INTEROCULAR TRANSFER AND OVERTRAINING IN THE RABBIT

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Abstract. The possible effect of overtraining on interocular transfer of striated pattern discrimination was studied in Chinchilla rabbits. Overtraining did not improve the low level of interocular transfer generally found in rabbits.

In the rabbit interocular transfer has been found to be poorly developed both for luminous flux and striated pattern discrimination (2, 8-13). Testing interocular transfer without uninterrupted series of monocular trials, by using color filters, also has not led to a significant increase of savings (1). Besides that rabbits are able to learn a task with one eye which is conflicting with a task learned with the other eye (8).

In these experiments no attention was paid to a possible effect of overtraining. Lepore et. al. (3) studied interocular transfer of a pattern discrimination task in split-chiasm cats. One group learned the discrimination task to criterion only. Another group, after reaching criterion, was overtrained with 1,600 trials. Most subjects of the last group showed chance performance during the first transfer session, but learned the pattern discrimination task much more rapidly with the second eye than cats in the non-overtrained group. The conclusion was drawn that the engram, after overtraining, had been layed down in both hemispheres. Overtraining was also found to improve interocular transfer in the rat (4).

In the present experiments rabbits were trained on a two-choice
striated pattern discrimination task and the effect of overtraining on interocular transfer was tested.

Forty-nine adult Chinchilla rabbits were used. The pattern discrimination apparatus and the automatic control system were described elsewhere (6,7). The apparatus essentially consisted of a box with one wall having two hinged panels, on which visual patterns could be back-projected. To make a correct choice, the animal was required to press the panel illuminated by the correct pattern. This response was automatically rewarded, but it terminated the trial as a non-correction procedure was used. The patterns were projected on a 10 cm diameter circular window in each panel, which was covered with glass and Kodatrace foil. The patterns were composed of white striations with a width of 1 cm on a dark background. The rewarded pattern was right or left in a random sequence. The shaping procedure was described before (7). In all cases 50 trials were given per day. At first the rabbits were trained binocularly on a vertical vs horizontal striations discrimination task (Fig. 1). After reaching the 90% correct level, training was continued monocularly with the same patterns. Animals which did not reach cri-

Fig. 1. In this figure the training procedure is illustrated. In all cases 50 trials were given per day. At first the animals were trained on a horizontal vs vertical striations discrimination. After reaching criterion (2) the animals were trained monocularly on the same task. During the third phase training was continued with the left eye open. The targets were 45° vs 135° striations (45° rewarded). In phase 4 the animals were retrained with the right eye open on a vertical vs. horizontal discrimination, followed by the 45° vs. 135° striations task in phase 5.
terion with the left and with the right eye separately in five training sessions of 50 trials each were discarded from the experiment. The remaining 30 animals were trained to discriminate mirror-image striations with the left eye open. Of these animals 5 rabbits, that failed to reach the 90% correct criterion within 30 days, were discarded. Eleven of the remaining 25 animals received 40 series of 50 trials extra after reaching criterion with the left eye open.

Before testing interocular transfer of the mirror-image task all rabbits again received series of vertical vs horizontal striations presented to the right eye. Ten rabbits reached the 90% correct level during the first series of trials. The others reached criterion after an average of 24.4 (SE ± 8.3) errors.

The animals differed considerably in their ability to learn the monococular discrimination of the mirror-image striations. With the left eye open, the group of animals that was overtrained reached the 90% correct level with the mirror-image striations after an average of 187.4 (SE ± 41.6) errors, the ones that were not overtrained after 125.1 (SE ± 27.2) errors. With the right eye the 90% correct level with mirror-image striations was reached by the overtrained animals after 114.2 (SE ± 34) errors, the non-overtrained ones after 94 (SE ± 16.7) errors.

Per animal interocular transfer was calculated by comparing errors to criterion with the left and right eye open:

\[
\frac{1 \text{st. eye score} - 2\text{nd eye score}}{1 \text{st. eye score} + 2\text{nd eye score}} \times 100.
\]

The average percentage of savings for errors to criterion in the overtrained group was 26.55 (SE ± 12.8), in the non-overtrained group 12.35 (SE ± 12.45) with the Students t-test. The difference was not found to be significant at the \( P = 0.05 \) level.

In summary, in contrast with the findings in the cat (3) and the rat (4) overtraining on a visual discrimination task did not improve interocular transfer in the rabbit.

These and all previous experiments (1, 2, 7-13) leave the question about the nature of the low level of interocular transfer unanswered. One possibility is that the phenomenon is peripheral. Rabbits have a tendency to fixate patterns in a discrimination box with the temporal retina. This means that if the left eye is open and the negative stimulus is on the left side, the animal has to move to the right in order to push the panel with the rewarded pattern. If the right eye is open the animal has to follow a different strategy. In this hypothesis learning with the other eye is not learning of pattern identification as such, but strategy adaptation.

A second possibility is a "central" explanation. In the rabbit inhibi-
tory fibers from one hemisphere to the other — via the corpus callo-
sum — have been described (5). Eye occlusion will lead to an unbalan-
ced input to the two hemispheres: the hemisphere which receives the
visual input from the open eye could well suppress the hemisphere con-
tralateral to the occluded eye and prevent the formation of a memory
trace in that hemisphere. A central explanation seems more likely than
a peripheral one: before training on mirror-image striations with the
right eye open, sessions of vertical vs. horizontal striations were pre-
sented to the right eye. All animals did well on this task. In other words,
the motor strategy was adapted immediately.

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