A Method for Acquiring Skin Conductance Measurements During Functional Magnetic Resonance Imaging

Introduction: In many different types of brain studies, it is desirable to monitor subjects' skin conductance responses (SCRs) during functional magnetic resonance imaging (fMRI) in order to study correlations between SCR and fMRI signals. The few studies that have employed combined SCR/fMRI acquisition were plagued by MR gradient and radio frequency (RF) artifacts in the SCR data. We developed a method of SCR/fMRI that eliminates these artifacts.

Methods: Subjects were scanned on a Picker EDGE 1.5 T scanner using a head coil and echo-planar imaging, while calibrated SCRs were acquired at 10 Hz. The SCR signal was brought out of the scanner through a moveable, shielded door situated away from the MR gradient cable. The subject was grounded, and the shielding of the SCR cables was also grounded. SCR data were obtained with subjects inside and outside the scanner, and with EPI on and off.

Results: No MR gradient or RF artifacts were observed in the SCR data, and the noise level in the SCR data was the same regardless whether the MR scanner was acquiring data or not. The noise background in the MR images was comparable to baseline levels.

Conclusions: By grounding subjects, filtering signal lines, and keeping SCR cables away from MR gradient cables one can simultaneously acquire SCR and fMRI data with low noise background.