Introduction

Transcranial magnetic stimulation (TMS) and functional MRI (fMRI) are technologies used to localize activity in human motor cortex. TMS is less expensive, but fMRI has more optimal spatial resolution. It is unknown which technique yields more reproducible results. The VA Brain Rehabilitation Research Center Upper Extremity Initiative, Neuroimaging Core, and TMS Core are comparing localization and reliability with TMS and fMRI. Optimization of parameters for both technologies will lead to selection of the best technique for specific applications. fMRI images were acquired after developing optimal parameters for data collection.

Experimental

Six healthy subjects completed performed a block finger-to-thumb opposition alternated with rest during fMRI acquisition. Functional (TR= 4000ms, TE=30ms, FA=70 deg, voxel size=2.0 x 2.0 x 2.0 mm, slices=55, orientation=axial, no gap) and structural (TR= 8.1ms, TE=3.7ms, FA=8, voxel size=1 x 1 x 1 mm, slices=160, orientation=sagittal, no gap) images were acquired on the Philips 3 Tesla instrument at the Advanced Magnetic Resonance Imaging and Spectroscopy facility (AMRIS) at the McKnight Brain Institute (MBI) of the University of Florida. Three fMRI and three TMS sessions were performed on each subject. fMRI data were analyzed with the Analysis of Functional Neuroimages (AFNI) software from NIH and locally developed programs.

Results and Discussion

fMRI images of motor cortex acquired at a 2 X 2 X 2 mm resolution with T2* BOLD contrast exquisitely outline the “hand knob” [1] in primary sensorimotor cortex contralateral to the moving hand (Figure 1, orange activity). The technique is sensitive enough to pick up negative BOLD activity in sensorimotor cortex ipsilateral to the moving hand (Figure 1, blue activity). Comparisons of localization and reliability between TMS and fMRI data are under way.

Conclusions

High spatial resolution fMRI provides for excellent localization of hand motor cortex, will be useful in comparisons with TMS, and will assist in optimizing TMS parameters.

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References