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Investigation of Directional Orientation in Mazes Without Goal Pointing Blinds

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AN INVESTIGATION OF DIRECTIONAL ORIENTATION IN MAZES WITHOUT GOAL POINTING BLINDS[1]

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INTRODUCTION

The purpose of this study was to investigate the assumption that directional orientation--if it is a factor in maze learning by the white rat--facilitates a rat's learning of a maze in which the goals are directionally opposed, as compared with the learning of a maze in which the goals are not directionally opposed.

Although the effect of the spatial relation of the goal to the rest of the maze in the absence of extra-maze cues has received scant attention in recent years, the authors of several recent text books (1, 4, 6) have revived the goal or directional orientation hypothesis. Despite the acceptance of the directional orientation hypothesis by the authors of these books, the evidence remains inconclusive. This may be partly due to the use of entries into goal pointing blinds as a measure of the orientation factor. In order to clarify the picture, further experimental evidence is needed in which directional orientation is isolated from the anticipatory goal reaction.

GENERAL EXPERIMENTAL PROCEDURE

Apparatus. Two modified T-mazes were used, as shown in the floor plan in Figure 1. The same starting box and choice point were used for both mazes.

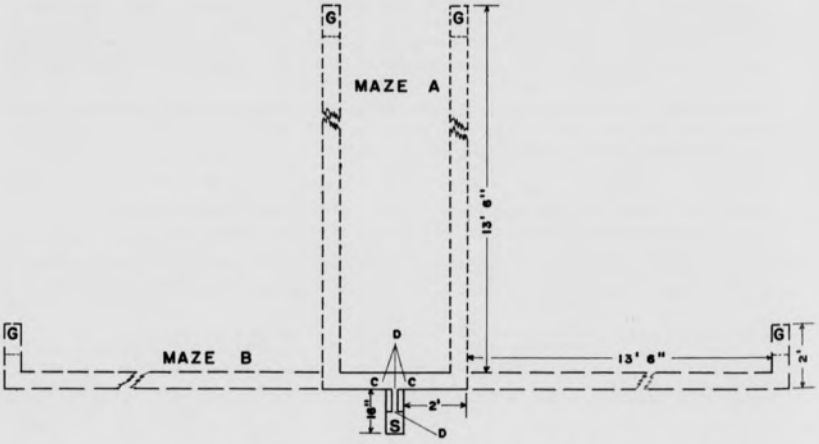

Fig. 1. Floor Plan of the Experimental Maze. C = Curtains, D = Guillotine doors, G = Goal boxes.

Constructed of white pine and painted a flat black, the maze alleys were 4 inches wide and 3½ inches high. They were covered with hardware cloth. The short alley leading to the choice point from the starting box was only 2½ inches wide in order to minimize the effects of following one wall up to the point of choice.

[1] The study reported in this paper was conducted by the writer in the Psychological Laboratory at the State University of Iowa. The writer wishes to express his gratitude to Dr. H. C. Wilcoxon for suggestions in the preparation of the manuscript.

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The goal boxes were 14 inches long, and sized to fit snugly inside the maze alleys. A hinged single-valve door, fastened on the front of the goal boxes, prevented retracing from the goal. The experimental room was lighted to provide uniform illumination over both paths.

Subjects and Training Procedure. The subjects were 22 female albino rats from the colony maintained by the Psychology Department of the State University of Iowa. At the beginning of the study, they were between 90 and 100 days old. The subjects were assigned at random to the two groups before the preliminary training began. After following a regular feeding schedule for one week, the animals were trained to run a straight alley 6 feet long within 5 seconds in 4 out of 5 successive trials. The food box in this straight alley contained a hinged single-valve door--the same as was employed in the maze used in the learning series. This helped the rats learn to open that type of door.

Learning Series. The learning series in the experimental mazes started the day after completion of preliminary training. Neither goal box contained a food reward on the first run, and the path chosen by each animal became the incorrect path for that animal for the remainder of the experiment. Each subject took four runs a day with 15 minutes between trials, until the criterion of 6 consecutive correct runs was reached. The non-corrective method was used throughout the study. A trial consisted of a run from the starting box to one of the two goal boxes. When an animal ran to the correct goal box, it was allowed to eat the small piece of food, and it was returned then to the carrying cage to await the next trial. If the animal ran to the incorrect goal box, it was removed after 30 seconds and returned to the carrying cage. Through such procedure, only one error could be recorded for each animal on each trial. A small pellet of the rat's regular diet was placed in the correct goal box as incentive. The pellets weighed about .15 gm. The animals were fed their daily ration, consisting of 8 gm. of Purina Dog Chow, immediately after the daily experimental period.

RESULTS AND DISCUSSION

The null hypothesis (that there is no difference between the groups) can not be rejected as the *t* for trials is .22 and for errors, .29. Thus, the results fail to support the assumption that directional orientation is a factor in maze learning by the white rat.

Table I. The Mean Number of Trials Required to Reach the Criterion and the Mean Number of Errors of the Two Groups with Respective Standard Deviations.

Group	Maze	Trials		Errors	
		Mean	Standard Deviations	Mean	Standard Deviations
I	A	10.27	6.27	5.82	3.32
II	B	10.82	4.91	5.45	2.28

The factor of goal or directional orientation has not been defined clearly. Most authors appear to imply that the rat actually learns the direction in which the goal lies, and further that the animal reacts to this "knowledge" from any point in the maze. Underwood (6, p. 426) has stated:

> Part of what a rat learns in a maze appears to be an orientation toward the goal. It is as if, after a few trials, the animal learns that the goal box is "over there."

If the writer correctly interprets this statement by Underwood, the maze designs used in this study were such that maze B should have been learned more readily that maze A, because the rat is capable of learning that the goal box is "over there." Although this learning of "over thereness" did not occur in this study, it "apparently" has been found in a number of previous studies. However, the complex design of many mazes used in studies of directional orientation

makes it difficult, if not impossible, to determine the variables which are influencing the learning of the rat.[2] In multiple T-mazes in which the last correct turn is the same as the turns leading into goal-pointing blinds, it is impossible to determine the influence of directional orientation, since the animal may be making anticipatory goal responses. For this reason the writer feels that Brogdon's definition (2, p. 601) is inadequate, since he defines directional orientation as the tendency to make more errors in goal-pointing blinds than in non goal-pointing blinds.

SUMMARY

Albino rats were run in two modified T-mazes in order to test the assumption that directional orientation would facilitate the learning of a maze in which the goals are directionally opposed, as compared with the learning of a maze in in which the goals are not directionally opposed.

There was no significant difference in the learning of the two groups when they were analyzed in terms of mean errors or in terms of the number of trials required to learn. Thus, the results failed to support the assumption that directional orientation is a factor in maze learning by the white rat.

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[2] It is possible that two different variables were operative in the present study, although the factor of anticipation of the last correct turn was removed from the maze situation. Both mazes had a forced turn for the animals after the choice was made. These turns may have gained secondary reinforcing properties, and therefore acted as sub-goals as described by Gilhousen (3). Spence and Grice (5), on the other hand, have presented evidence against the sub-goal effect in the type of maze used by Gilhousen. If sub-goals played a role in this maze situation, it would follow that arriving at them should have reinforced responses which led to them. In this study, the response at the choice point was the critical one to be learned. Thus, the problem is to deduce the possible differential effects of the sub-goals on the learning of this choice response. There are two important aspects of the present situation which must be considered: (1) the sub-goal in maze B should have had greater reinforcing properties since it was located much closer to the final goal, and (2) the sub-goal in maze A was achieved with shorter delay following the choice point and therefore should reinforce the choice response more strongly. As the effectiveness of the sub-goals appears to be equated, we may assume tentatively that they were not affecting differentially the learning of the rats in the two mazes. This, however, waits for an empirical test.