MASSIVE LESIONS OF THE SQUIRREL MONKEY'S LIMBIC SYSTEM LEAD TO FEWER LEARNING DEFICITS THAN SMALLER LESIONS

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The purpose of this study was to investigate the influence of extent of lesions on the recovery of learning functions after limbic lesions of various sizes. Altogether 22 squirrel monkeys were used: Two received lesions of the hippocampal formation, three animals each received lesions of the amygdala and hippocampal formation or the anterior and mediodorsal thalamus, and seven received lesions of septum, amygdala, hippocampal formation, and anterior and mediodorsal thalamus together. Seven sham-operated animals served as controls. All animals were tested after the surgery over a period of two years in various learning tasks, namely visual and spatial reversals, several concurrent object discriminations, a delayed non-match-to-sample task and an angle threshold discrimination. The results indicate that animals with massive lesions of the limbic system are <u>less</u> impaired in these learning tasks than animals with lesions of only one or two of these regions. Animals with one or two lesions were strongly impaired, compared to controls, but recovered significantly during the long period of testing. Animals with massive lesions were only slightly impaired compared to controls from the very beginning of testing.

The experiment was performed at the University of Konstanz.

THE STORAGE CAPACITY OF AN ASSOCIATIVE MEMORY WITH SUPERIMPOSED TRACES

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Using convolution and correlation operations, a model of a memory which is associative in its character can be built (Bottini, 1979). The central point of the model is a noise-like distributed coding of the information items being stored. Memory traces formed in this way can be superimposed on a common discrete substratum without cross-talk interference in the recall. This property is also plausibly shared by the neural memory traces.

The storage capacity of the model has been calculated for the case in which the storage of each single memory trace produces a change in the "weight" of all the memory elements. Each memory element can change its state within a range of levels, the number of which is related to the number of traces that can be stored.

It results that the amount of information H stored per memory element increases as the number of traces increases, and approaches a limit of about 0.3 bit/elem. For values of H close to this limit, much unwanted noise can arise in the recall. However, suitable working conditions for the memory system can be chosen in which H is as high as 0.2 bit/elem and the recall is almost free from error. For such an H, the storage efficiency, i.e. the ratio of H to the number of bits required by each memory element, can range from 0.01 to 0.03, depending on the number of traces. This parameter is sufficiently high to further strengthen interest in the principle underlying the model when it is referred to biological memory.