

A test for dominance of cues during maze learning by toads

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Toads (*Bufo marinus*) were trained to escape shock in a T maze with confounded visual and spatial cues. After each S reached a criterion of eight consecutive correct trials, it was given a single test trial with the positions of the visual cues reversed. When faced with a situation in which visual and spatial cues gave contradictory information, each of the six Ss performed on the basis of the spatial cue.

Differences in results when spatial and visual tasks are used (Bitterman, 1965) indicate that it is important for the comparative psychologist to study which cues are dominant for various animals in the experimental situations used for comparative studies. Mackintosh (1965) has suggested that whether Ss attend to the relevant cue determines whether rats show an over-learning reversal effect. Toads are almost totally dependent upon visual cues while feeding (Eibl-Eibesfeldt, 1951; Brower & Brower, 1962), so one might expect them to attend to visual cues during maze learning. However, when caimans, also heavily dependent upon vision while feeding, were trained in a T maze with confounded visual and spatial cues, they attended to the spatial cues (Williams, 1967). Therefore, it is impossible to make an a priori prediction with any certainty regarding which cue a toad would use in a maze situation. Training toads in a maze with confounded visual and spatial cues and then giving them a test trial on which the visual and spatial cues give contradictory information should reveal which cues are dominant in a maze learning situation.

Subjects and Housing

Six toads (*Bufo marinus*) served as Ss. They were purchased commercially and had a head and body length of approximately 4 in. They were kept in a 3 ft square box containing a 1 ft square pan of water. Identification of individual Ss was made possible by colored bands around their bodies.

Apparatus

The apparatus was a modified T maze with galvanized metal sides and a floor made of 1 in. wide stainless steel plates separated by 1/8 in. spaces. Dimensions of the maze are given in Fig. 1. A metal guillotine door converted the incorrect arm into a cul de sac. The maze was elevated 7 in. above the floor, and the floor of the goal pan was padded with cloth. The wall of the arms opposite the stem was made black on the right and white on the left, or vice versa, by 35-1/2 x 14 in. interchangeable sheet metal panels. A variable voltage transformer delivered shock through

a scrambler to the floor and sides of the maze. A short circuit current of about 1/2 mA was used.

Procedure

On each trial, the S was removed from the home box by hand and dropped onto the start area facing the choice point. When a S entered the goal pan, it was removed by hand and returned to the home box. An error was defined as a complete entrance into the wrong arm of the alley, and the criterion for learning was eight consecutive correct trials. Three Ss were trained with right and black positive, and three were trained to go to white on the left. Twenty trials were given the first day, and the remainder were given the second day. An 8 min intertrial interval was used. After a S reached criterion, it received a single test trial with the positions of the black and white reversed.

Results and Discussion

The individual Ss reached criterion in 19, 25, 27, 41, 42, and 45 trials and made 4, 5, 12, 13, 18, and 15 errors, respectively. On the test trials, all six of the Ss turned to the side to which they had been trained. This preference for the position cue was statistically significant ($p = .016$). These results with toads are in agreement with the finding that caimans chose the spatial cue unanimously in an identical situation (Williams, 1967). Although it is impossible to make meaningful, direct comparisons of quantita-

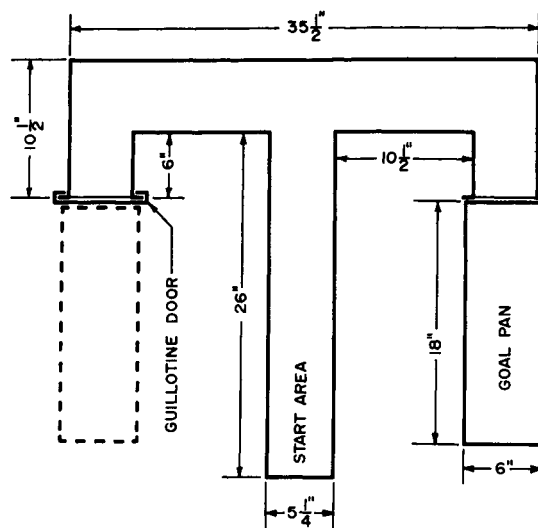


Fig. 1. Top view of maze showing major dimensions. Maze walls were 14 in. high.

tive results because of the possibility that motivational levels were not equated, it is interesting to note that the median number of trials to criterion was 34 for the toads as compared with 10.5 for the caimans. The median numbers of errors were 12.5 and 2.0 for the toads and caimans, respectively. Only one caiman, discontinued after 30 trials, learned as slowly as the toad which learned most quickly. This difference is in line with what one might expect from phylogenetic and neurological considerations. It is somewhat surprising, however, that these animals, naturally so dependent upon vision, apparently do not attend to visual (at least brightness) cues in this situation.

Spigel & Ellis (1965) reported a preference by *Rana pipiens* for dark as opposed to light alleys. If there were a preference for dark alleys in these toads,

it was relatively weak and easily overcome. Four of the six Ss went to the black side on the first trial, but those Ss with black positive did not learn any faster than did those with the white side positive.

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Note

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