

# FMRI of Functional Electrical Stimulation (FES) on Wrist Extensor Muscles

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**목적(Purpose):** To investigate the brain activation by functional electrical stimulation(FES) on the wrist extensor muscles

**대상 및 방법(Materials and Method):** We studied 4 healthy volunteers(men, mean age 35 years, ranged 20 to 50). The stimulation and rest paradigm consists of 20-second epochs alternating between the two tasks. The wrist extensor muscles are stimulated at a frequency of 1 Hz. The blood oxygen level-dependent(BOLD) functional MR images are acquired by using the multi-slice gradient-echo EPI on the 1.5T whole body MR scanner (Seimens Vision Plus). In the experiment, TR/TE/ $\alpha$ =2 sec/6msec/90°, FOV of 210 mm, a matrix size of 64×64 and a slice thickness of 5 mm are used. The total of 600 images( 10 images for one epoch) are acquired and the volunteers are instructed to stay motionless with eyes closed. For comparison with the effect of FES the active and the passive wrist contraction-relaxation exercises are carried out with the same paradigm. The acquired data are analyzed by using the software of Stimulate (CMRR, Univ. Minnesota) adopting Student t test.

**결과(Results):** The functional electric stimulation on the wrist extensor muscles activates the motor cortex as well as sensory cortex. The activated quantity by FES is comparable with that by active exercise and greater than that by passive exercise.

**결론(Conclusion):** We observe the activation of the motor cortex as well as sensory cortex when FES is applied to the wrist extensor muscles. This demonstrates that FES has an effect on the central nervous system(CNS). Our fMRI study gives the potential to substitute the FES for the active or passive exercise for the rehabilitation of CNS patients.