Measurements and models of electric fields in the *in vivo* human brain during transcranial electric stimulation

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Transcranial electric stimulation aims to stimulate the brain by applying weak electrical currents at the scalp. However, the magnitude and spatial distribution of electric fields in the human brain are unknown. Here we measure electric potentials intracranially in ten epilepsy patients and estimate electric fields across the entire brain by leveraging calibrated current-flow models. Electric field magnitudes at the cortical surface reach values of 0.4 V/m, which is at the lower limit of effectiveness in animal studies. When individual anatomy is taken into account, the predicted electric field magnitudes correlate with the recorded values (r=0.89 and r=0.84 in cortical and depth electrodes, respectively). Modeling white matter anisotropy and different skull compartments does not improve accuracy, but correct magnitude estimates require an adjustment of conductivity values used in the literature. This is the first study to validate and calibrate current-flow models with *in vivo* intracranial recordings in humans, providing a solid foundation for targeting of stimulation and interpretation of clinical trials.