PSYCHOLOGY

Learning in Two Sense-modalities

In previous investigations[1,2] monkeys were taught to discriminate between shapes or rates of intermittence exclusively in one sensory modality (say visual) and were afterwards tested with the same shapes or rates exclusively in another modality (say tactile for shapes or auditory for rates). There was no evidence of cross-modal transfer of training. A variation of this procedure was also briefly described[1]. Four animals first learnt to discriminate between two test objects exclusively by touch (in the dark) and were afterwards tested for 30 trials with the same objects (in the light) under conditions where the objects could be discriminated either by touch or by vision. Only one animal performed significantly better than chance in the light. It was concluded that "even when monkeys are constrained to touch the very cues which served as the basis for successful somato-sensory discrimination of shape or size on the preceding day, there is still no clear indication of positive transfer on visual testing" (p. 62). In the present investigation the converse procedure was used: animals were first trained to discriminate between test objects by vision and/or touch (in the light) and were afterwards tested with the same objects for discrimination by touch alone (in the dark).

Three separate batches of respectively 8, 6 and 7 untrained rhesus monkeys (weight-range, 3·3–6·3 lb.) formed the three groups of subjects. All the subjects in a group were trained concurrently and all training was carried out under comparable conditions by the same investigator. However, group I animals were trained during March, group II during July and group III during November. (This consecutive training was necessary because all animals afterwards took part in different experiments.)

Standard apparatus (Wisconsin general testing apparatus) was used in conjunction with two food boxes placed 12 in. apart. The test objects were fastened to the lids of these boxes. Forty trials (non-correction) were given each day with the right/left positions of the positive test objects determined by the Gellerman schedule. During tactile training (in the dark) the animals' performance was observed by means of an infra-red telescope.

Animals of group I were first taught (see Table 1) to discriminate in the light between two relatively unsaturated hues, pink and cream. Animals of groups II and III were first trained on a quality discrimination in the light. In this test the positive (rewarded) object consisted of a piece of black foam rubber (2 × 0·75 × 0·3 in.) attached across the lid by a steel strip and two bolts. The negative object consisted of a black piece of wood of nearly the same dimensions as the rubber (but of different texture). The lids could only be opened by grasping and then pushing either the rubber or the wood. For their second test all 21 animals were trained to make this quality discrimination in the dark. However, animals of group III were concurrently given a further 100 trials on the visual form of this test according to a method described elsewhere[3]: visual trials in the light alternated with tactile trials in the dark (making 20 visual and 20 tactile trials each day), but were excluded from the learning scores relating to the tactile form of the test.

Table 1. Training Histories and Results on Quality Discrimination Test

Group I (n = 8)	Group II (n = 6)	Group III (n = 7)
Visual hue discrimination Mean = 275 trials	Quality discrimination (in the light) Mean = 192 trials	
Tactile quality discrimination test (in the dark)		
Animal: (1) 137 trials	93 trials	85 trials
(2) 162 ,,	116 ,,	55 ,,
(3) 133 ,,	98 ,,	243 ,,
(4) 157 ,,	97 ,,	43 ,,
(5) 60 ,,	84 ,,	318 ,,
(6) 108 ,,	120 ,,	46 ,,
(7) 124 ,,		62 ,,
(8) 161 ,,		

The figures refer to the number of trials required to reach the standard level of performance (10 or less errors in 100 consecutive trials).

Table 1 contains the results for the tactile test. There is considerable overlap between the scores of animals belonging to different groups. Animals of group I tended to have the highest scores and animals of group III, with two exceptions, tended to have the lowest scores. These two animals, although extremely hesitant and unresponsive on this their first tactile test, have not been excluded because on subsequent tactile testing their performance fell within the range relating to other animals. Statistical comparisons (Mann-Whitney 'U' test) indicate a significant difference between the scores of group I and group II animals ($P = 0{\cdot}02$); but not between the scores of group I and group III animals ($P = 0{\cdot}14$) or between those of group II and group III animals ($P = 0{\cdot}15$).

These results indicate that in the monkey combined visual and tactile experience of two objects may lead to significantly improved performance (group II animals) when the same objects are afterwards offered for exclusively tactile discrimination. A comparable investigation has not been found in the literature. There are at least three interpretations of the present results. First, since cross-modal transfer from vision to touch could not be demonstrated in a previous investigation[1] it is unlikely that memory of the actual visual quality discrimination improved the performance of the group II animals during later tactile testing in the dark. Secondly, non-specific familiarity with the test objects, acquired during training in the light, may have accelerated subsequent tactile learning. Thirdly, it is possible that obligatory tactile contact with the objects during testing in the light led to some measure of genuine tactile discrimination learning. Irrespective of its origin, this improvement in tactile learning resulting from visual-tactile experience of the test objects in the light was not as pronounced, at least under the present experimental conditions, as might have been expected.

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