*GENERALIZATION OF AUDITORY INTENSITY AS A
FUNCTION OF SMALL AMOUNTS OF
DISCRIMINATION TRAINING¹*

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Rats were trained on a two-valued auditory-intensity discrimination for 5, 2, 1 or 0 days. Then, the bar-press response rate was sampled in the presence of seven added discrimination stimuli (generalization) for seven days. Daily training sessions were 4 hr in length throughout the experiment. Only the five-day group exhibited a marked superiority on the multi-valued discrimination when contrasted with the group having had no prior simple discrimination training.

The authors previously reported a study closely related to the present experiment (Sherman and Pierrel, 1961). Operant generalization gradients were obtained for rats in a bar-press situation. These gradients reflected performance following 6, 13 or 27 4-hr training sessions on a two-valued auditory-intensity discrimination. Gradient form and session-to-session-stability were shown to be a function of the number of pre-generalization training sessions. The smoothest, sharpest and most stable gradients were obtained following the greatest amounts of simple discrimination training. Performance on the two-valued discrimination was described by a discrimination ratio; an index obtained by dividing the number of bar-press responses made in the presence of the negative stimulus intensity (S^A), by the number of responses made during exposure to the positive, or reinforced, stimulus-intensity (S^D). It was determined that the discrimination ratio decreases most rapidly within the first five or six sessions. Once the relation between gradient form and the level of simple discrimination previously attained had been established, it seemed desirable to examine generalization following even shorter periods of simple discrimination training.

METHOD

The numbers of training sessions used in the present investigation were selected from the range within which the most marked changes occur in the development of two-valued discrimination as measured by the discrimination ratio. This study is an extension

of the 1961 investigation. Comparable methods, procedures and data analyses were carried out in the two experiments.

Each of four training enclosures was so arranged that a bar could be automatically introduced. Sound stimuli were presented through a speaker above the rat enclosure. Food pellets were dropped into a food dish below the lever. This equipment was enclosed within a sound-shielded refrigerator shell. The apparatus was fully automated; ventilation, changes in sound intensity, pellet delivery, the recording of the bar-press responses on counters and cumulative recorders were controlled from a room adjacent to those housing the animal enclosures. A more complete account of the apparatus employed is given in Pierrel and Sherman, 1960.

Two sound intensities, differing by 40 decibels (db), were employed as the positive stimulus (S^D) and the negative stimulus (S^A) intensities. The stimuli were all 4Kcps tones. The unattenuated signal (S^A) was 100 db above .0002 dynes per cm². Hereafter the S^A intensity will be referred to as 0 db (attenuation) and all other intensities will be described in terms of attenuation from this reference value. Thus, the S^D intensity was attenuated by 40 db.

Sixteen male albino rats were randomly assigned to four groups of four animals each and treated as follows: prior to the start of the training session, the animals were placed

¹This study was conducted as a portion of a research program under United States Public Health Service Grant M-2554. Reprints may be obtained from Rosemary Pierrel, Brown University, Providence 6, Rhode Island.

on a food deprivation schedule and reduced to 80 per cent of their free-feeding weights. Weights were maintained at this 80 per cent value throughout the investigation.

On the day preceding the start of discrimination training, all animals in all groups were placed in the experimental units in the presence of the intensity which was to serve as S^D (40 db) and each animal was allowed to collect 100 regular reinforcements. Following this bar-training session, Discrimination I training was carried out. Daily sessions were 4 hr in length for all groups; subdivided such that the S^D intensity was present for 1 hr, the S^A intensity being present for a total of 3 hr. The S^D periods ranged from 1 to 3 min in length, whereas the S^A periods were from 2 to 9 min long. The S^D and S^A periods alternated according to a predetermined "random" order taken from the Gellerman series designed to prevent double alternation sequences. Reinforcement was programmed to occur on a VI schedule with an average of one a minute during S^D intervals. Discrimination Training I was carried out for five days for Group I, two days for Group II, and one day for Group III. Group IV was exposed to Discrimination II (generalization) the day immediately following bar-training. Discrimination II was a multi- S^A -valued discrimination training situation in which eight S^A values were presented during the 3 hr in which the original S^A had previously been presented. One of these was the original S^A , the others were values intermediate between S^D and S^A . The intervals were presented in random order for a total of 24.5 min for each intensity. The duration and temporal positions of S^D and the VI schedule of reinforcement in S^D remained as in Discrimination I. This phase of the experiment continued for seven days (28 hr).

RESULTS AND DISCUSSION

From the Discrimination Training I data, discrimination ratios were computed, taking the number of responses in S^A per number of responses in S^D . (The S^A response totals were first divided by three to correct for the greater amount of session time devoted to S^A .) The group mean ratios and their ranges obtained on the last day of simple discrimination training are given in Table 1.

Table 1

Group Mean Discrimination Ratios and Ranges at End of Discrimination I		
Group	Mean S^A/S^D Responses	Range
I (20 hr)	.15	.31
II (8 hr)	.43	.56
III (4 hr)	.89	.32

In each instance the discrimination ratio shows some effect of simple discrimination training as response rates in S^D were higher than those in S^A . The mean ratios were inversely correlated with the amount of previous discrimination training.

Figures 1 and 2 present the gradients for the same single representative animal in each group on the first and seventh-day sessions of the multi- S^A -valued discrimination. Figures 3 and 4 show the group mean data for the same sessions. The S^D totals were multiplied by a constant (.38) to correct for the longer exposure to this intensity. Figures 1 and 3 show that the Group I animals produced a sharper and more concave gradient than did the other three groups. Although the mean functions for Groups II, III, and IV show a tendency toward negative slope (lowered response rate),

Fig. 1. Total number of responses made on Day 1 of Discrimination Training II as a function of intensity level. Each point on each function represents the session response total for a single animal representative of its group. The amount of prior simple discrimination training was: Group I (20 hr); Group II (8 hr); Group III (4 hr); Group IV (0 hr).

Fig. 2. Total number of responses made on Day 7 of Discrimination II as a function of intensity level. Each point on each function represents the session response total for the single representative animal from each group shown in Fig. 1. Note that the data point for the S^D session total for the Group I animal does not appear within the coordinates. The actual value of 3315 responses is not plotted although the slope of the line to 35 db from S^D is correctly represented.

moving along the abscissa from S^D toward S^A , there is no clear concavity such as that typically reported when generalization gradients are obtained following longer periods of simple discrimination training (Pierrel, 1958; Pierrel and Sherman, 1960; Sherman and Pierrel, 1961). With the exception of the fact that the Group II gradient is slightly more concave, there seem to be no conspicuous differences among the Group II, Group III and Group IV gradients. By Day 7 of Discrimination II (Fig. 2 and 4) the individual and mean gradients for all four groups exhibit greater steepness and concavity. The Group I animals have continued to maintain their superiority in discrimination performance and no marked differences emerge systematically between Groups II, III and IV.

Fig. 3. Total number of responses made on Day 1 of Discrimination Training II as a function of intensity level. Each point on each function represents the mean of a given group of animals. $N=4$ for Groups II and III; a failure in the equipment produced $N=3$ in Groups I and IV.

Fig. 4. Total number of responses made on Day 7 of Discrimination Training II as a function of intensity level. Each point on each function represents the mean of the same groups of animals shown in Fig. 3.

It appears, then, that the amount of simple discrimination training determines not only the magnitude of the discrimination ratio but also the form and slope of the post-discrimination gradients. However, the advantages gained as a result of relatively small amounts (4 or 8 hr) of the two-valued training, as opposed to none, in the development of a second multi-S^A-valued discrimination appear to be negligible. This seems to be the case both early (Session 1) or later (Session 7) in the course of the second discrimination training.

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Received October 10, 1962