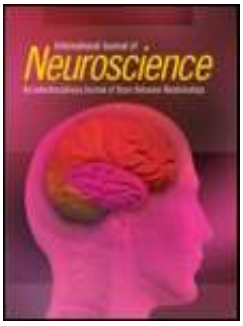

International Journal of Neuroscience

ISSN: 0020-7454 (Print) 1543-5245 (Online) Journal homepage: http://www.tandfonline.com/loi/ines20

Association Systems of the Brain Abstracts

To cite this article: (1984) Association Systems of the Brain Abstracts, International Journal of Neuroscience, 22:3-4, 167-208, DOI: 10.3109/00207458408990678

To link to this article: http://dx.doi.org/10.3109/00207458408990678

tude of correcting movements increase too. It means that the task is solved through an increased number of movements which indicate longer time for analysing somatic impulses. Thus, local destruction of the pericruciate cortex led to marked impairments of precision and speed with which the visuomotor task is resolved. These may be due to difficulty in determining the limb position in space at each moment.

Isolated lesioning of fields 5 and 7 in the parietal area caused decrement of correct responses. Latencies and time of retaining the position were not affected, whereas time of search increased. Longer time requisite for the performance is related to a changed type of search movements. When field 5 was lesioned, correct response is attained through multiple correcting movements whose amplitude gradually fall. When field 7 is lesioned, the animal manages to make spots coincide by numerous gradual corrections of the same sign.

These changes in visually guided movements in literature are explained by insufficient information of visual nature (lesion of field 7) or of somatic nature (lesion of field 5). Total lesions of parietal cortex probably impair the analysis of spatial properties of both somatic and visual information; resulting are irrevocable deficits in visuo-motor tasks.

Coagulation of the ventrolateral (VL) nucleus affected realization of ready and formation of new visuo-motor syntheses. Trained animals showed rather quick restoration of all response parameters. In intact animals the ability to learn the task tested decreased. Coagulation of the dorsomedial VL in trained cats decreased the correct response probability. This deficit disappeared with time, but more postoperative trials were required. Training was difficult and oftentimes ineffective. Total VL coagulation by kainic acid completely destroyed the cat's ability to perform. Thus, VL coagulation radically affects the ability to form visuomotor coordinations and causes temporary deficits in coordinations elaborated earlier. Coagulation of various VL portions shows different deficits and confirms heterogeneity of this structure.

Lesions of cortical and thalamic structures indicate that higher association systems of the brain, i.e., thalamo-parietal and thalamo-frontal systems play essential parts in visuomotor coordinations. VL is probably one of thalamic structures which mediates cerebellar influences and is connected with parietal and frontal areas and can provide for their interplay during the formation of visually-guided skills.

On the Role of Cortical Association Systems in Performance of Learned Motor Coordination (on the Model of Alimentary Instrumental Reflex in Dogs)

N. P. BALEZINA, M. E. IOFFE, V. E. MATS AND O. G. PAVLOVA
Moscow, USSR

This study deals with the functional role of parietal and frontal cortical areas in motor learning, namely in the reorganization of motor coordinations and in the formation of new coordinations.

Three dogs were trained to lift the right forepaw in response to the sound or light conditioned stimulus (CS) to the height about 15 cm to keep the paw lifted at least 1 sec and then to lower it (1st phase of the reflex). Then the dogs received a cup with food placed on a movable disc situated at the bottom of the trough. The disc was connected mechanically to the paw, and to reach food the dog had to lift the paw again and keep it lifted during eating, as during lowering the paw the disc was lowered

too (2nd phase of the reflex). It has been shown before that during acquisition of 2nd phase of the reflex an inborn coordination (eating with lowered forepaws) had to be suppressed and a new coordination of two simultaneous reactions (eating with lifted paw) was established. This new coordination was disturbed after motor cortex ablation or pyramidal tract section.

With the reflex established, parietal cortical area (parts of g. marginalis, g. ectolateralis and g. suprasylvius) was bilaterally ablated. Three months later the frontal area (g. proreus) was also bilaterally lesioned.

In the first experimental day after the parietal area lesion the instrumental reaction grew disintegrated: either 1st or 2nd phase was manifest. The reflex restored quickly but some parameters of 1st phase were disturbed, e. g., the increased latency during the first conditioned movement inexorably decreased. Thus adequate reaction with required parameters (amplitude, 15 cm; time of keeping the paw lifted, 1 sec) was usually performed after some failures of 1st phase and consequently the so-called latency of the reinforced movement increased. These probably resulted from the disturbances of the synthesis of proprioceptive and exteroceptive information after parietal lesions described elsewhere and perhaps from the "motor memory" disturbances. However, 2nd phase was unaffected by parietal lesions and only small changes in the form of movements emerged .

Frontal lesion series after maximal recovery of reflexes showed strong dependence upon the location of the lesions. Local lesions of proreal gyrus gave no new deficits; on the contrary, all disturbances tended to diminish. On the other hand, damages to the premotor area (anterior part of g. sygmoideus ant.) lead to profound disturbances in 2nd phase of the reflex. The dogs were unable to eat with a limb lifted. With the head lowering into the trough, the paw was lowered at once; then it was lifted again, etc. Actually, the form of the movement was very similar to that after motor cortex ablations or the pyramidal tract section observed in other experiments.

These results show that the program of a learned motor coordination of two simultaneous reactions including suppression of inborn coordinations is formed in the premotor cortex and then is realized by the motor cortex. Since these findings were obtained after complex lesions of parietal and frontal cortices, a special series is required to check the hypothesis about the functional role of the premotor area in motor learning.

The Role of Striatum in Selecting Relevant Signals

K. B. SHAPOVALOVA, S. P. POLTAVETZ, M. I. BOIKO
Leningrad, USSR

According to current viewpoint, striatum is an association structure of the brain involved in the inhibitory control of behavior.

This study deals with the effects of preliminary low-frequency (2 Hz) stimulation of the head of caudate nucleus (CNH) upon differentiation of auditory signals and upon the "transfer" of motor habits in dogs in the situation of instrumental defence reflexes related to the maintenance of a certain posture. Animals (10 adult male dogs) were trained to avoid the electrical shock delivered to the left hindlimb by raising it to a certain level to disconnect the circuit. The dogs had to retain this posture throughout the conditioned signal. Bipolar electrodes were inserted stereotaxically into the