Irrelevant stimuli and response rate for a pigeon

BILLY L. SMITH*

University of Mississippi†, University, Miss. 38677

The purpose of the first experiment was to train three pigeons to ignore a novel irrelevant stimulus or distractor. It was found that the distractor would interrupt ongoing pecking behavior in pigeons. It was also found that after many presentations of the distractor, its interrupting effect ceased and the pecking rate returned to its predistractor level. In addition, it was found that generalization of the habituation-training effect occurred to stimuli similar to the distractor. The habituated stimulus also had no distracting effect on responding to a subsequently established discriminative stimulus.

In a discrimination learning situation, several stimuli or combinations of stimuli may simultaneously impinge upon the receptors of an organism. The stimulus that the organism must respond to in order that reinforcement may occur can be designated as the "relevant" stimulus. All other stimuli in the environment that are not correlated with reinforcement can be designated as "irrelevant" stimuli.

EXPERIMENT 1

The present experiment was an attempt to train three pigeons to "ignore" a novel irrelevant stimulus or distractor. It was hypothesized that the ongoing behavior of pecking a moveable key would be interrupted by the presentation of a distracting stimulus¹ and that after many presentations of this distractor (habituation training), its interrupting effect would be reduced and the pecking rate would return to its predistractor level.

Method

Three experimentally naive pigeons served as Ss. They were maintained at 70% to 75% of their free feeding body weights for at least 2 weeks prior to the start of experimentation and throughout the experiment. Drinking water was available at all times.

The Ss worked inside a standard Lehigh Valley pigeon chamber. Two transparent pecking keys of 2.54-cm diam were set into one wall, 25.40 cm above the floor and 12.70 cm apart, center to center. A Lehigh Valley grain feeder was mounted between and 12.70 cm below the response keys. General illumination in the chamber was provided by a clear "house light" located at the top of the stimulus panel and by a clear "magazine lamp" that came on when the feeder was

activated, illuminating the grain hopper.

All pecking responses to the right-hand key were recorded on a cumulative recorder and electric counters. The experimental stimuli were presented by a Foringer inline projector. The stimuli consisted of three white vertical dots and three white horizontal dots on a dark ground. The dots were 0.48 cm in diam and spaced 0.21 cm apart. The distracting stimulus was a green light at about 545.0 nm peak intensity, projected over the entire area of the response key. Generalization-test stimuli used had peak intensities at about 590.0 (amber), 530.0 (blue-green), and 630.0 nm (red) and also covered the entire key area.

First the Ss were trained to keypeck. Then they were trained on a visual discrimination task (vertical vs horizontal). Three vertical dots served as the S^D and three horizontal dots as the S^A for S1. The converse combination of stimuli was used for Ss 2 and 3. The Ss were gradually trained to respond on a VI 1-min schedule. The Ss were continued on VI 1 min until the response rate in S^A divided by the response rate in S^D times 100 was less than 10% for 3 consecutive days. This "error rate" of less than 10% for 3 consecutive days was the discrimination mastery criterion. At this time, their performance was interrupted by the presentation of the distractor for a 1-min period. The distractor was superimposed over the discriminative stimulus, i.e., the green light replaced no light as background

around the discriminative stimulus. After this, the Ss were habituated to the distractor by presenting it continuously until its effect had been eliminated (habituation training).

Generalization test probes (of 1 min each) were then given for the distractor and similar stimuli described above. The probe consisted of projecting each wavelength on the key so as to form a colored background for the S^D. There were four probes per session, one with each wavelength. The probes were presented 5 min apart in random order. No reinforcement was available 1 min prior to, during, or 1 min after the probe. Reinforcement for responding to S^D was given as usual between probes. This testing continued for four sessions. Test probes were administered during S^A for all colors, but no change in behavior was observed. Following this, the Ss were again given habituation training with the distractor.

Results

The results were as follows: When the Ss had mastered the form discrimination, presentation of the distractor caused their response rates to go to a very low level. Table 1 shows almost complete cessation of pecking during the 1-min probe with the distractor (545.0 nm). These data show clearly that pecking was inhibited by presentation of the distractor.

Table 2 shows the response rate during a 1-min probe with the distractor after habituation training. It can be seen that presentation of the distractor had practically no effect on response rate for any S.

It was also found that the effect of habituation training generalized to other stimuli. It can be seen in Fig. 1 that responding decreased the more the test stimuli differed from the former distractor.

EXPERIMENT 2

It was found in Experiment 1 that the introduction of an irrelevant stimulus would interrupt ongoing pecking behavior but that this interrupting effect could be eliminated by habituation training. It was hypothesized that the effect of the habituation training would be manifested in other than the original discrimination situation. That is, if the

Table 1
Mean Response Rates in S+ for Four 1-Min Probes With a Distracting Stimulus for the 1-Min Period Immediately Before the Probe, During the Probe, and for 1 Min After the Probe

S	Before	During	After
1	90.50	0.25	94.75
2	90.00	8.75	83.75
3	139.00	6.00	135.25

Table 2
Mean Response Rates in S+ for Four 1-Min Probes With a Distracting Stimulus After Habituation Training for the 1-Min Period Immediately Before the Probe, During the Probe, and After the Probe

S	Before	During	After
1	77.00	66.25	75.25
2	66.25	63.75	59.75
3	138.75	147.75	141.25

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†Now at Dyersburg State Community College, Dyersburg, Tenn. This report is based on a thesis submitted in partial fulfillment of the requirements for the MS degree, University of Mississippi, 1969.

Fig. 1. Generalization tests in Experiment 1 after habituation training.

animals were trained on another discrimination learning problem and the distractor presented, no decrease in responding would occur.

Method

The Ss in Experiment 2 were the same Ss that served in Experiment 1.

The apparatus was identical to that of Experiment 1, with one exception. The new stimuli were a white equilateral triangle, with sides 1.04 cm in length and a height of 0.79 cm, and a circle of 0.79 cm diam. Like the dots, both figures were white on a dark ground.

The procedure in Experiment 2 was similar to that of Experiment 1. The Ss were trained on another discrimination (circle vs triangle)

Table 3
Mean Response Rates in S+ for Two 1-Min Probes With a Distracting Stimulus for the 1-Min Period Immediately Before the Probe, During the Probe, and for 1 Min After the Probe

S	Before	During	After
1	42.00	34.50	36.50
2	81.50	92.00	82.00
3	202.50	176.50	180.00

without any distractor habituation training. A white circle in the center of the stimulus key served as S^D and a white triangle served as S^A for Ss 1 and 2. The converse combination of stimuli was used for S3. When they had mastered this second discrimination (error rate less than 10% for 3 consecutive days), they were given distractor generalization tests similar to the ones in the first discrimination problem.

Results

Table 3 shows that the presentation of the former distractor (545.0 nm) did not alter the response rate significantly.

As can be seen in Fig. 2, generalization to other stimuli was similar to that of Experiment 1.

DISCUSSION

The purpose of the present experiments was to determine if pigeons would learn to "ignore" an irrelevant distracting stimulus which was presented while the Ss were responding in a discrimination situation. When the Ss had mastered the form discrimination, the distractor caused their response rates to go to practically zero in its presence. The rate of response returned to its previous level upon removal of the distractor.

It was found that with habituation training, the distractor soon lost the ability to interrupt responding. It can be seen (Table 2) that response rate was about the same when the distractor was present as when it was absent. In a study of "attention," Reynolds (1961) found that with a very complex discriminative stimulus, pigeons responded only to the minimum number of cues necessary in making correct responses. The present study, as well as Reynolds's, suggests that a pigeon "economizes" by attending to a minimum number of cues necessary to master a discrimination. In the present experiment, the habituated distractor was irrelevant and not necessary for a correct discrimination, and it was no longer attended to. Generalization of habituation training was found to occur with more responding in the presence of the habituated distractor than in the presence of other

Fig. 2. Generalization tests in Experiment 2 without habituation training.

wavelengths (Fig. 1).

The effect of habituation training was found to carry over into a second-form discrimination problem. These results showed that presentation of the former distractor had no effect at all upon discrimination performance in Experiment 2. Generalization of habituation training similar to that of Experiment 1 occurred in Experiment 2 (Fig. 2). From the evidence presented here, it seems that once a distracting stimulus is habituated or "ignored," it does not interfere with other behavior in a similar situation. There was no habituation training in Experiment 2, yet when the former distractor was presented, the Ss did not respond to it.

REFERENCES

REYNOLDS, G. S. Attention in the pigeon. *Journal of the Experimental Analysis of Behavior*, 1961, 4, 203-208.

NOTE

1. Throughout the paper, the terms "the distractor" and "the distracting stimulus" will refer to a green light with a peak intensity at about 545.0 nm, viewed by a pigeon through a transparent pecking key.

ERRATUM

FARTHING, G. WILLIAM. Effect of a signal previously paired with free food on operant response rate in pigeons. *Psychon. Sci.*, 1971, 23 (5), 343-344.—P. 343, Col. 2, line 16 should read as follows: lower right edge of the speaker, and.