J Neurol Neurophysiol 2018, Volume 9
DOI: 10.4172/2155-9562-C3-068

Brain activity during learning and forgetting a complex motor task

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The study of the mechanism for the adaptation involving vestibular, proprioceptive, and other pathways in the central nervous system may serve as a framework to develop new rehabilitation strategies to optimize the treatments for several painful and disabling conditions. The use of motor imaginery (MI) interventions is one of the most actually promising features for improving the motor learning process. The aim of the study was to determine the brain areas activity during a motor imaginery intervention of a complex motor learning task. A double-blind randomized controlled trial was performed. All participants were controlled for vestibular system during gait and riding a regular bicycle. Also, brain activity was assessed with electroencephalography (EEG) before and after learning a complex motor task such as riding an inverse steering bicycle. During the resting times the experimental group was asked to perform MI training looking into virtual reality goggles and the control group was asked to watch a video without any movement implication. Forty-eight healthy subjects were recruited (22 males and 26 females) aged between 19 and 29 years old. Statistically significant different EEG activity in Brodmann areas 47, 38, 21 and 13 ($P<0,01$) were only found in the experimental group (n=24). In our study the main areas activated by the experimental group were associated with motor sequencing, motor learning, imagination, and interlimb coordination. We consider that the MI intervention helped to preactivate the contralateral lower limb for improving motor planning. Surprisingly, we found that the subjects were unable to reassemble on a regular bicycle for a few minutes after this intervention. Future studies may consider this implications in the learning process.

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