Abstract View

# EFFECTS OF JUMP MOTOR LEARNING ON THE SYNAPTIC EFFICACY OF CEREBELLAR PURKINJE CELLS AND HIPPOCAMPAL PYRAMIDAL CELLS

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Experimental evidence suggests that the cerebellum is critical in the learning process. The cerebellum is known to operate as an error detector in voluntary movement, particularly in smooth and slow movement. Electrophysiological studies have shown that the efficacy in the parallel fiber-Purkinje cell synapse is chronically depressed following low-frequency, conjunctional stimulation of parallel and climbing fiber inputs to Purkinje cell, suggesting that long-term depression of parallel fiber-Purkinje cell synapse might be the part of the engram of motor learning. But the possible role of the cerebellum in learning the skills for involuntary, automated movement has not been tested. I addressed this issue by comparing trained and untrained rats (4-week-old male Sprague-Dawley) for automated movement (jump induced by classical conditioning) in the efficacy of the parallel fiber-Purkinje cell synapse, and the Shaffer's collateral-pyramidal cell synapse in the hippocampus.

The data have shown that the population spike of cerebellar Purkinje cells from parallel fiber stimulation is potentiated in a long-term fashion in trained rats after tetanic stimulation (100 Hz, 1 sec) of granular cell layer, whereas it is depressed in untrained ones, and the population spike in hippocampal pyramidal cells evoked by Shaffer's collateral stimulation is potentiated after tetanus (100 Hz, 1 sec) in both trained and untrained rats. These results suggest that the cerebellum, not the hippocampus, is involved in learning the skills for involuntary, automated movement, and long-term potentiation, not depression, is probably the electrophysiological signature for automated motor learning.

Citation:

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