discrimination learning*. Unpublished doctoral dissertation, McMaster University, 1969.