

TRANSFER OF TRAINING FOLLOWING DISCRIMINATION  
LEARNING IN A DISCRETE TRIAL SITUATION

by

INGO KEILITZ

B.A., Drew University, 1968

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A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Psychology

KANSAS STATE UNIVERSITY

Manhattan, Kansas

1970

Approved by:

*Jerome Freeman*  
Major Professor

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**THIS BOOK  
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### Acknowledgements

This research was conducted during the author's tenure as a NIMH Predoctoral Trainee, Grant MH 08359. I am grateful to Drs. Jerome Frieman, Stephen J. Handel, and Charles C. Perkins, Jr. for their assistance. I am especially indebted to Dr. Jerome Frieman for his continuous support and guidance during all phases of research and writing of this thesis.

I wish to thank my wife, Patricia, who was responsible for typing the manuscript.



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In recent experiments with pigeons it has been shown that discrimination training along one stimulus dimension will facilitate subsequent learning of a discrimination along a different dimension. That is, discrimination learning between two line-orientations has been found to transfer positively to a color discrimination task (Eck, Noel & Thomas, 1969), and conversely, discrimination training with colors has been found to facilitate the learning of a line-orientation discrimination problem (Keilitz & Frieman, in press). This positive relationship between prior discrimination training on one dimension and subsequent learning about another dimension found in transfer experiments, seems to be supported by studies of generalization as well. Honig (1969) trained pigeons to discriminate between two colors and found a sharpened gradient of generalization along a line-orientation dimension in subsequent testing. Similar results have been reported elsewhere (cf. Thomas, Freeman, Svinicki, Burr & Lyons, 1970).

At least one general conclusion can be drawn from the results of the experiments with pigeons cited above, namely that the learning of one dimensional problem seems to aid the learning of another discrimination task along a new dimension. It will be useful to refer to these results as supporting the view that discrimination training establishes a general set which implements a positive transfer of training to new discrimination problems. Clearly, such a view is not incompatible with the work on "learning set" formation reported by Harlow (1949,1959). Thomas (1969), for one, has found it useful to incorporate the

the concept of attention into the explanation of such occurrences of positive transfer. In brief, he proposes that discrimination training produces an increase in attention to stimulus differences such that subsequent discrimination learning is facilitated. The critical feature of such an attentional analysis is that the enhanced attention following discrimination training is not focused upon specific dimensional aspects of the discriminative stimuli in question. Instead, a "general attentiveness" to differences in stimuli produces the facilitated learning in subsequent problems.

The notion of a general attention and the group of studies showing positive transfer which it purports to explain, are inconsistent with and in many ways contradictory to the only well developed theory of discrimination learning incorporating attentional constructs, namely stimulus-analyzer theory. This theory, as represented in the various writings of Sutherland and Mackintosh (e.g., Sutherland, 1964b; Mackintosh, 1965c), describes attention not as a general process as Tomas (1969) has done but rather as a specific, selective process. An animal is assumed to be able to attend to only a limited number of stimulus dimension simultaneously. The process whereby behavior is controlled by environmental cues is mediated by a coding system of "stimulus analyzers" which serves to selectively filter certain features of the environment. At the extreme, stimulus analyzer theory predicts that the strengths of different analyzers are negatively correlated. That is, attention paid to one dimension (e.g., color) is at the expense of attention

focused on another dimension (e.g., form). A number of experiments by Sutherland and Mackintosh seem to support the prediction based on their theory that the strengths of different analyzers are inversely related or negatively correlated (cf. Sutherland & Mackintosh, 1964; Mackintosh, 1965a, 1965b).

The point has already been made that, contrary to the tenets of analyzer theory, there seems to be cases where a positive correlation between different analyzers exists, where the process of attention seems to be non-selective and more general in nature. A brief account of a recent experiment where predictions based on analyzer theory are contrary to the data, will illustrate nicely the limitations on a selective attention interpretation.

Keilitz & Frieman (in press) attempted to explore the amount of transfer of training which follows discrimination learning. Two groups of pigeons were first trained to discriminate between two colors. After mastery of this task they were given training with two line angles, both superimposed on the color which was correlated with reinforcement in the first phase. A control group was given only single stimulus training prior to being trained on the second problem, which was identical for all groups. According to stimulus-analyzer theory, one should expect the activation and strengthening of a color dimension analyzer in the first discrimination; the Ss given discrimination training should attend to the color cue and will be able to solve the problem in terms of that cue. In the second dis-

crimination the color dimension is present but irrelevant. Since only the orientation cue is relevant, these Ss will not be able to solve the problem in terms of the color cue to which they have been trained. Hence, these Ss will take longer to learn the problem than those in the control group which have had no color discrimination training to establish selective attention to the color cues. Such predictions based on stimulus-analyzer theory are contrary to the results reported by Keilitz and Frieman (in press). These investigators found that successive discrimination training involving colors transferred positively to a discrimination of two line angles. The groups pretrained with color took less time to learn the second problem than the control group with no such pretraining. These results seem more compatible with a "general attention" notion espoused by Thomas (1969) than the Sutherland-Mackintosh brand of selective attention explaining discrimination learning.

A central concern of the present thesis is with the apparent inadequacy of analyzer theory in providing explanations for the positive transfer of training effect observed in some discrimination learning experiments. A selective attention theory does well in providing some compelling theoretical discussion for various paradigms of discrimination learning experiments involving two or more stimulus dimensions. It fares rather poorly when applied to recent transfer of training studies in which a general attentional analysis seems more appropriate. This discrepancy between the data supportive of a selective attention

theory and those studies compatible with a general attentional view seems reliable enough to warrant closer investigation of the different procedures and experimental designs used in studying these attentional effects.

Two gross differences in procedure are evident from the literature. Sutherland, Mackintosh and their co-workers have gleaned support for their selective attention theory (stimulus analyzer theory) using rats in the controlled responding situation presented by a Lashley-jumping apparatus (e.g., Sutherland & Mackintosh, 1964; Mackintosh, 1965a, 1965b). On the other hand, those experiments which favor a general attention notion (e.g., Thomas, 1969; Honig, 1969) have typically employed pigeons in a free operant situation. Although some compelling comparative data have been reported regarding the species difference between rats and pigeons as it pertains to learning (cf. Bitterman, 1965), no attempt will be made here to account for the discrepancy in the attentional studies along comparative lines. The second difference has to do with the experimental conditions under which data have been obtained. Mackintosh and Sutherland have typically used a discrete trial, controlled responding procedure, while Thomas and others in agreement with his general attention notion, have used a free-operant procedure. It is the present hypothesis that such differences might be responsible for the divergent results obtained by the researchers espousing general and selective attentional accounts of discrimination learning. This hypothesis is by no means a novel one. It reflects a problem of some importance to which researchers in

learning have given considerable thought. Deese and Hulse (1967), for instance, have expressed their concern over the fact that "the simple principles of learning which are developed from data obtained in free responding situations may not generalize very well to controlled-responding situations[p.17]."

There seems to be at least two major relevant distinctions between a free operant procedure and a controlled-responding situation employing a series of discrete trials. The first is the duration of the stimulus event and the second has to do with the integrity of the stimulus event following a response. Let us deal with the latter distinction first.

Typically, those studies which have yielded general attention effects have employed a free-operant procedure in which a stimulus presentation is of one-minute duration. No change in the external stimulus occurs after a response; the stimulus is available for a specified amount of time during which the pigeon is free to respond. The crucial factor is that the animal has the opportunity to attend to the identical stimulus before and after all responses, for the duration of the stimulus period. In a discrete trial procedure, on the other hand, the opportunity to make the instrumental behavior in question is strictly controlled, insofar as the response terminates the stimulus event. Attention to the stimulus is mechanically limited to the first response.

Jenkins (1965) is referring to the integrity of the stimulus event after a response, when he suggests that a confounding



element arises in a free operant procedure when discriminative stimuli presentations are correlated with the contextual framework of prior reinforcement or nonreinforcement. For example, in a free operant situation antecedent reinforcement during an S+ period can develop a cue function which can confound the measurement of stimulus control attributed to the experimental stimulus. That is, reinforcement in the first part of a one-minute stimulus period becomes a signal increasing response tendencies in the remainder of that period. With regard to experiments investigating transfer of training between two discriminations involving different dimensions of stimuli, such cues from antecedent reinforcement and nonreinforcement would affect response probability in the same way in both problems. Thus, a differential response probability associated with S+ and S- periods acquired solely on the basis of antecedent reinforcement and nonreinforcement in the first problem, would transfer positively and facilitate acquisition in the second problem. If these factors are present in considerable strength, they could conceivably overshadow the effects of selective attention to irrelevant dimensions which typically lead to retarded learning (Sutherland & Mackintosh, 1964). Furthermore, it is conceivable that such factors could lead to the erroneous assumption that general attentional phenomena gave rise to transfer of training. Such confounding from antecedent reinforcement and nonreinforcement is clearly avoided in a discrete trial procedure because only one response per trial is possible. The first response removes the stimulus and terminates the trial.



The second distinction between a discrete trial and a free responding procedure, which might contribute to differential attentional effects, involves the duration of the stimulus event and the response latencies. In a discrete trial situation the stimulus event is of short duration (i.e., several seconds). Thus, an animal must respond quickly to be reinforced. Typically, after some experience with the experimental procedure, the animal responds in the first second or two of the trial. It is plausible that in such a "forced" situation an animal tends to respond more readily to the onset of specific familiar (although irrelevant) aspects of a stimulus pattern and disregard novel dimensions. Thus, such an animal might be retarded in learning a transfer discrimination in which the stimulus dimension of the pre-training phase is present but irrelevant. Some suggestive evidence for such a conceptualization has been presented by Baker and Holland (1965). These investigators obtained spectral generalization gradients from pigeons using a discrete trial procedure. Gradients produced by responses of short latencies were generally flatter than those produced by responses of longer latencies. This relationship was also shown to hold when the latencies were experimentally limited by manipulating the lengths of trials. These results suggest the possibility that brief stimulus exposures, such as those used in discrete trial procedures, predispose the animal to cue his responses to the onset of specific aspects of the stimulus and ignore others. Clearly, such conjecture has the flavor of a selective attention interpretation.

The primary purpose of this thesis was to determine if the positive transfer effects obtained using free operant procedures will be obtained when a discrete trial, controlled responding procedure is employed. To implement this purpose, two groups of pigeons were pretrained, one with a two color discrimination and the other with only a single color stimulus. Both groups were then given discrimination training with two line-angles superimposed on the previously positive color.

It is the hypothesis of this thesis that the present study, in which a free operant procedure was employed, fails to replicate the positive transfer effects found in free operant studies (cf. Eck, Noel & Thomas, 1969; Keilitz & Frieman, in press) to which a general attention interpretation is applicable. Such results point out some interesting limitations on attentional accounts of transfer in discrimination learning.

## Experiment 1

Experiment 1 followed a design used by Keilitz & Frieman (in press) in a free operant situation. A discrete trial, controlled responding condition was employed in this experiment, however.

### Method

#### Subjects

Sixteen experimentally naive Silver King pigeons, obtained from a local breeder, were maintained at 70-75% of their free feeding weights.

#### Apparatus

All experimentation was conducted in a 3/4 inch plywood operant pigeon chamber with associated standard programming equipment. The chamber had internal dimensions of 32cm. X 34.5cm. One wall housed a Grason Stadler response key 17.5cm. from a wire mesh floor. Directly below the key, 5cm. from the floor, was an opening (5.2cm. X 6.4cm.) allowing access to a grain hopper. The response key was transilluminated by stimuli projected from a Industrial Electronics display cell equipped with General Electric No. 44 miniature lamps. Chromatic stimuli of peak wavelength of 538 and 555 nm. were produced by Kodak Wratten filters No. 74 and 99 in the display cell which also produced a straight white line (.32cm. X 2.22cm.) in various orientations.

White noise was continuously present in the chamber to mask

extraneous sounds. A 28 volt houselight mounted below the wire mesh floor provided constant illumination in the chamber except during reinforcement periods when a magazine light was operative.

### Procedure

Subjects were assigned to two groups, a Discrimination group and a Single Stimulus Control group, with eight subjects in each group.

Preliminary training. After the initial placement into the experimental space, a naive bird was placed before a raised hopper in which food grain was clearly visible. The bird was allowed to eat for about 10 sec., after which the hopper was dropped. If after several unsignalled presentations the bird consistently approached the hopper when it was presented, key-peck training was initiated using an automated procedure in procedural details identical to that introduced by Brown & Jenkins (1968).

A 5 sec. illumination of the response key with light of wavelength of 538 nm. constituted a trial, after which the keylight and houselight were turned off and the grain hopper was made available for 4 sec. A keypeck during a trial turned off the keylight and the houselight, produced the food hopper immediately. The intertrial interval varied randomly within a range of 5-30 sec. with a mean of 15 sec. A response during the intertrial interval delayed onset of the following trial for 10 sec. A daily session consisted of 60 trials. A bird was considered keypeck trained if 10 or more responses to the lighted

key occurred in one daily session.

The day following keypeck training, birds in both groups were given 4 days of training in the presence of a single stimulus (555 nm.) on a FR 1 Timeout schedule. Under this procedure, the conditions were identical to those in the auto-shaping procedure with the exception that reinforcement was response contingent. If no peck occurred before the termination of the 5 sec. trial, the houselight and keylight were turned off but no reinforcement was delivered. Preliminary single stimulus training was instituted to establish stable responding with minimal omission errors (i.e., failure to respond during a trial) and to eliminate intertrial responding.

Phase 1. Ss in the Discrimination group were given discrimination training with 538 nm. as the positive stimulus (S+) and 555 nm. as the negative stimulus (S-). During S+ trials, responses terminated the trial, turned off both the houselight and the keylight, and raised the hopper allowing access to grain for 4 sec; S+ trials were terminated in non-reinforcement if no response occurred within 5 sec, of stimulus onset. Responses during S- trials or failures to respond during the trial terminated the trial in non-reinforcement. Each discrimination was a go, no-go discrimination in which the stimuli were presented alone on successive trials in a quasi-random order with the restrictions that a) no more than two S+ or S- trials appeared successively and, b) that within each block of 30 stimulus presentations S+ and S- trials appeared 15 times each. Discrimination training for

Ss in the Discrimination group continued until a criterion of 90% correct responding was attained in three consecutive daily sessions of 60 trials per day.

Ss in the Single Stimulus Control group were trained with a single stimulus (538 nm.) on a FR 1 Timeout schedule for 60 trials per day. In order to equate the number of training days in Phase 1 for the two groups, each Control S was unsystematically paired with a Discrimination S and trained an equal number of days.

Phase 2. Upon completion of the first phase, both groups were given discrimination training between a vertical (S+) and a horizontal (S-) white line. Both stimuli were superimposed on the positive stimulus (538 nm.) used in the discrimination of Phase 1. During this phase the following index of overall discrimination performance and transfer of training effects was computed daily for each S:

$$\frac{[R+] + [R-]}{T}$$

[R+] = Positive trials in which responses occurred  
 [R-] = Negative trials in which no responses occurred  
 T = Total trials

This index of discrimination takes into account the response probability in both positive and negative trials. A score of 1.00 reflects perfect discrimination; 0.50 indicates random performance. Both groups were maintained on the Phase 2 discrimination for ten consecutive daily sessions each consisting of two blocks of 30 trials. Procedural details for the Phase 2

discrimination task were otherwise identical to those of the first phase.

### Results

All birds in both groups were keypeck trained within 3 daily sessions consisting of 60 trials. Preliminary training with a single stimulus (538 nm.) on a FR 1 Timeout schedule had the desired effect of virtually eliminating omission errors (i.e., failures to respond during a trial), and reducing inter-trial responding. Total omission errors for all 16 birds in both groups during the last day of pretraining numbered 15 with a range of 0-8; total intertrial responses numbered 74 with a range of 0-22 and a mean per S of 4.1.

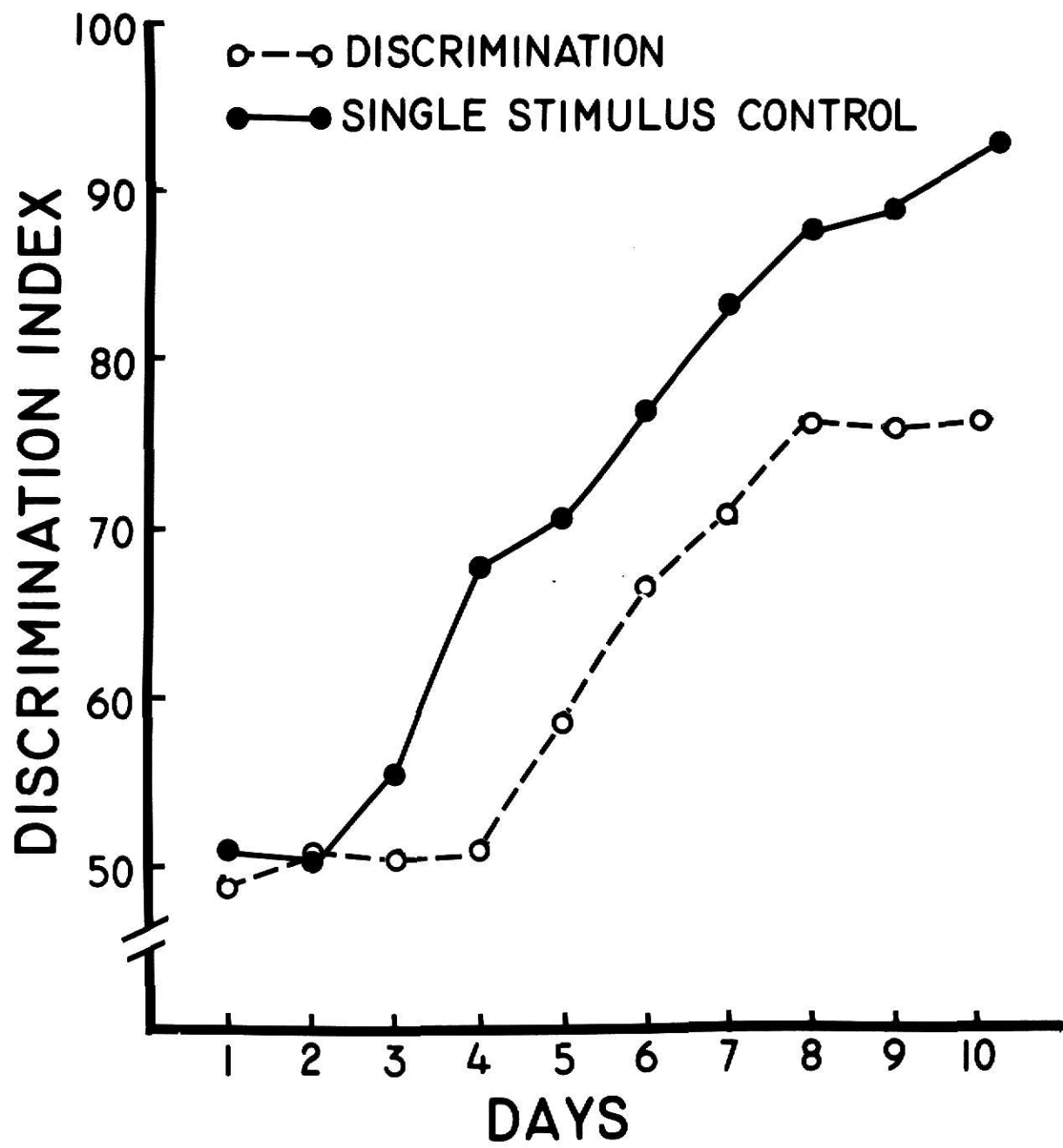
Phase 1. Of the eight Ss in the Discrimination group, 3 birds reached criterion on the wavelength discrimination on Day 4 (including the 3 criterion days), 3 on Day 5, and one bird each on Day 6 and Day 10. Ss in the Single Stimulus Control group were matched with Ss in the Discrimination group with respect to the number of days they were maintained in Phase 1.

Phase 2. Subjects in both groups were maintained on the line-angle discrimination for 10 consecutive days. Acquisition curves plotted in terms of discrimination index scores for both groups are depicted in Fig. 1. The single Stimulus Control group appeared to show more rapid learning than the Discrimination group. The mean number of days to reach a criterion of at least a score of 0.90, was 8.75 for the Discrimination group and 6.75

Figure Caption

Fig. 1. Mean discrimination index scores for the Discrimination and Single Stimulus Control groups during Phase 2.





for the Single Stimulus Control group. However, a two-tailed test of the difference between the group means on the days to criterion measure did not reveal a statistically reliable difference [ $t(14) = 2.14$ ,  $.05 < p < .06$ ].

A 2 X 10 (Group X Days) analysis of variance of discrimination index scores revealed a statistically reliable day effect  $F(9,126) = 26.35$ ,  $p < .001$ , but no group effect,  $F(1,14) = 3.24$ ,  $p = .05$ , and no Group X Day interaction,  $F(9,126) = 1.16$ ,  $p > .30$ .

## Experiment 2

The results of Experiment 1 suggests the possibility that the absence of transfer of training in the Discrimination group is due to attention focused on the irrelevant color dimension. That is, some birds in the Discrimination group were retarded in acquisition because they attempted to solve the problem in terms of the cue dimension to which they were trained in the first phase of the experiment. Experiment 2 attempted to determine whether the presence of the irrelevant color dimension in the Phase 2 discrimination was responsible for the failure to find positive transfer of training effects in Experiment 1.

### Method

#### Subjects and Apparatus

Eight naive Silver King pigeons, from the same breeder and maintained at the same deprivation level as Ss in Experiment 1, served. The same apparatus used in Experiment 1 was used in this experiment.

#### Procedure

All eight Ss were assigned to a No-Color group. Birds in this group were auto-shaped, pretrained, and given Phase 1 discrimination training between two wavelength according to a procedure identical to that employed in Experiment 1 with Ss in the Discrimination group. The No-Color group differed from the Discrimination group of Exp. 1 in that it received the same Phase 2 discrimination training between a vertical and a horizontal line

but no color surrounding illuminated the response key. Thus, the No-Color group of this experiment and the Discrimination group of Exp. 1 differed only with respect to the presence of a color (538 nm.) surrounding the white lines.

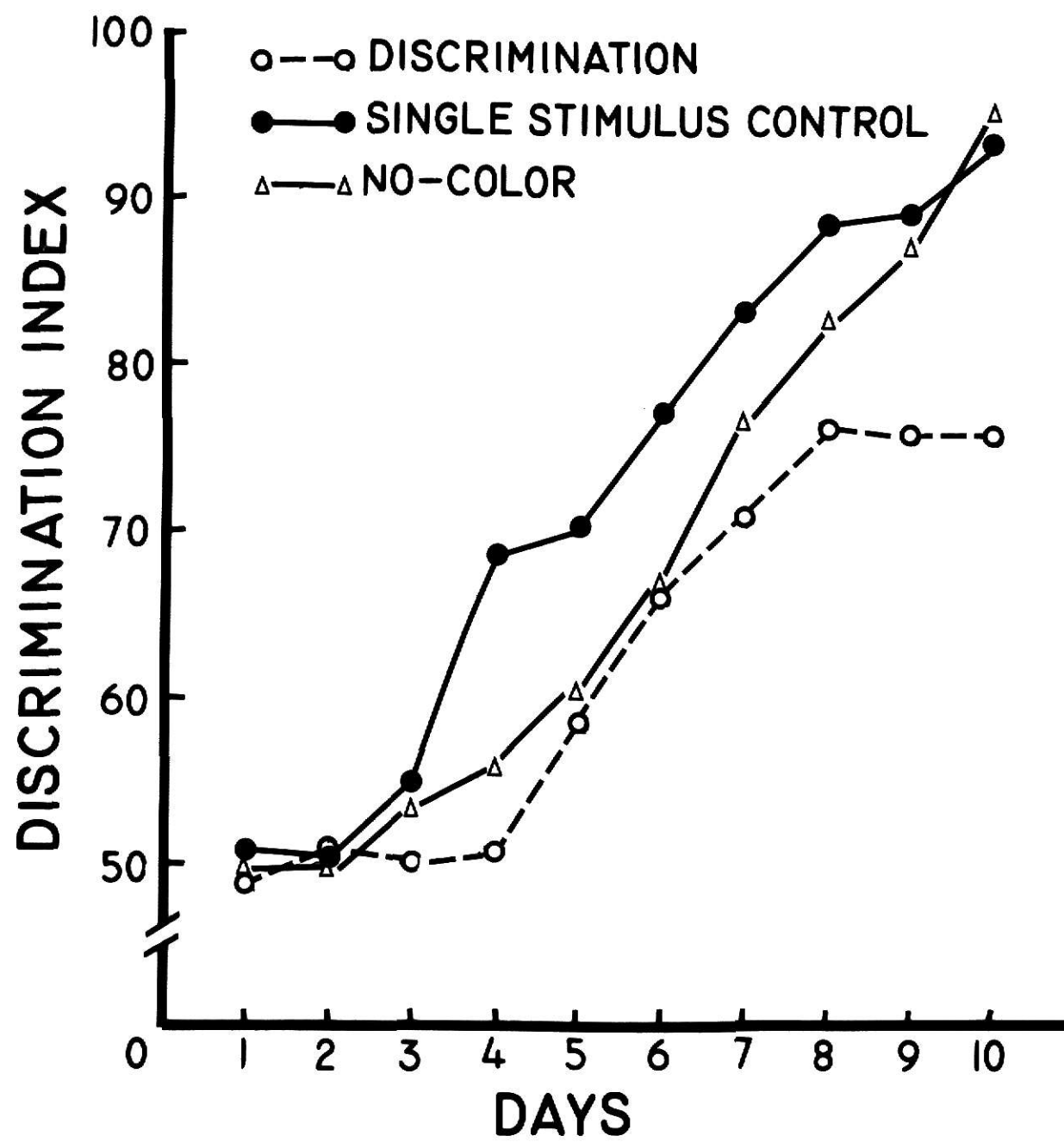
### Results

All Ss in the No-Color group were keypeck trained within 3 daily sessions. On the last day of pretraining with a single stimulus (538 nm.) on a FR 1 Timeout schedule, total omission errors for all eight Ss numbered two, and intertrial responses numbered 62 with a range of 0-26 and a mean per S of 7.8.

In Phase 1 Ss in the no-Color group were trained to discriminate between two colors. Of the eight birds in the group, half reached criterion on Day 4 and the other half reached criterion on Day 5. In Phase 2 all Ss were trained on the line-tilt discrimination for 10 consecutive days each consisting of two blocks of 30 trials each. In Fig. 2 the acquisition curve plotted in terms of index scores for the No-Color group is presented. For comparison, curves for the Discrimination group and the Single Stimulus Control group of Exp. 1 are also presented. The No-Color group demonstrated a speed of acquisition intermediate between that of the Discrimination group and the Single Stimulus Control group.

Figure Caption

Fig. 2. Mean discrimination index scores for the Discrimination and Single Stimulus Control groups (Exp. 1) and the No-Color group (Exp. 2) during Phase 2.



## Discussion

The failure of the Discrimination and the No-Color groups in the present experiments to exhibit positive transfer of training is incongruent with the results reported by Eck, Noel, & Thomas (1969) and Keilitz & Frieman (in press) who employed free operant procedures. The present results indicate that subjects trained on a wavelength discrimination will be retarded in the learning of a subsequent line-tilt discrimination in which color is irrelevant, if a discrete trial procedure is used. Such findings, taken together, support the hypothesis that the usual experimental procedures used in animal discrimination studies exert a very powerful influence upon transfer of training effects.

The Sutherland-Mackintosh stimulus analyzer theory (Sutherland, 1964b; Mackintosh, 1965c) has been shown to be of limited utility when applied to free operant transfer experiments (cf. Eck et al., 1969; Keilitz & Frieman, in press). However, the present results seem to be wholly consistent with analyzer theory and predictions based on a selective attention theory. According to analyzer theory, the more strongly any one analyzer is "switched in" the slower will be the learning of responses to outputs of different analyzers of stimulus dimensions. Presumably, the No-Color and Discrimination groups acquired the line-tilt discrimination less rapidly than the Single Stimulus Control group because the former two groups were pre-trained with color and proceeded to the line-tilt discrimination with the inappropriate analyzer. It seems correct to conclude

that the lack of positive transfer of training exhibited by the Ss in the No-Color and Discrimination groups is support for the Sutherland-Mackintosh brand of selective attention. But such selective attentional explanations are inappropriate when applied to experiments using a free operant procedure. On this basis, any general application of principles developed from analyzer theory to situations beyond a circumscribed, discrete trial procedure would appear to be premature.

Although it is valuable to recognize the gross procedural factors which strongly affect transfer of training, there remains the task of isolating specific variables which directly influence the amount of transfer. Two variables which distinguish a free operant and a discrete trial procedure and seem to offer good opportunities for further investigation are the duration of the stimulus event and the integrity of the event following a response.

The present experiments involved stimulus periods never exceeding five seconds. No positive transfer was exhibited by pigeons in the learning of the second task. The free operant studies by Eck, Noel & Thomas and Keilitz & Frieman found transfer in a situation which involved uninterrupted stimulus periods of one-minute duration. These results are suggestive insofar as the duration of the stimulus event might be directly related to the amount of transfer of training. An interesting question is whether intermediate amounts of transfer of training would be obtained in a situation in which the duration of the stimulus



period was systematically varied between 5 sec. and 60 sec., for example. Promising results along this line were reported by Baker & Holland (1968). These researchers varied the length of discrete trials and found that such variation had a pronounced effect upon the amount of spectral generalization in pigeons. A projected, hypothetical experiment might be one in which four groups of pigeons are given two discrimination problems involving the same set of stimulus dimension used in the present experiments (i.e., color and line-orientation). With two groups a typical free operant procedure would be used; one group would be presented with a continuous stimulus of five sec. duration, the other group with one lasting 60 sec. The second two groups would be studied in a discrete trial situation, in which the stimulus events are again no longer than 5 sec. and 60 sec., respectively for each group. Such a hypothetical study involves a 2 X 2 design in which two variables (experimental procedure and stimulus duration) are manipulated systematically. This factorial design, it would seem, could yield some interesting insights into the function of stimulus duration in transfer of training.

The integrity of the stimulus event after a response, which differs greatly in a discrete trial and a free operant procedure, can be experimentally manipulated in at least two ways. First, the opportunity to attend to the stimulus after a response can be easily varied by the absence and presence of the stimulus following a response. Second, the added cue element introduced by antecedent reinforcement and nonreinforcement can be similiary

varied by the presence-absence of the stimulus following the response. Both factors can be manipulated experimentally. Clearly, the absence or presence of these factors are important features of free operant and a discrete trial procedure.

A discrete trial procedure in which the response does not remove the stimulus would allow a S the opportunity to attend to that stimulus after a response. Such a procedure would be difficult to employ in a situation in which stimuli transilluminate a response key; in such a situation the pigeon must remove himself from the location of the stimulus to acquire reinforcement. However, with auditory stimuli the continuous presence of the stimulus before and after a response can be accomplished. For example, a discrete trial procedure could be designed in which a response in a S+ period allows access to food but does not remove the auditory stimulus. In S- periods a response would darken the response key and maintain the stimulus for a time equal to that of food access in S+ periods. Such a procedure would allow the animals to attend to the stimulus before and after a response and still maintain the trial-terminating function of the first response. This would make such a procedure similar to free operant designs in that the opportunity to attend to a stimulus is not limited to the time preceding a response.

Jenkins (1965) has presented some cogent arguments with regard to the confounding due to antecedent reinforcement-nonreinforcement in discriminative operant conditioning. These argu-

ments will not be dealt with here, except to say that Jenkins outlines procedures which avoid this confounding. These procedures seem to be very flexible in that they permit stimulus presentations which are continuous or discrete, regular or variable reinforcement, and single or multiple responses.

In conclusion, it seems that there are important variables influencing transfer of training in discriminative operant conditioning and discrete trial procedures which have been largely ignored. In order to avoid misleading and incomplete conclusions based on results obtained in very circumscribed standard procedures a variety of methods need to be devised for measuring transfer of training. A viable approach alluded to above might be one in which attempts are made to manipulate the conditions of the standard free operant and discrete trial procedures in such a way as to bring them on common comparable ground.

## Appendix A

## Phase 2

## Discrimination Index Scores: Discrimination Group

Blocks	Subjects							
	DA 4	DA10	DA 2	DA15	DA 3	DA 8	DA 6	DA17
1	.50	.47	.50	.43	.43	.53	.50	.50
2	.50	.47	.50	.50	.43	.50	.50	.50
3	.50	.50	.50	.50	.50	.57	.50	.50
4	.50	.50	.53	.50	.50	.50	.50	.50
5	.50	.50	.50	.50	.50	.50	.50	.50
6	.50	.50	.53	.50	.50	.50	.50	.50
7	.50	.50	.50	.50	.53	.50	.50	.50
8	.50	.50	.50	.53	.57	.50	.50	.50
9	.50	.50	.53	.50	.90	.50	.70	.50
10	.50	.50	.50	.60	.63	.50	.83	.57
11	.50	.50	.63	.70	.80	.50	.87	.50
12	.50	.50	.73	.83	.93	.50	1.00	.70
13	.53	.50	.73	.57	.97	.50	.93	.67
14	.50	.50	.97	.93	.77	.50	.93	.90
15	.50	.50	1.00	.83	.97	.50	.90	.90
16	.50	.50	.97	.83	1.00	.50	.93	.97
17	.50	.50	.93	.83	.87	.50	1.00	.93
18	.50	.50	.97	.87	.87	.50	.97	.97
19	.50	.50	1.00	.80	.80	.50	.90	.90
20	.50	.50	1.00	.87	.77	.73	.97	1.00

## Appendix B

## Phase 2

## Discrimination Index Scores: Single Stimulus Control Group

Blocks	Subjects							
	SA18	SA11	SA 7	SA 9	SA 5	SA13	SA12	SA14
1	.57	.50	.50	.43	.57	.53	.50	.50
2	.50	.53	.50	.50	.50	.53	.50	.50
3	.50	.50	.50	.50	.50	.50	.50	.50
4	.50	.50	.50	.50	.50	.53	.50	.50
5	.50	.50	.50	.50	.50	.60	.50	.50
6	.50	.50	.50	.50	.73	1.00	.50	.50
7	.63	.87	.50	.50	.80	.97	.50	.50
8	.77	.97	.50	.50	.90	.97	.50	.50
9	.83	.87	.50	.50	.83	.87	.67	.50
10	.90	1.00	.50	.50	.73	.83	.77	.50
11	1.00	.93	.50	.50	.80	.90	.97	.53
12	1.00	1.00	.53	.50	.80	.90	.93	.53
13	.97	1.00	.50	.53	.90	.97	.97	.53
14	1.00	.97	.50	.73	.90	1.00	1.00	.80
15	1.00	.97	.50	.70	.93	1.00	1.00	.83
16	.97	.97	.50	.87	.97	1.00	.97	.97
17	.90	1.00	.50	.83	.93	1.00	1.00	.83
18	1.00	1.00	.50	1.00	.93	1.00	1.00	.83
19	1.00	1.00	.60	1.00	1.00	1.00	1.00	.87
20	1.00	1.00	.73	.97	.93	1.00	1.00	.90

## Appendix C

## Phase 2

## Discrimination Index Scores: No-Color Group

Blocks	Subjects							
	NA19	NA16	NA18	NA20	NA 7	NA 3	NA 2	NA11
1	.47	.60	.47	.57	.53	.50	.50	.53
2	.50	.40	.50	.50	.47	.50	.57	.50
3	.50	.50	.50	.47	.50	.50	.50	.50
4	.50	.50	.50	.53	.50	.50	.50	.50
5	.50	.57	.50	.53	.50	.50	.63	.50
6	.50	.50	.50	.50	.50	.50	.87	.50
7	.50	.50	.50	.50	.50	.50	.70	.50
8	.50	.50	.63	.70	.50	.50	.87	.50
9	.50	.50	.60	.70	.50	.50	.77	.50
10	.50	.53	.50	.90	.73	.50	.93	.50
11	.50	.50	.50	.77	.83	.53	.90	.73
12	.70	.60	.50	.67	.93	.50	.77	.73
13	.90	.67	.50	.83	.83	.50	.90	.87
14	.93	.73	.50	.90	.87	.67	.90	.87
15	.93	.93	.50	1.00	.90	.90	.57	.87
16	.97	.93	.50	.90	1.00	.83	.60	1.00
17	.87	.90	.57	.90	.90	.90	.70	.97
18	1.00	.97	.70	.90	.93	.90	.93	1.00
19	.93	.93	.90	1.00	.93	.93	.90	1.00
20	.97	1.00	.97	.87	1.00	.93	1.00	1.00

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TRANSFER OF TRAINING FOLLOWING DISCRIMINATION  
LEARNING IN A DISCRETE TRIAL SITUATION

by

INGO KEILITZ

B.A., Drew University, 1968

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AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Psychology

KANSAS STATE UNIVERSITY  
Manhattan, Kansas

1970

### Abstract

In Exp. 1, one group of pigeons was given go/no-go discrimination training involving discrete trials between two colors, while another group received only single-stimulus training with one color. Both groups were then transferred to a discrimination problem between a vertical and horizontal white line superimposed on the previously reinforced color. The group which had prior discrimination training with color acquired the vertical-horizontal discrimination less rapidly than the group which had experience only with a single stimulus. In Exp. 2, a group of pigeons trained to discriminate between two colors, was subsequently given a vertical-horizontal discrimination with a black surrounding. This group demonstrated a speed of acquisition on the line discrimination which was intermediate between speeds exhibited by the groups in Exp. 1. Thus, in both experiments discrimination training along one dimension retarded the subsequent acquisition of a new discrimination along another dimension. These results support certain assumptions derived from selective attention theory. The set of experiments fail to replicate data obtained in a free operant situation. It is suggested that procedures typically used to study transfer of training exert a powerful influence upon transfer of training effects.