GENERAL ATTENTIVENESS EFFECTS OF DISCRIMINATIVE TRAINING

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Using a design that permitted the simultaneous assessment of intra-, inter-, and extradimensional effects of discriminative training, the generality of discriminative effects that have been said to reflect increases in "general attentiveness" was assessed. Pigeons received either discriminative training with two stimuli correlated with reinforcement and one stimulus correlated with nonreinforcement, or nondifferential reinforcement (control) training. One positive stimulus was part of an intradimensional task and the other was not. After training, generalization tests were conducted to assess stimulus control along several dimensions. Discriminative training resulted in increased control along dimensions of the positive stimulus involved in the intradimensional task, but not along any dimensions of the other positive stimulus. The results suggested that discriminative training leads to increases in attention that are neither so general as suggested by the "general attentiveness" view nor so specific as to be revealed solely by intradimensional effects.

Key words: general attentiveness, discrimination, stimulus generalization, key peck, pigeons

One major emphasis of the literature on discriminative training has been directed at an understanding of the effects on stimulus generalization of differential reinforcement correlated with stimuli on the generalization test dimension. Recent studies have reflected an interest in the assessment of discriminative effects, not only on the specific dimension involved in the discriminative training, but also on other stimulus dimensions. Switalski, Lyons, and Thomas (1966) proposed the following classification of these effects. An effect is *intradimensional* when both the S+ (stimulus correlated with reinforcement) and the S- (stimulus correlated with nonreinforcement) lie on the generalization test dimension. Nonspecific effects, *i.e.*, effects on stimulus dimensions not explicitly correlated with differential reinforcement, are either *interdimensional* when one of the discriminative stimuli (usually S+) is on the test dimension and the other stimulus condition is either the absence of S+ or a stimulus orthogonal to the test dimension (*e.g.*, Jenkins and Harrison, 1960), or *extradimensional* when both discriminative stimuli are on the same dimension but stimuli on the test dimension are either absent or irrelevant during training (*e.g.*, Honig, 1969).

Thomas, Freeman, Svinicki, Burr, and Lyons (1970) proposed that nonspecific effects are quite general concomitants of discriminative

training. They proposed that discriminative training establishes a "set to discriminate", which results in greater stimulus control being established by single-stimulus training that follows discriminative training. However, questions about the generality of these effects have been raised. For example, Turner and Mackintosh (1972) suggested that these general attentiveness effects are importantly affected by certain procedural variables (discrete trials *versus* free-operant situations).

The present study sought to extend the evaluation of the generality of these nonspecific discriminative training effects by providing a simultaneous assessment of inter-, intra-, and extradimensional effects and by using several types of discriminative training procedures. Two features of the present design provided a simultaneous assessment of these effects. One feature was the assessment of effects on several stimulus dimensions in the generalization tests. The other was the use of two S+ stimuli and one S- stimulus in discriminative training. To illustrate, consider a training situation in which one S+ stimulus is a white vertical line and the other S+ stimulus is a bright yellow keylight and in which the S-

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stimulus is a white tilted line. Generalization tests along the tilt dimension would assess an intradimensional effect, tests along the intensity dimension of the yellow keylight would assess an interdimensional effect (the line-tilt S— stimulus is orthogonal to the yellow intensity dimension), and an extradimensional effect would be assessed by tests along the intensity dimension of the white line (this dimension was irrelevant to the line-tilt dimension). The various types of discriminative training procedures were distinguished by the manner in which the S— was introduced.

METHOD

Subjects

Fifty experimentally naive Silver King and White Carneaux adult male pigeons were maintained at 80% of their free-feeding weights. They ranged in age from 4 to 9 yr.

Apparatus

Four Lehigh Valley Electronics operant chambers (36 by 36 by 35 cm) each contained three pigeon keys made of clear Plexiglas located 23 cm from the chamber floor. The two side keys were dark and electrically inoperative. Behind the center key was mounted an Industrial Electronics Engineers Co. Projector, model no. 10-1279-1829L, that could project a white line on a black surround in any one of nine orientations and homogenous fields in any one of three colors. Access to the food magazine, located below the center key, was limited to 3 sec.

Resistors were used to equate the training stimuli across chambers for intensity. As measured by an S.E.I. light photometer the luminance measures were: 17.1 cd/m² for the bright yellow field (BY), 0.6 cd/m² for the yellow field

dimmed by 300 ohms of resistance (DY), 17.5 cd/m² for the vertical white line on a black surround (0°), and 20.2 cd/m² for the line tilted 80° to the right of vertical (80R). It should be noted that the lowest Weber fraction reported by Shumake, Hatfield, and Smith (1966) for pigeons for stimuli in the 1.5 to 50 cd/m² range was 0.36. Thus, the j.n.d. for a stimulus intensity of 17.1 cd/m² is at least 6.2 cd/m².

Procedure

Magazine training was followed by key-peck training by the method of successive approximations. This preliminary training was given in the presence of bright yellow and a vertical line, which were randomly alternated with the restriction that neither stimulus was repeated more than twice in succession. Preliminary training was terminated after 30 reinforced responses under a fixed-ratio 1 (FR 1) schedule of reinforcement. After the first few reinforced key pecks, the length of the stimulus presentations was adjusted in an attempt to ensure that about half of the responses would occur in the presence of each stimulus.

Fifteen daily training sessions were given in which each of the two S+ stimuli was correlated with a variable-interval 15-sec (VI 15-sec) schedule of reinforcement on the first day, a VI 30-sec schedule of reinforcement on the second day, and a VI 45-sec schedule of reinforcement for the remaining 13 days. The VI 15-sec and VI 45-sec schedules were arranged in accordance with a 10-interval Fleshler and Hoffman progression (Fleshler and Hoffman, 1962); the VI 30-sec schedule contained 14 such intervals.

The birds were randomly assigned to five groups (see Table 1). The birds in the control group (N = 10) were exposed to nondifferen-

Table 1
Design of the Experiment

Training Stimuli	Differential Reinforcement S— Yellow (N = 15)		S— Line (N = 15)		Nondifferential Reinforcement (N = 10)	Single Stimulus Training S+ Yellow (N = 5)		S+ Line (N = 5)
	*BY+ 0°+	DY—	BY+ 0°+	80R—	BY+ 0°+	BY+		0°+
Test Stimuli			BY				DY	
			†0°				80R	
			†0° (bright)				0° (dim)	

*See text for description of stimuli
†Same stimulus

tial reinforcement training: these birds received training under a *mult* VI VI schedule of reinforcement, using the appropriate mean interval parameters (*i.e.*, 15 sec on first day, 30 sec on second day, and 45 sec thereafter). For this group, BY and 0° alternated randomly, with the restriction that neither stimulus was presented more than twice in succession. There were 15 BY presentations and 15 0° presentations per session; each presentation was 30 sec in duration. Two other groups (each $N = 15$), distinguished by the S— used, received discriminative training under a *mult* VI VI EXT schedule with the appropriate mean variable-interval parameters. The S— stimulus presentations during the EXT component were interspersed into the sequence of BY and 0° presentations used in the nondifferential reinforcement condition. The S— was never presented more than twice in succession and it preceded and followed BY and 0° stimuli equally often. There were 30 S— presentations per session. All stimulus presentations were 30 sec in duration, except as otherwise indicated. No blackouts occurred between presentations. The S— for one of the two groups that received discriminative training was DY. The S— for the other group was 80R. Each S— group was further divided into three groups of five birds each. Each subgroup was exposed to either a fading (Terrace, 1963), response-prevention (Lyons, 1969), or conventional (Smith and Hoy, 1954) method of discriminative training.

During the fading procedure, the initial S— periods were of brief duration (2 sec) and the luminance of the keylight was reduced until it was barely perceptible to the experimenter. Over the first two sessions, the keylight was always dimmed, while the duration of the S— presentations was gradually increased to 30 sec. Over the next two sessions, the duration of the S— was always 2 sec, while the brightness was increased to its normal intensity. During the fifth session, both the intensity and the duration of the S— were initially at low levels and were simultaneously increased to their normal levels over the course of the session. In the 10 subsequent training sessions, the S— was always presented at its full duration intensity.

During the response-prevention procedure, the bird was observed through a one-way screen. When the pigeon approached the key as if to peck it, the observer operated a switch

that turned off the keylight for a 3-sec blackout period. The houselight remained on during the blackouts. Except during the blackouts the S— was always at full intensity. The duration of the EXT component was always 30 sec; if a blackout occurred within 3 sec of the end of an EXT period, the blackout was shortened by the termination of the EXT period.

During the conventional procedure, the S— stimulus was presented at its full duration and intensity. Responses on the key had no scheduled consequences.

On the day after the final training sessions, generalization tests were administered. During the generalization tests, 14 stimuli were presented: BY and four yellow stimuli dimmed by 75, 150, 225, and 300 ohms; 0° and four white line stimuli tilted 20°, 40°, 60°, and 80° to the right of vertical; 0° dimmed by 75, 150, 225, and 300 ohms. The duration of each stimulus was 30 sec and each of the 14 stimuli was presented four times for a total of 56 trials. Two random sequences of the 14 stimuli were generated and each sequence was presented twice.

We reasoned that if a difference appeared in the generalization gradients between the birds receiving differential reinforcement and those receiving nondifferential reinforcement, then the difference might be due to a sharpening of the gradient by differential reinforcement, to a flattening of the gradient by nondifferential reinforcement, or both. To distinguish among these possibilities, two additional groups (each $N = 5$) were trained; one group was trained with BY only; the other with 0° only. Each bird was magazine trained and each peck in the presence of the appropriate S+ was reinforced under an FR 1 schedule of reinforcement until 15 reinforcements had been delivered. Fifteen daily sessions were given in which responses were reinforced on VI 15-sec on the first day, VI 30-sec the second day, and VI 45-sec for the remaining 13 days. The S+ duration was 30 sec and the S+ was repeated 15 times per session. Generalization tests were administered the day following the last training session.

RESULTS

Discriminative training did not lead to significantly higher response rates in the presence of either of the S+ stimuli. Analyses of vari-

ance with repeated measures were performed separately on the data of the birds for which the S- was a dim yellow light and on the data of those for which the S- was a slanted white line. The data of the birds that received nondifferential reinforcement training provided the control data in each analysis. Both analyses revealed only significant trials effects ($p < 0.001$ in each case). The absence of higher S+ rates with discriminative training is consistent with the findings of other studies in which differential reinforcement was given from the outset of training (Gonzalez and Champlin, 1974; Yarczower and Curto, 1972).

Although positive contrast is a robust phenomenon in pigeons when differential reinforcement of key pecking is given after a number of sessions of nondifferential reinforcement, when differential reinforcement is given from the outset higher S+ rates are less likely to result. Dysart, Marx, McLean, and Nelson (1974) reported higher S+ rates even when discriminative training was carried out from the outset, but Kodera and Rilling (1976) concluded that behavioral contrast was less likely to result if the S- was introduced early (*i.e.*, when discriminative training was given from the outset of training), thus confirming a sug-

gestion reported by Yarczower, Dickson, and Gollub that: "It is possible that behavioral contrast is less likely to occur when both S+ and S- stimuli are alternated at the very beginning of training" (1966, p. 635).

The results of the generalization tests along the line-tilt dimension are shown in Figure 1. (Individual subject's data, from which Figures 1 to 3 were derived, are shown in Table 2.) The mean number of responses emitted to the test stimuli are shown for the groups that received differential reinforcement training and for the group that received nondifferential reinforcement training. The data of the birds that received different discriminative training procedures (fading, response prevention, conventional) are not shown separately. Analyses of variance of repeated measures indicated that there were no significant differences among them, and their data were pooled. A repeated measures analysis of variance was performed separately on the data of the birds for which the S- was a line tilt and the data of those for which the S- was a dim yellow keylight. The group $\times$ stimulus interaction was significant when the S- was line tilt ($p < 0.001$) but not when the S- was a dim yellow keylight ($p > 0.10$). This indicates that discriminative

Fig. 1. Absolute generalization gradients along the line-tilt dimension. The closed circles represent the data of birds given nondifferential reinforcement (ND) training. The open circles represent the data of birds given differential reinforcement (D) training. The left panel contains the mean gradient of the birds exposed to a slanted line as the S- stimulus and the right panel contains the mean gradient of the birds exposed to a dim yellow (DY) keylight as the S- stimulus.

Table 2
Responses to Generalization Test Stimuli

Training Condition		Test Dimensions and Stimuli													
		Yellow Intensity (stimuli in ohms)					Line Orientation (stimuli in degrees)					Vertical Line Intensity (ohms)			
		0	75	150	225	300	0	20	40	60	80	75	150	225	300
DIFFERENTIAL REINFORCEMENT WITH 80°R AS S—															
Fading Procedure	5274	136	103	41	15	0	139	134	126	108	86	50	7	3	0
	59	179	169	77	74	11	163	146	152	105	81	5	0	0	1
	5258	144	178	130	53	3	183	132	57	46	2	36	0	0	0
	5037	37	38	0	2	0	54	5	0	0	0	1	0	0	0
	7099	58	81	32	26	0	150	184	148	109	79	6	1	0	0
Response Prevention Procedure	5036	173	188	13	6	0	199	128	105	74	67	3	1	2	1
	4895	125	144	130	94	11	128	99	93	121	113	59	0	2	0
	5107	123	109	69	35	5	113	54	62	17	7	4	0	0	0
	5270	134	115	96	63	4	148	145	108	103	74	12	1	1	1
	5066	110	124	43	36	7	164	50	39	83	23	24	0	0	0
Conventional Procedure	5491	109	114	77	69	8	156	124	109	86	67	12	5	0	2
	67	122	127	62	69	18	157	98	55	46	27	4	14	1	1
	45	161	149	26	34	1	181	129	80	29	1	3	3	0	0
	5014	90	86	19	30	1	129	35	27	6	1	10	0	0	1
	4717	100	129	52	5	1	110	69	50	13	0	3	0	0	0
DIFFERENTIAL REINFORCEMENT WITH DY AS S—															
Fading Procedure	5338	98	61	8	6	0	105	94	89	80	0	33	5	0	0
	1564	171	107	40	16	0	138	129	143	102	96	8	1	0	1
	2617	95	82	7	1	0	93	82	100	102	59	4	3	0	0
	5122	122	61	5	6	0	147	130	137	118	112	10	1	0	0
	5664	144	153	48	2	0	131	131	110	73	90	37	20	0	0
Response Prevention Procedure	5124	91	87	32	28	0	114	13	74	60	52	13	7	0	1
	81	183	174	151	64	11	153	149	155	160	188	53	3	7	5
	5117	63	62	39	10	3	102	59	47	23	39	5	0	0	0
	5718	20	32	12	15	0	90	25	42	13	25	6	0	0	0
	5293	116	146	56	11	0	180	87	87	12	19	6	0	0	0
Conventional Procedure	83	139	148	31	9	1	131	84	82	53	55	4	6	1	0
	5050	115	100	52	7	0	89	55	62	73	59	14	1	2	0
	5234	125	73	65	38	1	39	16	26	33	20	18	0	0	1
	5288	131	104	45	13	0	108	79	76	54	45	3	0	0	0
	5139	129	89	75	62	1	99	102	119	96	130	82	21	0	0
NONDIFFERENTIAL REINFORCEMENT															
	3421	51	39	68	39	6	75	47	64	73	56	33	9	0	0
	5297	127	135	91	101	67	135	116	144	136	120	94	3	8	1
	4593	75	117	33	16	2	82	43	39	66	97	21	12	1	1
	5622	126	110	75	76	16	73	64	90	50	48	19	7	8	5
	88	106	139	109	62	20	129	88	81	98	79	30	4	0	10
	4345	210	186	53	31	6	156	120	136	131	109	10	0	0	0
	42	54	54	32	25	4	68	43	36	5	17	4	0	1	0
	5295	23	31	25	51	20	65	39	58	22	17	20	14	1	0
	5650	100	97	73	29	1	139	47	66	50	58	22	0	5	0
	5123	45	41	22	5	0	58	54	52	9	9	4	0	0	0
SINGLE-STIMULUS TRAINING WITH BY AS S+															
	5734	59	65	49	7	1	0	0	0	0	0	0	0	0	0
	5248	71	75	53	3	0	0	0	0	1	0	0	0	0	0
	5440	74	55	63	43	6	10	3	23	7	8	0	1	0	0
	90	202	218	215	143	30	13	13	28	4	1	0	0	1	1
	3366	87	103	28	0	0	0	0	0	1	0	0	0	0	0
SINGLE-STIMULUS TRAINING WITH 0° AS S+															
	3640	8	5	7	0	1	111	68	57	48	37	9	2	0	3
	3961	2	2	0	0	0	104	94	68	60	37	5	0	0	0
	5087	6	0	0	7	0	37	8	4	5	3	14	0	0	0
	5136	4	2	2	6	0	92	78	70	80	56	5	5	0	2
	3969	4	0	0	0	0	74	50	25	33	32	20	1	2	1

training with a line tilt as the S— produced generalization gradients along the line-tilt dimension that were steeper than those produced by nondifferential reinforcement training. Discriminative training with a dim yellow keylight as the S— did not steepen gradients along the line-tilt dimension. The fact that the generalization gradient of the group receiving a tilted line as the S— was significantly steeper than the generalization gradient of the control group that received nondifferential reinforcement training, plus the fact that the generalization gradient of the group that received a dim yellow light as the S— was not significantly different from the generalization gradient of the same control group, leads to the expectation that the gradients of the two discriminative training groups should differ from one another. A repeated measures analysis of variance revealed a significant groups $\times$ stimulus interaction ($p < 0.001$), confirming that expectation.

Relative generalization gradients along the line-tilt dimension were constructed by expressing the number of responses to each test

stimulus as a percentage of the number of test responses emitted to S+. (Thus, the level of responding at S+ was assigned a fixed value of 100%.) Analyses of the relative gradients paralleled those of the absolute gradients. Slope differences between the gradients of birds given a line tilt as the S— and the gradients of control birds approached but did not reach statistical significance ($0.05 < p < 0.10$). The group $\times$ stimulus interaction was not significant ($p > 0.20$) when the S— was a dim yellow light. The groups effect also was not significant ($p > 0.20$) when the S— was the dim yellow light. (The main effect of groups also assesses slope differences in relative gradients when the level of responding at S+ is assigned a fixed value, *i.e.*, 100%. For example, the percentages at the other test stimuli would be lowered in the case of a steepened gradient, and thus would be reflected in a significant groups effect.)

The results of the generalization tests along the intensity dimension of the white vertical line are shown in Figure 2. Analyses of variance of repeated measures were performed on the test data. The group $\times$ stimulus interac-

Fig. 2. Absolute generalization gradients along the intensity dimension of the vertical line. The closed circles represent the data of birds given nondifferential reinforcement (ND) training. The open circles represent the data of birds given differential reinforcement (D) training. The left panel contains the mean gradient of the birds exposed to a slanted line as the S— stimulus and the right panel contains the mean gradient of the birds exposed to a dim yellow (DY) keylight as the S— stimulus.

tion was significant ($p < 0.001$) when the S— was the line tilt but not when the S— was the dim yellow light ($p > 0.10$).

Analyses of the relative generalization gradients revealed a groups effect that approached but did not reach significance ($0.05 < p < 0.10$) when the S— was the line tilt. Both the group $\times$ stimulus interaction and the groups effect were not significant (p 's > 0.20) when the S— was the dim yellow light. The expectation of significant slope differences between the two discriminative training groups was confirmed ($p < 0.001$) in the analysis of absolute gradients along the intensity dimension of the vertical line.

The results of the generalization tests along the intensity dimension of the yellow keylight are shown in Figure 3. Analyses of variance of repeated measures yielded a significant group $\times$ stimulus interaction ($p < 0.025$) when the S— was a dim yellow light. The group $\times$ stimulus interaction was not significant ($p > 0.20$) when the S— was the line tilt.

Analyses of the relative generalization gradients revealed a significant groups effect ($p < 0.005$) when the S— was a dim yellow light. When the S— was a tilted line, both the groups effect and the interaction were again not sig-

nificant (p 's > 0.20). In this case, however, the expectation of significant slope differences between the two discriminative training groups was not confirmed ($p > 0.20$).

Slope differences in the generalization gradients between birds exposed to differential reinforcement and birds exposed to nondifferential reinforcement may be due to the steepening of gradients by differential reinforcement or to the flattening of gradients due to nondifferential reinforcement, or to both factors. Analyses of the generalization gradients of birds exposed to nondifferential reinforcement and birds exposed to single-stimulus training yielded results that indicated no significant differences in slopes. Analyses of variance of repeated measures of both absolute and relative scores, yielded nonsignificant ($p > 0.20$) group $\times$ stimulus interactions. Thus, generalization gradients along yellow intensity, line orientation, and vertical line-intensity dimensions were not flattened by nondifferential reinforcement training.

DISCUSSION

Intradimensional effects are typically produced by procedures that involve only two

Fig. 3. Absolute generalization gradients along the intensity dimension of the yellow keylight. The closed circles represent the data of birds given nondifferential reinforcement (ND) training. The open circles represent the data of birds given differential reinforcement (D) training. The left panel contains the mean gradient of the birds exposed to a slanted line as the S— stimulus and the right panel contains the mean gradient of the birds exposed to a dim yellow (DY) keylight as the S— stimulus.

stimuli during discriminative training. The procedures of the present study, which involved three stimuli, also yielded intradimensional effects. Generalization gradients along the line-tilt dimension were steepened when the S— was the slanted line. Similarly, generalization gradients along the intensity dimension of the yellow keylight were steepened when the S— was a dim yellow light.

The discriminative training procedures that yielded intradimensional effects did not produce interdimensional effects. Generalization gradients along the intensity dimension of the yellow keylight were not steepened when the S— was a slanted line. Similarly, generalization gradients along the line-tilt dimension were not steepened when the S— was a dim yellow keylight. If a general "set to discriminate" is established by discriminative training procedures, which are effective in producing intradimensional effects, then one would have expected interdimensional effects, but none appeared. There were, however, other effects consistent with a kind of "general attentiveness" view. Generalization gradients along the intensity dimension of the vertical line were steepened when the S— was a slanted line. However, generalization gradients were not steepened when the S— was a dim yellow keylight. Thus, an extradimensional effect was revealed, but only in the data of the birds given a line tilt as an S—.

How is this pattern of results to be understood? Consider the possibility that the three stimuli used in the discriminative training procedures of the present study functionally comprised one discriminative task plus single-stimulus training. Thus, one group of birds received discriminative training with a vertical line as S+ and a slanted line as S— and, in addition, received single-stimulus training with a bright yellow keylight. In a similar fashion, the other group of birds received discriminative training with a bright yellow keylight as S+ and a dim yellow keylight as S— and, in addition, received single-stimulus training with a vertical line. Intradimensional effects were produced by the discriminative task, but generalization gradients along the dimension involved in a single-stimulus task were no different than the generalization gradients of birds given only single-stimulus training ($p's > 0.20$). If, in fact, the procedures operated in this fashion, then interdimensional effects were ab-

sent because there were no interdimensional discriminations; the line tilt S— did not interact with the bright yellow light S+ to provide the basis of an interdimensional discrimination, nor did the dim yellow light S— interact with the vertical line S+ to provide the basis of an interdimensional discrimination.

There remains the question as to why extradimensional effects were revealed in the data of one group of birds given discriminative training but not in the other group. Two procedures have been used to assess extradimensional effects of discriminative training. In one, the stimuli on the test dimension are present but irrelevant during discriminative training (Thomas *et al.*, 1970). In the second procedure, the stimuli on the test dimension are absent during discriminative training (Honig, 1969). Although not noted by Thomas *et al.* (1970) or by Honig (1969), there may be a difference in the ease with which extradimensional effects are revealed using these two procedures. Thomas *et al.* (1970) reported statistically significant effects, whereas Honig (1969) reported a series of nonsignificant differences, which were interpreted as reflecting an effect because of consistencies across experiments. Thus, effects may be more readily revealed when the stimuli on the test dimension are present during training than when they are absent. The present results also support the need for a distinction between these two procedures. If, in fact, the discriminative training situation of the present study functionally comprised one discriminative task plus single-stimulus training, then the dimensions of the stimulus involved in the *single-stimulus training* were not present during the discriminative task, and therefore the assessment of effects along these dimensions resembled the procedure used by Honig (1969). None of these effects was revealed. The group that received discriminative training between the vertical and slanted line showed no enhancement of control by the intensity dimension of the yellow key. Similarly, the group that received discriminative training between two intensities of a yellow keylight showed no enhancement of control by either the tilt dimension or the intensity dimension of the white line. However, for the former group (intradimensional training on the line-tilt dimension) the intensity dimension of the vertical line was obviously present during the discriminative task. Indeed,

it was an integral part of the S+ stimulus. Therefore, for this group, the assessment of extradimensional effects along the white line intensity dimensional resembled the procedure used by Thomas *et al.* (1970). These effects were revealed. It may be the case that extradimensional effects of discriminative training occur only when the dimension along which the effect takes place is a component of the S+ stimulus complex involved in discriminative training. According to this interpretation, extradimensional effects would have been obtained for the group that received discriminative training along the intensity dimension of the yellow key if the generalization tests assessed control by some other dimension(s) of the yellow key, *e.g.*, wavelength.

The results of the present study support the suggestion that discriminative training generates byproducts that are not quite so general as the "general attentiveness" view suggests, and yet not so specific as to be revealed only by intradimensional effects.

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