Visual discrimination learning following single-stimulus training¹

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Grice's (1948) experiment on the effect of prior single-stimulus training upon subsequent two-choice discrimination has been successfully replicated with the preliminary training conducted in a separate single stimulus apparatus and with the positive stimulus counterbalanced. This eliminates a criticism by Mackintosh (1965) of the original experiment.

Using a design originally developed by Lashley & Wade (1946), Grice (1948) found a significant effect of preliminary training to a single stimulus upon the subsequent learning of a visual discrimination problem involving that stimulus. A group of Ss trained to respond to the positive stimulus of the discrimination problem (++) learned the discrimination more rapidly than a group with prior training to the negative stimulus (+-). Grice interpreted this finding as opposed to the Lashley and Wade view that generalization decrement depends entirely upon discrimination training, and in support of a theory of discrimination learning which assumes that animals acquire response tendencies to the specific stimuli.

More recently, this design has been criticized by Mackintosh (1965a,b). Specifically, he suggested that the preliminary training procedures used might permit the animal to learn a relational brightness discrimination and that transfer from this discrimination would produce the result obtained by Grice. Grice presented the single stimulus on one side to a two-choice discrimination box, with a black door closed in the vacant stimulus position. The problem itself was to approach the larger of two white circular discs. Since either disc presumably reflected more light than the black door, and since the large disc reflects more than the small one, such a basis for transfer is conceivable. Mackintosh suggested that Grice should have used a factorial design with each stimulus positive rather than only the large one used in the experiment. Data presented by Mackintosh (1965a) from an experimental situation different from that used either by Lashley and Wade or by Grice tended to support this interpretation.

There is a direct and rather obvious way to test this interpretation of Grice's data. This is simply to conduct the preliminary training in a narrow single-stimulus apparatus with no black door available for comparison. This appears particularly feasible in view of the high degree of transfer of a discrimination learned in the single-stimulus apparatus to the choice situation (Grice, 1949). Such an experiment is reported here. While the need for the factorial design suggested by Mackintosh is less obvious in this situation, this has also been done.

Method. The Ss were 40 experimentally naive male albino rats 98-134 days of age at the beginning of the experiment. The 23½ h food deprivation schedule was started one week before the pretraining sessions were begun and was continued until the S had completed the learning of the discrimination problem. The Ss received 200 trials of pretraining (20 per day) in the single-stimulus apparatus (Grice, 1949) at the end of which was an 8 cm white circle for half the Ss and a 5 cm white circle for the other half. The S received a 37 mg food pellet by opening a door in the center of the circle with its nose. In the next phase the S then learned a size discrimination problem in the two-stimulus apparatus originally used by Grice (1948). For half the Ss in each pretraining group the same size circle was positive in the discrimination (the ++ groups), and for half the Ss the alternate size circle was positive (the +- groups). The criterion for learning the size discrimination problem was 18 of 20 consecutive trials correct with the last 10 correct. Twenty trials were run per day. Detailed descriptions of the apparatus and procedures were given by Grice (1948, 1949).

Table 1
Mean Numbers of Errors and Trials to Criterion

Positive Stimulus in Discrimination	Shift Condition			
	++ (Not shifted)		+- (Shifted)	
	Errors	Trials	Errors	Trials
5 cm	20.5	62.1	32.6	87.7
8 cm	34.2	88.5	40.5	108.7

Results and Discussion. The mean number of errors and mean trials to completion of the criterion for the sub-groups of 10 Ss each are presented in Table 1. It may be seen that the ++ groups having the same circle positive as was used in the single-stimulus training committed fewer errors and required fewer trials to criterion than the +- groups having the alternate sized circle positive. This effect was significant for both measures: Errors— $F = 4.97$, $df = 1/36$, $p < .05$; Trials— $F = 5.90$, $df = 1/36$, $p < .025$. The interactions of experimental condition with positive stimulus size were not significant. However, the simple effect of positive stimulus size was significant for both measures. Errors: $F = 6.83$, $df = 1/36$, $p < .025$. Trials: $F = 632$, $df = 1/36$, $p < .025$.

While the figures are not directly comparable in that Grice (1948) did not include criterion errors and trials in the numbers presented, it is still clear that learning in both comparable groups was slower here than in the original experiment. There are two probable reasons for this. In the original study the single-stimulus training was done with the stimulus equally often on the right and left of the choice apparatus. This would tend to equalize position habits. Also it was observed that the animals in this experiment showed considerably more tendency to explore the area behind the stimuli in the choice apparatus than animals trained from the beginning (including shaping of the panel pushing response) in this situation. Not only did this appear to be generally disruptive, but may have provided a source of reinforcement for approach to the negative stimuli. The behavior was noted particularly when the negative stimulus was the small circle, affording a larger area for exploration.

The chief import of the findings is that the effect of single stimulus training originally obtained by Grice (1948) was replicated. The procedures and design were such that the basis for criticism raised by Mackintosh cannot be reasonably regarded as an explanation of the outcome. In other words, we may be reasonably certain that the effect is literally due to single-stimulus training. Grice's original theoretical interpretation remains applicable.

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NOTE

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