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FINAL REPORT TO THE BIAL FOUNDATION

Assessing Coherence Between Psychic Healers and Patients by Simultaneous Monitoring of Physiological Variables

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Summary

Simultaneous EEG and ECG data was recorded from 11 healer-patient pairs during control and treatment periods and from nine pairs of non-healers who acted as controls. EEG coherence was computed between all homologous electrode leads from each pair of subjects and was generally the same between control pairs and healer-patient pairs. However, some of the treatment periods for two nationally known healers were characterized by unusual activity, but this was not consistent between healers or across different treatment sessions for each healer. Heartbeat data was analyzed for the healer's ECG appearing in the patient's EEG, but no evidence for this effect has been found. Ongoing analysis is continuing for possible evidence of more subtle EEG and ECG effects. One healer agreed to participate in fMRI studies, and data from three such studies has been analyzed. The first two studies indicated that eye movement may have caused substantial artifact, but a third study, which attempted to control for eye movement, showed evidence of increased frontal lobe activation during treatment periods. One of two fMRI runs from a patient treated while in the magnet approximately 30 feet from the healer indicated frontal lobe activation as well, but this was not replicated in a subsequent run or with a second patient. Further fMRI studies with better equipment are planned.

Methods and Results

Two types of EEG/ECG recording systems were used. A Lexicor NRS-24 recording system was purchased and used in combination with an existing Lexicor system borrowed from the Rhine Research Center to form a pair of 20 channel systems. The dual Lexicor systems were configured for simultaneous data acquisition and were sufficiently portable that they could be taken to other locations, such as the healer's home or offices, for recording sessions. Also, through a collaboration we were able to use a pair of 128 channel EGI systems at their home offices in Oregon.

EEG and ECG data was recorded from 11 healer-patient pairs during control and treatment periods. Control recordings were obtained from nine pairs of non-healers. Two nationally known healers, Jane Katra and Mietek Wirkus (Figures 1 & 2), participated in the study and each treated multiple patients. It became apparent early in the study that hand movements by the healers or muscle tension from holding their hands in a fixed position would not allow recording clean skin conductance responses in many of them, so this physiological measure was not pursued.

Coherence was calculated between homologous electrodes from each pair of subjects and was generally between 0.35 and 0.4, as previously reported by other investigators (Figure 4). Generally, there were no striking differences in coherence between control pairs and healer-patient pairs. However, in some healer-patient pairs

there were some differences between treatment and non-treatment (control) periods, although there was no consistent and significant trend across all the healers (Fig. 5).

Figure 1. Healer treating a patient by laying on hands while simultaneous EEG and ECG was recorded from both individuals using linked Lexicor NRS24 systems.

Figure 2. Resting quietly during a control period while recordings continue.

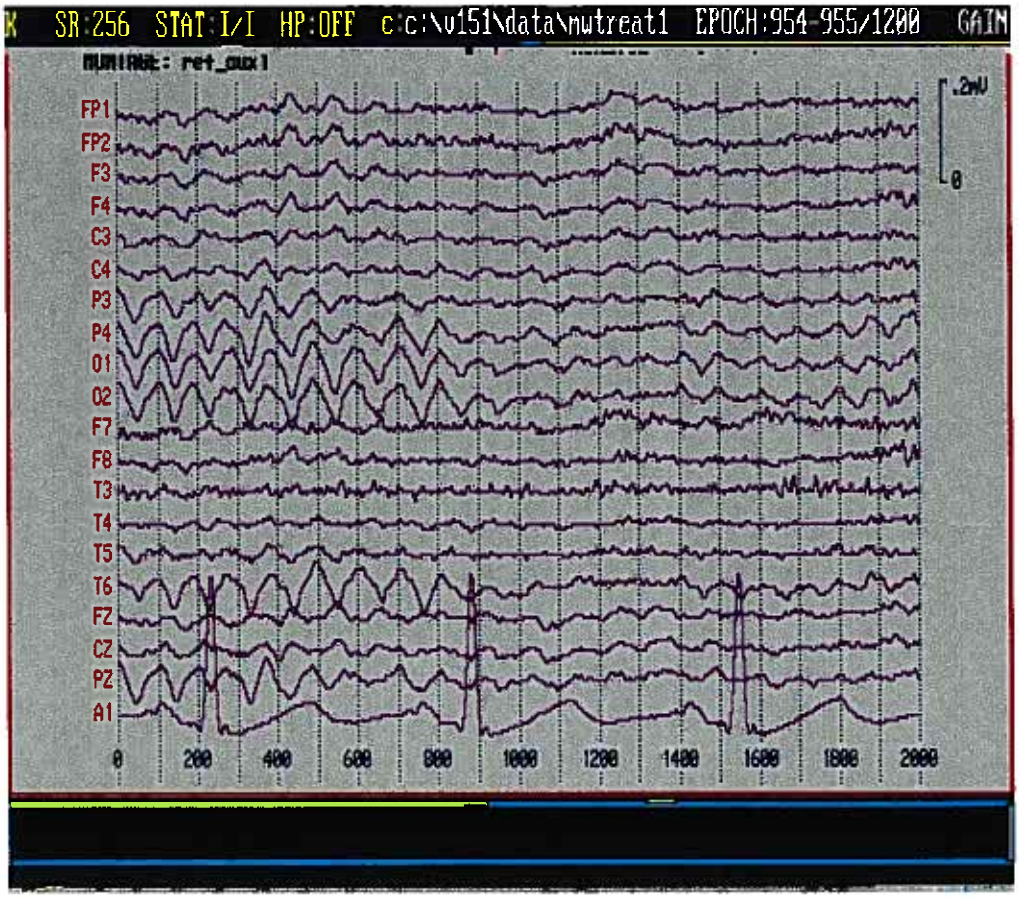

Figure 3. Sample of data obtained from one of the Lexicor systems showing 19 channels of EEG activity and one channel (A1) of ECG activity at the bottom.

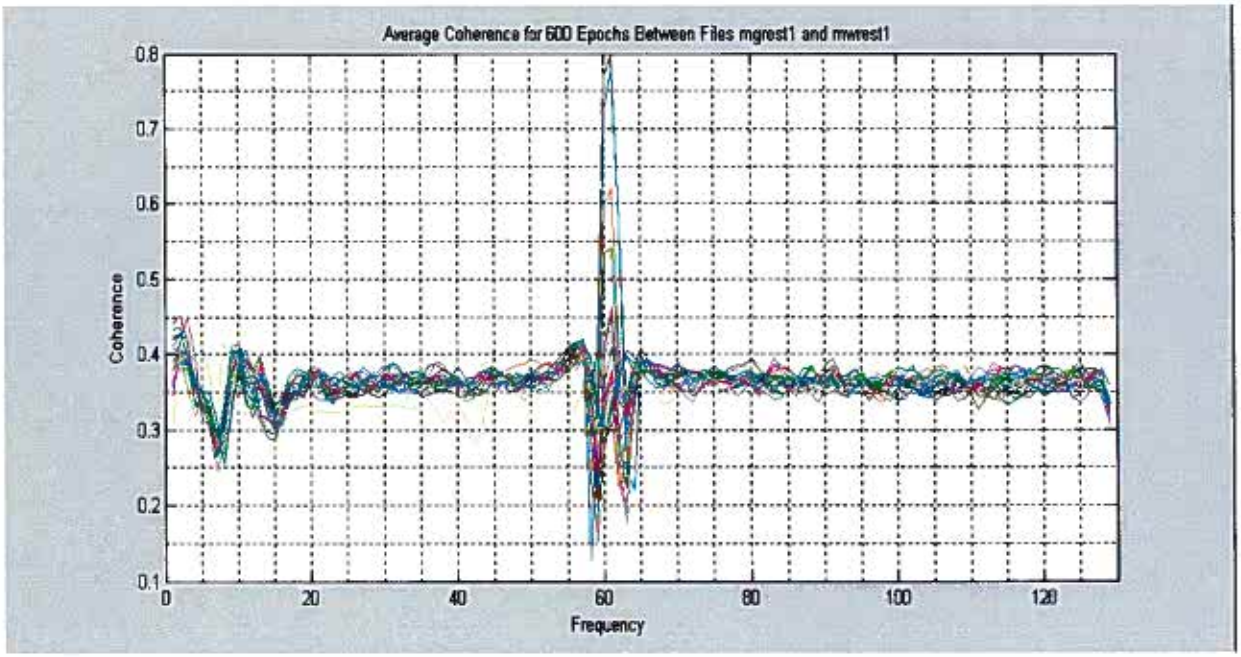

Figure 4. Average coherence vs. frequency during a control period between healer and subject for all channels. Large peak and oscillation near 60 Hz is an artifact of power line noise common to both recording systems.

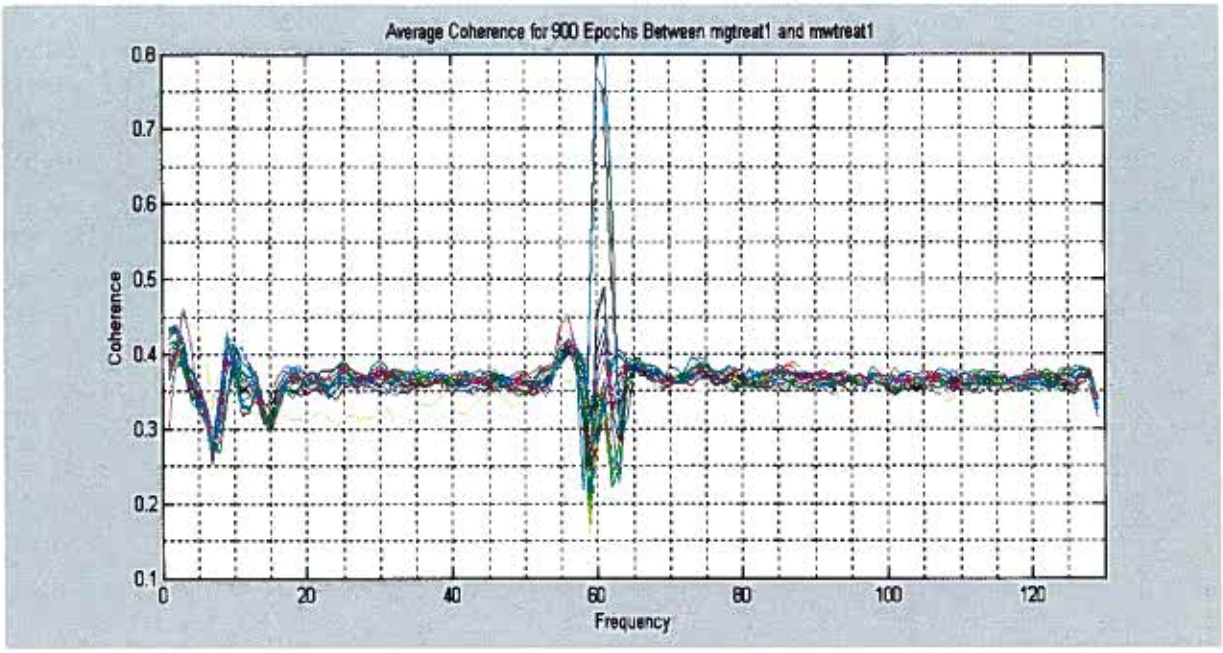

Figure 5. Average coherence vs. frequency during a treatment period between healer and subject for all channels. Note higher activity at 56 Hz for all channels, especially the peak for two channels (F3 and Oz), which was not seen in the control period in the previous figure.

A program was written to calculate the presence of the healer's ECG within both the healer and the patient's EEG. The ECG was detected in the healer's own EEG, as expected (Figure 6), but analysis to date has not revealed evidence of the healer's ECG in the patient's EEG (Figure 7) as previously reported in some therapists tested by Russek and Schwartz (1997).

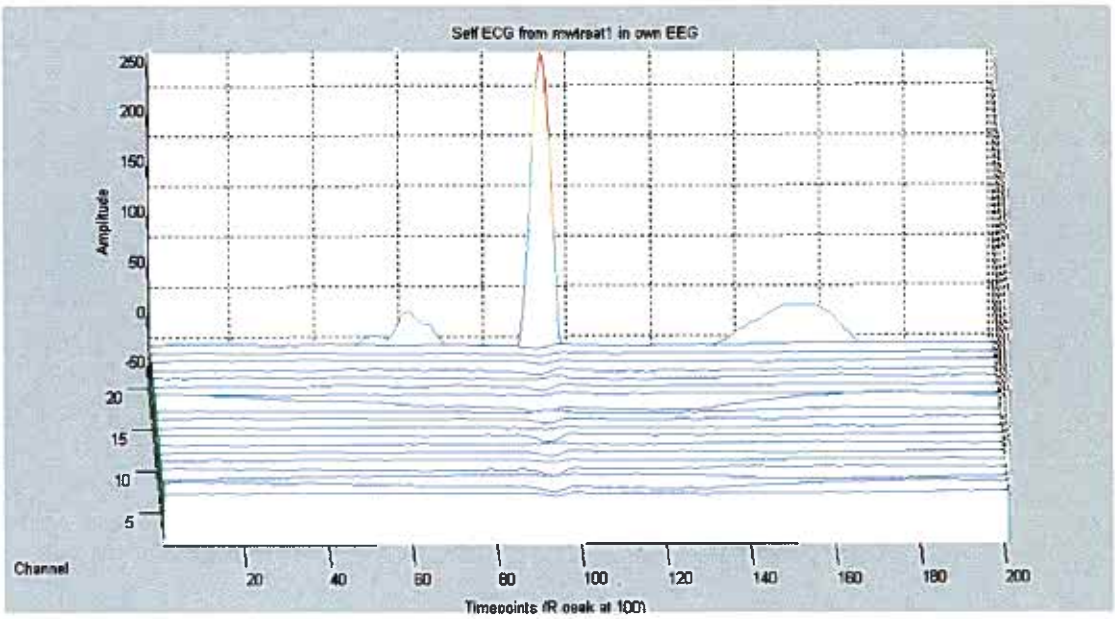

Figure 6. Averaged ECG is apparent in the healer's own EEG, even at large scaling. Note the small ripple that appears in nearly all of the EEG channels near point 100 on the x axis. The large peak in the background is the averaged ECG signal.

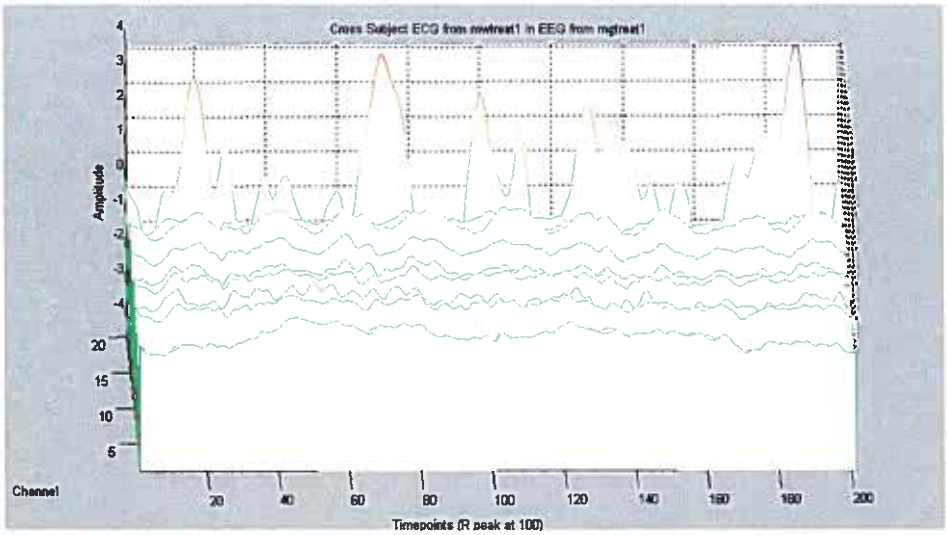

Figure 7. When the peak of the R wave in the healer's ECG is used as the time point for averaging in the patient's EEG, no such ripple is observed, even at much greater magnification of the y axis, indicating there was no transference of the ECG from healer to patient. Large signals in the background are the randomly occurring ECG.

Further analysis of these large EEG and ECG datasets is ongoing in an attempt to refine the analytical and statistical methods for more fine-grained analysis.

Although some healers refused to participate in the fMRI portion of the study, one healer agreed, and data obtained from three fMRI studies in which he participated was analyzed. The first two studies showed widespread activation in the eyes and frontal lobes (Figures 8), but synchronized eyeball movement apparently contaminated these studies (Figure 9).

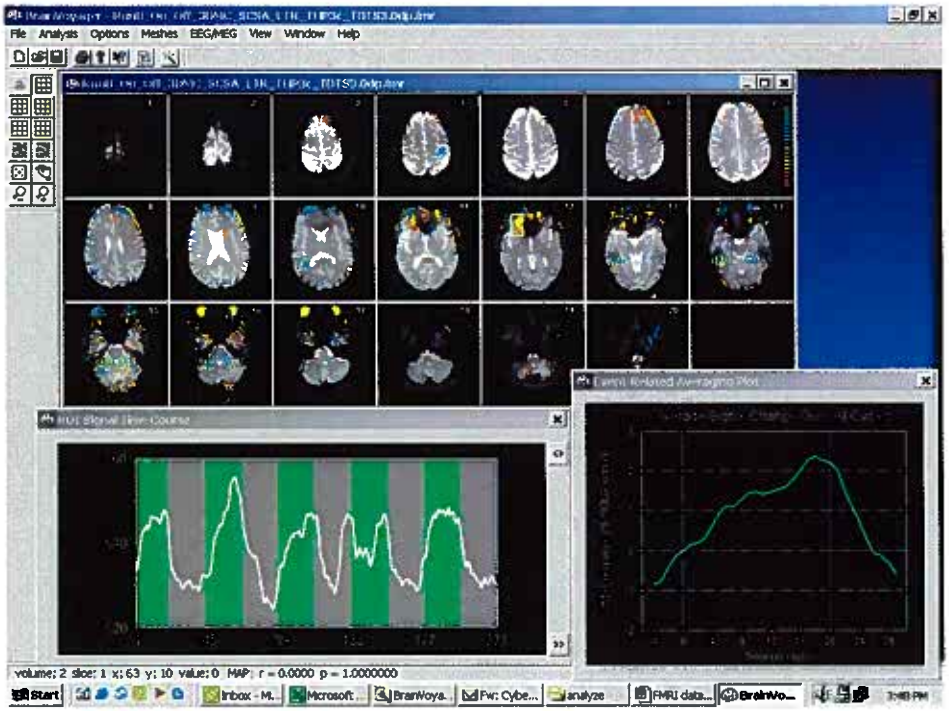

Figure 8. FMRI data shows widespread activation when healing ON blocks (in green) are contrasted with healing OFF blocks (in grey). Right anterior inferior frontal lobe is highlighted as region of interest and shows ~ 3% signal increase.

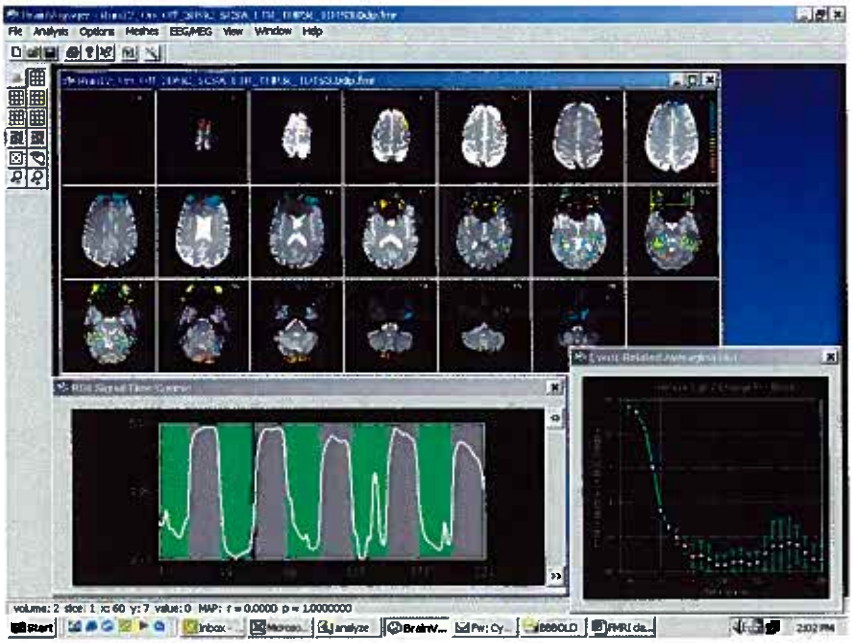

Figure 9. Both eyes highlighted as the region of interest and 5 periods are averaged showing ~ 25% signal decrease during ON conditions! However, there was noticeable eye movement during this run that appears to coincide with the change in conditions.

A third fMRI study attempted to control eyeball movement by having the healer fixate on crosses during the fMRI scans. Activation still occurred in the frontal lobes and eyes (Figure 10), although to a lesser degree than during the first two studies.

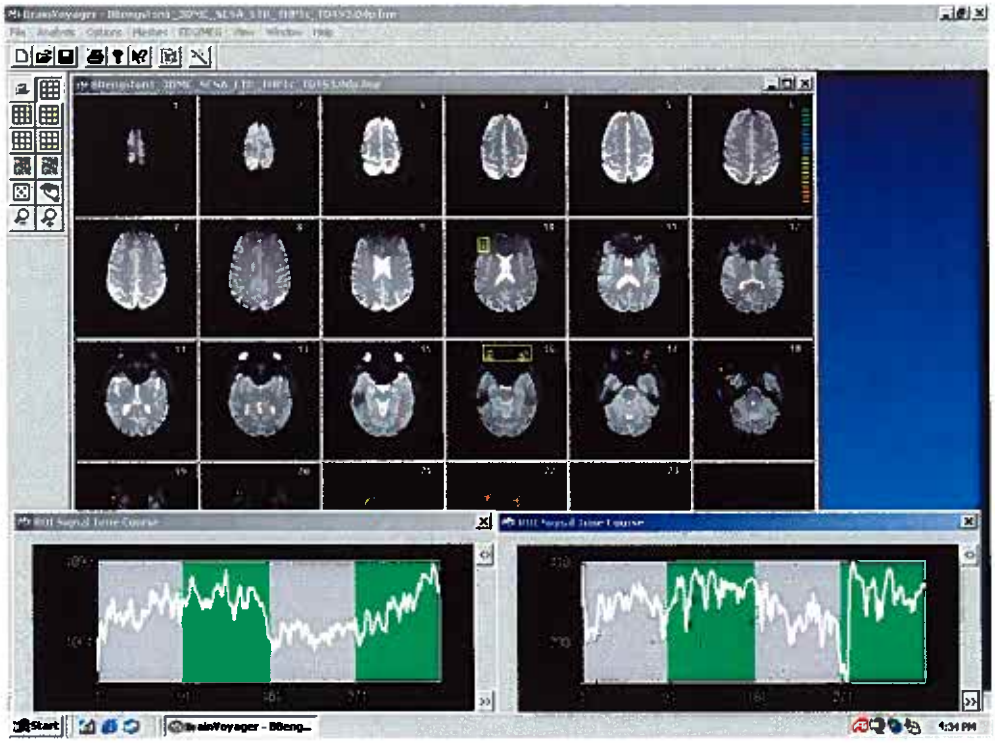

Figure 10. Data from 3rd fMRI session with a healer who was in the MR Scanner attempting to treat a patient about 30 feet away in the MR Control Room. Eye-movement was controlled in this session by having the healer fixate on cross-hairs with both eyes. Control periods are in grey and treatment periods are in green. Note significant ($p>7.8 \times 10^{-9}$) changes in activation in frontal lobe and eyes which are outlined by the yellow rectangles.

Nearby slices showed an overall decreased activity in the eyeballs, indicating possible eye movement, despite the attempt to fixate on the crosshairs. Even so, this may not explain the frontal lobe activation.

On the same day two patients were treated by the healer while they were in the scanner and he was in the control room about 30 feet away. Each patient was treated in two separate runs of 12 minutes and each run was divided into three-minute blocks of ON and OFF. In the first run with the first patient there was significantly increased activation of 0.5-1% in the anterior cingulate and orbitofrontal regions of the frontal lobes during the treatment periods (Figure 11).

Figure 11. Activation in medial orbitofrontal and anterior cingulate cortex of subject in scanner while being treated by healer in adjacent room ~ 30 feet away. Signal increase during treatment periods compared to control periods is highly significant ($p < 4 \times 10^{-8}$).

However, the effect did not replicate during a second fMRI study performed about 10 minutes later. In fact there was a signal decrease in some areas during the treatment periods. A second subject who was treated by the same healer later in the day did not show any significant activation effects during the fMRI study. Further fMRI experiments are planned with the use of a better MR scanner and eyeball tracking equipment.

This grant has provided the opportunity over the past two years to develop experimental methods and a suite of software analysis tools to study complex physiological signals that may help to understand the mechanism of psychic healing. The data obtained from this study continues to be analyzed and mined for possible subtle effects. The results will be used in the submission of grants to the National Institutes of Health and private foundations in the United States to continue the work. I am greatly indebted to the Bial Foundation for the support provided to undertake this work.