

**Bilateral Contributions of Functional Motor Activation
of the Cerebellum Investigated using EPI fMRI**

Eun-Chul Chung, Eun-Kyung Youn, Yoo-Kyung Kim*, Jung-Soo Seo*, Kee-Duk Park@
Sung Kyun Kwan University College of Medicine, Kangbuk Samsung Hospital, Department
of Radiology, Ewha Womans University College of Medicine,
Departments of Radiology* and Neurology@

Purpose: The ipsilateral cerebellum will be activated by unilateral repetitive complex finger movements and this activation paradigm can be reliably visualized by fMRI. Some evidences showing complete or near complete recovery following cerebellar infarction or damage, rise the question whether the motor recovery is the expression of a bilateral activation in the cerebellar cortex which could be verified by fMRI.

Materials and Methods: Five right-handed subjects (M:F=2:3, mean age 30.3 years) carried out repetitive finger apposition with dominant right as well as subdominant left side. EPI fMRI was performed using 1.5 T MRI scanner (TR 1.68 msec., TE 64 msec., FOV 22 cm, 10 slices, 10 mm thickness). The paradigm was 3 sets of alternate resting and moving fingers for 6 cycles resulting in times of 360 sec. for the study (10 slices x 15 EPI x 6 cycles=900 images). Image processing was done on a 200MHz Dual Pentium PC using home-made software. T-test ($p < 0.005 \sim p < 0.001$) and time series analysis were done. Resulting images were analyzed in a color coded overlay to the reference T1-weighted spin echo coronal images (TR/TE: 490/14, 256 x256 matrix) to verify locations of activated regions. Percent change of signal Intensity (PCSI) were calculated from the processed data.

Results: It was able to detect significant contralateral primary motor activation (PCSI of right/left side: $3.5\% \pm 2.3$ / $2.7\% \pm 2.1$) and ipsilateral cerebellar activation ($4.6\% \pm 2.5$ / $3.2\% \pm 1.8$) in all volunteers. In 3 of 5 volunteers, we detected motor activation in the anterior upper half of the contralateral cerebellum ($4.6\% \pm 2.2$ / $2.6\% \pm 1.5$). All data were matched with time-series analysis.

Conclusion: Bilateral cerebellar activation in fMRI is particularly associated with unilateral complex finger movements. This result supports the clinical observations that cerebellum may exert bilateral effects on motor performances and is bilaterally activated during unilateral limb movement.