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Short Communication

Regional cues and visual discrimination in the rabbit

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Rabbits were trained to discriminate patterns consisting of straight bars and rows of dots of different orientation. It was found that using proximal pattern presentation, at a distance of 5 cm in front of the animal, dot rows of different orientation are not discriminated on the basis of tilt extrapolation, but by the use of regional cues.

In a recent publication experiments were described in which rabbits were trained to discriminate between vertical and horizontal striations at a distance of 25 cm[1]. After the 90% correct level had been reached, transfer to vertical and horizontal rows of dots was studied. It was found that performance depended on the degree of dot separation. With angular dot separations larger than 4.9°, performance was below the 75% correct level.

These results compelled a reconsideration of the conclusions based on an earlier study where it was found that rabbits trained to discriminate bars did not transfer to rows of dots, whereas rabbits trained to discriminate rows of dots of different orientation, immediately transferred to bars[5]. Based on these findings it was assumed that rabbits have two mechanisms of orientation discrimination, one in which straight edges are the critical features by which the patterns are discriminated, and another mechanism that extrapolates a vector across the retina derived from the zones of darkness.

These early experiments were carried out in a discrimination apparatus in which the patterns were attached to the gates which the animal had to open with the nose in order to reach the food reward. Under those circumstances the distance between the animal's eyes and the patterns is some 5 cm. At this distance the angular separation of the centers of the dots used in that experiment was 22.31° and the smallest distance between dots was 8.58°. Considering recent results[1] this distance is relatively large. Therefore the question arose whether the animal was indeed extrapolating a vector derived from the zones of

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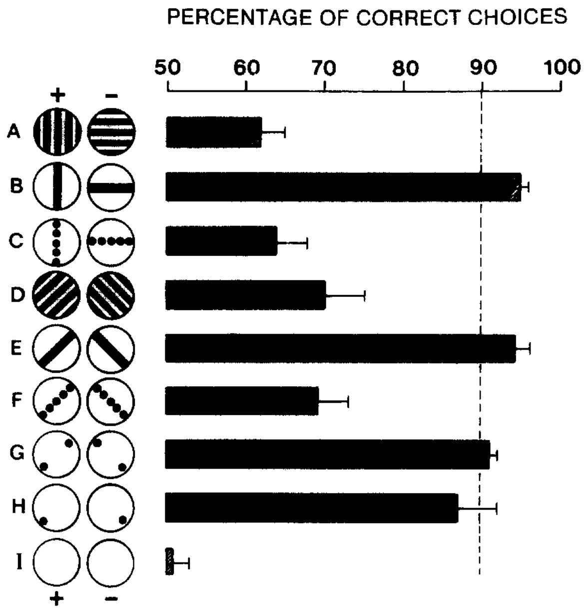

Fig. 1. In the left column the various targets are presented. The horizontal bars in the right column indicate the average percentage of correct choices and standard errors on the first day of training with each pattern pair.

darkness on the display or from the use of regional cues[2].

Eight Dutch belted rabbits were studied. The discrimination apparatus and the automatic control system used in the experiments were essentially the same as used previously[3,4]. The apparatus consisted of a box with one wall having two hinged panels on which visual patterns could be back projected. The distance between the animals' eyes and the pattern was about 5 cm. To make a correct choice, the animal had to press the panel illuminated by the correct pattern. This response was rewarded by a food pellet. When the animal chose the incorrect pattern no reward was given and the trial was terminated. The food rewarded pattern was placed randomly right or left. Per day 100 trials were given.

The left part of Fig. 1 shows the training schedule used. The rewarded patterns are shown in the first column. After an initial shaping procedure to train the animals to operate the panels for food reward, they were then trained to discriminate vertical versus horizontal striations. After the 90% criterion had been reached, training was continued with single bars and rows of dots. The right part of Fig. 1 shows the average scores and standard error on the first day a new task was given. None of the animals had any difficulty with the change from the striated patterns to single bars (Fig. 1, compare row A with B and D with E). Performance drastically dropped below the 90% criterion when the single bars were replaced by a row of dots (compare row B with C and E with F). After successful discrimination learning on dot rows (see F) training was continued using only the dots at both ends of each row. This decrease in the number of dots had no influence on performance (Fig. 1F–G). This means that the presence of a dot vector is irrelevant, as the animals needed only the position of the lower dot in the display (Fig. 1G–H).

Thus the present results do not support the position that the rabbit, under present test conditions, extrapolates a directional vector from the displays. On the other hand in a series of linear dot discriminations, where the dot sparing was gradually increased, clear indications of vector extrapolation were seen[1]. However this was only possible for displays of high dot density at a distance of 25 cm.

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