

DISTANT HEALING INTENTIONALITY AND BRAIN FUNCTION IN RECIPIENTS, USING FMRI ANALYSIS

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Introduction

Traditional healing systems in all parts of the world include beliefs about the effects of intention on health. Intentionality itself has been called the 'crown jewel of healing' (Fahrion, 1997), and has been considered essential for healing by many authorities, including Benor (1996) and May (1969). This shared belief serves as the foundation for healing in major established systems of healthcare such as Traditional Chinese Medicine, Anthroposophic Medicine, Tibetan Medicine, and Native American practices.

The terms distant intentionality (DI) and distant healing intentionality (DHI) describe practices based on a postulated non-material connection between individuals. Distant healing intentionality includes many practices such as prayer, energy healing, healing at a distance, transpersonal imagery, Therapeutic Touch, Reiki, and Qi Gong.

Intentionality, itself, has been defined as a focused attention, or "mental projection of awareness, with purpose and efficacy, toward some object or outcome, such as promoting change in one's self or another" (Braud & Schlitz, 1991). Intentionality can be considered a nonlocal phenomenon, with quantum qualities. These could include events of acausality, nonlinearity, being unbounded by time or space, unmitigated and immediate. Writers such as Lynn McTaggart (2007), Wayne Dwyer (2007), and Carlos Castaneda (1993) have captured the imagination of their extensive readership and suggest that intention may be an actual universal force, like gravity, and when accessed be able to change the nature of the physical world.

The possibility that human intention can act at a distance to promote healing is largely dismissed by Western biomedicine partially because there is not a scientifically tenable mechanism of action for the putative effects, and partially because the studies are not trusted. The research

designs are criticized with a passion, even though medical treatments have historically been adopted with inadequate or no research at all. Scientists often make up their own minds about intentionality—or any unusual finding—without actually reading the research. The foundational research for this article was, in fact, rejected for publication by the most prestigious scientific journal because it was “entirely too novel”!

To date, efficacy studies of distant healing practices have yielded equivocal findings and many studies have been challenged on the basis of design flaws and claims that are not supported by their findings. Attempts to objectively evaluate DHI practices are complicated by the fact that healing intention is often directed at psychological or spiritual problems, thus empirical measures using medical outcomes do not adequately describe beneficial changes. Jonas and Crawford (2003) identified at least 2,200 published reports on various DHI practices, and commented on the high rate of poorly-designed studies. Nevertheless, they concluded that these provisional findings merited further investigation of DHI. Austin, Harkness and Ernst (2000) conducted a systematic review of distant healing, and discovered that 57% of 23 randomized, controlled trials showed a positive treatment effect. There were methodological limitations of several studies, making them difficult to interpret; however, the evidence merited further study.

The shared premise of most DHI or DI practices is that various mental activities have the potential to link or connect the consciousness of two or more people. Healers who practice a particular form of DHI are generally trained to serve as the intercessor or mediator for a larger, cosmic or divine source of life energy. This source is called by many names; i.e., *mana* in Hawaii, *Chi* or *Qi* in China. Healers that we interviewed for our research by and large contended that all healing is essentially self-healing and that they were merely a vehicle through which healing is allowed to take place.

The physiological evidence for intercorrelated activity between brains has been demonstrated in several studies. Over five decades ago researchers described what they termed ‘extrasensory induction’ in monozygotic twins who were sensory-isolated from each other (Duane & Behrendt, 1965). In two of 15 pairs of twins, changes in EEG alpha rhythms evoked in one twin correlated with EEG changes in the other sensory isolated twin. In subsequent studies, visual evoked potentials (VEPs) or visual cortical activity were recorded in one member of the pair, the so-called ‘sender’, by having the individual view a flashing

light or a visual pattern at random intervals. Simultaneous VEPs were observed in 10 to 15% of the sensory-isolated members of the pair.

A spate of small EEG studies was initiated by the work of Grinberg-Zylberbaum, Delaflor, Atti, and Goswami (1987), which showed that VEPs in one member of a pair of individuals took place at above chance rates in the nonstimulated subject who was isolated, at a distance, and in an electromagnetically shielded room. Grinberg-Zylberbaum and his colleagues also showed that when pairs were supposedly empathically bonded by meditating together, the intercorrelated brain activity was enhanced. An additional single case study employing a similar paradigm, but using fMRI, reported correlated visual signals (Standish, Johnson, Kozak & Richards, 2003).

Conceptually, prayer should be placed under the rubric of DHI, given the widespread belief that petitioning divine intervention or channeling a vital (or life) force results in healing for the person being prayed for. Targ (2002) reports that more than 80% of Americans believe that their thoughts or prayers can cause healing, and this view is shared by 75% of family practice doctors. However, two recent, large, randomized controlled studies failed to show any effect of prayer on physical health of cardiac patients. Krukoff and his colleagues (2005) studied 748 patients having percutaneous coronary intervention or elective catheterization from nine medical centers. They were randomly assigned to one of three groups: intercessory prayer; a combination of music, imagery and touch therapy (MIT); and a control group. The end point was a composite of major adverse cardiovascular events, combined with readmission and 6-month death. No effect was seen on the composite primary end-point, although the MIT group experienced significantly less mortality within six months. (This latter point, interestingly, was ignored by the press coverage of the study, and not emphasized in the original report.) Twelve groups from Christian, Muslim, Jewish, and Buddhist faiths participated, receiving the name, age, and illness of patients who had been randomly assigned to them. They prayed according to their usual practices for a period that ranged from 5-30 days.

A similar study design was conducted by Benson and colleagues (2006) at Harvard—the Study of Therapeutic Effects of Intercessory Prayer: A Multicenter randomized trial of uncertainty and certainty of receiving intercessory prayer'. A sample of 1,802 persons who had received coronary artery bypass graft surgery were divided into three groups: (1) a group was told they might or might not receive prayer and

did; (2) a second group was told that they might or might not be prayed for and were not; and (3) a third group was told they would be prayed for and were. The prayers were Protestant and Catholic groups who received the first name and last initial of the person for whom they were to pray, based upon randomized assignment. Prayer continued for a 2-week period. Intercessory prayer itself had no effect on recovery. Certainty of being prayed for was associated with an increased incidence of complications.

All research of this or any nature should honor both context and cultural validity, i.e., be conducted in circumstances that conceptually replicate the natural environment of the phenomena under study. In this light, Larry Dossey (2006, personal communication) makes several points about these large prayer studies: (1) nowhere in the world is prayer carried out in this fashion, i.e., randomized, double-blind controlled trials; (2) people generally pray for loved ones whom they know and care for, but these studies were designed to eliminate a relationship between the prayers and those who were prayed for; (3) prayer is normally carried out in context and with ceremony; and the studies did not meet these criteria; (4) In the Benson *et al.*, study, patients were essentially taunted and teased about whether they would be prayed for or not.

The studies of correlated brain activity cited earlier also were not conducted under the same conditions that normally exist when and where such experiences occur. The events which appear to involve correlated brain activity are subjectively and anecdotally recorded as premonitions, synchronicities, dreams, intuitions, and shared physical symptoms by people who are isolated and at a distance, and are normally associated with significant life events. The laboratory settings created an artificial environment, using checkerboard or other patterns to stimulate brain activity in one member of a sensory isolated pair. The fact that correlations were demonstrated even in a significant minority of trials is noteworthy, therefore.

Research Questions

In my opinion, for a test of nonlocal consciousness or DHI, a logical choice of participants would be individuals such as healers who had extensive training and experience in some form of distant healing. My colleagues and I initially studied healers paired with individuals with whom they felt empathically linked or bonded. We designed this

because of previous information that a close connection might result in more of a commingling of consciousness than in people who were unknown to one another. In the first study, reported in detail elsewhere (Achterberg *et al.*, 2005), fMRI technology demonstrated that DHI was correlated with a significant activation of brain functions in the recipients of the healing intention. The group significance was $p = .000127$; primary brain areas involved were the anterior cingulate cortex, middle cingulate cortex, frontal cortex and the precuneus. The level of probability encouraged further investigation of the phenomenon. The extent that the bonding or close personal connection may have played in such highly significant results was a primary issue for the research that will be described in this paper. The research reported in Achterberg *et al.* (2005) will be referred to as 'Group One: Bonded DHI pairs'; and the second comparative research will be called 'Group Two: Non-Bonded DHI pairs'. The research question addressed in this first aspect of the work was:

Group One: Bonded DHI pairs

"Is there evidence for correlations between DHI and brain function in recipients of DHI who are tested using fMRI?"

In the next phase of the work, which will be described in this paper, the protocol was taken one step further by studying healers paired with people whom they did not know, and had not established an empathic bond. The research questions addressed in this aspect of the research are:

Group Two: Non-Bonded DHI pairs

"Is there evidence for correlations between DHI and brain function in recipients of DHI who are unknown (non-bonded) to the healers, as measured by fMRI?"

"Are there significant differences in correlated brain function between empathically bonded versus non-bonded healers and patients?"

A limitation of addressing the second question is that only three healers in the first group were willing to participate in a second study. Therefore, the research questions address the issue of empathic bonding and DHI and not the performance of the healers under the two conditions. The reluctance to do additional sessions was generally due to the fear expressed by the healers that being so close to the source of electromagnetic energy (the MRI scanner) might be dangerous and

impair their healing abilities. I do not, personally, believe this could be true, not only because the control booth was shielded, but also because there is no evidence that DHI is related to electromagnetism. However, it is of vast importance to honor the belief systems of research participants, and I chose not to try to persuade them to participate in subsequent research.

Research Considerations and Language

Care is taken in describing my work on DHI to avoid the term 'sender' in reference to the healer whenever possible. 'Sender' implies that DHI involves a transfer of a signal, energy, or information. The MRI control booth is shielded both optically and acoustically from the person in the scanner, and sending sensory clues is highly unlikely, if not impossible. The scanner and the control booth are shielded from outside electromagnetic energy, the usual form of signal transfer described in the popular literature on DHI and by many healers, themselves.

Functional magnetic resonance imaging (fMRI) was selected as the most appropriate technology to explore research questions pertaining to DHI. Functional brain imaging technology has the capability to map brain hemodynamics that correspond to mental activities, and provides high-resolution data correlating brain function and anatomy.

Methods

Participants

Group 1: Bonded DHI Pairs. Twenty-two participants (11 pairs of healers and recipients of DHI) were recruited on the Big Island of Hawaii. Three men and eight women with an age range of 46-71 participated as healers. The recipients of the healing ranged in age from 44-61, and included three men and eight women. On average, healers had been practicing their healing traditions for 23 years. The healers represented a variety of practices, including Healing Touch (distance healing and laying of hands, conducted primarily by nurses trained in the methods); a traditional Hawaiian healing form called *pule* that consists of prayer, chant, and song by a spiritual elder or Kahuna; Peruvian shamanic healing; Reiki (a form of energy healing that may have ancient origins and was purportedly rediscovered in the 19th

century in Japan); vibration or sound healing, and three eclectic forms of DHI that did not fit into a single established tradition. Three of the pairs represented a Chinese method of healing called Qigong.

Group 2: Non-bonded DHI Pairs. Twenty-six participants (13 pairs of healers and DHI recipients) were also recruited on the Big Island of Hawaii. One man and twelve women with an age range of 50-61 participated as healers. The recipients of the healing ranged in age from 49-63, and included four men and nine women. The healers represented a variety of practices including Reiki, Christian prayer, non-Christian prayer, General Healing Intention, Healing Touch, and psychic healing. Two of the healers participated in both Groups One and Two.

The large number of women versus men is to be expected, given the interest and activities of healing that are gender related on the island and elsewhere.

Inclusion criteria for healers

1. The claimed ability to have the skills to communicate or heal in some distant or nonlocal form
2. Acknowledgement within their communities for their healing abilities
3. Fulfilling cultural requirements for training, apprenticeship, and practice
4. A stated belief in their ability to turn on and off their healing intentions within a time frame of approximately 2 to 4 minutes, which was built into the fMRI program

Additional inclusion criteria for healers:

Group 1: Bonded DHI Pairs. Ability to name an individual with whom they have a special, close or bonded connection, who understands the goals of the experiment, and is willing to have an fMRI scan.

Group 2: Non-Bonded DHI Pairs. The healer agrees to be paired with a recipient they do not know

The inclusion criteria for the receivers of DHI for Groups 1 and 2

1. Meeting the standard requirements for receiving an MRI (no implanted devices or metal objects such as pacemakers, joint pins), and no history of claustrophobia
2. Willingness to undergo an fMRI scan of 34 minutes' duration and a post scan interview

Standard Procedures for the Research

The Institutional Review Board, University of Hawaii, John Burns School of Medicine, and Manoa, Hawaii approved the study protocol. It was conducted in the Department of Radiology, North Hawaii Community Hospital in Waimea, Hawaii, from August 2003 through July 2005. Analysis of the technical information was performed by Todd Richards, Ph.D, who is affiliated with the University of Washington. Consultants affiliated with UCLA; University of California, Irvine; and University of Pittsburgh periodically reviewed the research protocol and results.

Pre fMRI scan. Both members of each pair in both groups signed an informed consent form and filled out a demographic questionnaire. A semi-structured interview was conducted with each healer within 4 days prior to the scan. The interview was designed to elicit information on their DHI practices. The healers were given information about their role, and the 'On' (DHI) and 'Off' (No DHI) procedures were described. Instructions were standardized and included information that the healers should try to connect with the receiver during the On condition in ways that are prescribed by their own DHI practice. In describing their practices, the language most often used involved notions of energy, prayer, good intentions, or thinking of the individual in the scanner and wishing for them the highest good. During the Off conditions, they were instructed to take their attention away from the person in the scanner, and they frequently chatted casually with the principal investigator or research nurse.

The instruction given to the recipients of DHI was to relax as well as they could in the scanner environment. They were provided with a call button and shown how to use it should they become distressed, had questions, or wanted to stop the procedure. No one in either group used it to make contact during the study trials. They were given general information about the nature of the study, both in the informed consent form that was signed, and again prior to going into the scanner.

The recipients in Group 1 knew about the type of DHI that they would receive because they had worked with the healer previously. The participants in Group 2 knew only that the study would involve some form of distant healing. None of the recipients were provided with any information about the timing of the On/Off conditions. In other words, they knew they would be receiving DHI of some kind, but not when. The healers were not informed about the timing of the On/Off signals

before the trials, so they could not have coached their receivers before the scan.

Timing and Experimental Conditions. The healer, principal investigator and/or research nurse, and radiology technician were in the electromagnetically shielded control room, and were physically, optically and audibly isolated from the receiver in the scanner. During the course of the experiment, the healer was verbally instructed by one of the researchers with cues to start and stop the DHI. The random pattern of the twelve 2-minute intervals was determined prior to the onset of the study using a coin toss. A single randomized sequence that had an equal number of On and Off sessions was used for each session. The pattern was Off, On, On, Off, On, Off, Off, On, On, Off, On, Off for a total of six 2-minute on periods and six 2-minute Off periods. In three instances, the length of the interval was 4 minutes because two of the On or Off conditions occurred back to back. This pattern remained the same for each healer. The reason that a unique pattern was not used for each pair is because in small scale trials such as this one—i.e., with only twelve 2-minute segments—the majority of random sequences could be quite unequal in terms of numbers of On and Off sessions. In other words, it is likely that sequences for pairs might include virtually all On or all Off trials. Since each recipient is serving as his or her own control, it is necessary to have a reasonably equal number of On (Experimental) and Off (Control) conditions for effective statistical comparison.

The total time that individuals were in the scanner was 34 minutes, which included a 10-minute structural baseline of sagittal and transverse images. During the time in the scanner, no physical or sensory contact was made with the recipient by any member of the research team.

Post scan. The scan was followed by an open-ended interview with both the healer and the recipient in order to document their subjective experiences during the trial. After the end of the trial, participants were paid \$100 for their efforts.

Analysis¹

The fMRI localizes brain activity as well as brain structures, and it is the former that differentiates it from MRI. A strong magnetic field (approximately 30,000 times that of the earth's magnetic field) is passed through the participant's head. The scanner is connected to a computer that rapidly produces images, with the most common being blood oxygen level dependent (or BOLD) images. This is the 'raw data' that other analyses are based upon. The BOLD measures blood flow that accompanies neural activity. The fMRI technique does not require ingestion or injection of radioactive or other substances, as do the PET or SPECT scans, and there is exceptionally high resolution; hence our choice of technology. The fMRI has the capacity to image 3-dimensional volumes of the brain. Software designed to analyze the BOLD images varies from center to center. We used FSL—a common program for the industry. Images were statistically analyzed, using the single voxel as a unit of measurement. Granted that this may be an oversimplification, but the fMRI is basically a subtractive procedure—i.e., activation functions and structures are compared with nonactivation functions and structures. The participant, therefore, serves as his/her own control. Statistical programs allowed for intra-individual comparison as well as group averages and comparison between groups.

Structural and functional magnetic resonance imaging was performed on a 1.5 Tesla MR imaging system (Siemens Symphony Magnetom, Software Numaris/4, version Syngo MR 2003BDHHS). The facility where the scanner is located is shielded from all known electromagnetic field signals. Blood oxygen level dependent (BOLD) functional MRI scans were acquired using a T2-weighted gradient echo version of the echo-planar imaging (EPI) pulse sequence to identify regional brain activation. Heavily susceptibility-weighted sequences were used to maximize the BOLD response. Additional parameters of the fMRI data acquisition include TR = 4.4, TE = 65 milliseconds; slice thickness 6mm, skip 1 mm; 64 x 64 acquisition matrix; 21 slices positioned to cover the whole brain; and 324 brain volumes to cover the

¹ fMRI Acquisition and Analysis Methods: Detailed Technical Overview (conducted and written by Todd Richards, Ph.D., Neuroradiologist, University of Washington). This is a highly technical report, and readers may prefer to skip all but the first paragraph that describes fMRI.

24-minute acquisition period. Four hundred and eight brain volumes were collected per subject.

Functional MRI scans were analyzed using the FSL software program (Functional Magnetic Resonance Imaging of the Brain, Software Library, Oxford Center) which offers robust corrections for false positives, autocorrelation, multiple voxel testing comparison, and cluster size detection. Analysis was carried out using FEAT FMRI Expert Analysis Tool, Version 5.1, part of FSL. The following pre-statistics processing was applied: motion correction using MCFLIRT; spatial smoothing using a Gaussian kernel of FWHM 5mm; high pass temporal filtering (Gaussian-weighted LSF straight line fitting, with $\sigma = 50.0s$). Time-series statistical analysis was carried out using FILM (FMRIB's improved Linear Model) with local autocorrelation correction. Z (Gaussianised T/F) statistic images were thresholded using clusters determined by Z greater than a cluster significance threshold of $p = 0.01$. Registration to anatomical images was carried out using FLIRT.

General Linear Model (GLM) regression was applied to generate statistical p-value maps based on the contrast between the On versus the Off variables. The expected response to changes in the healer/recipient protocol may be equated to the expected response to stimulation paradigms currently used in brain research. In these research paradigms, the responses follow a hemodynamic delay curve. The GLM regression can determine the extent to which the observed receiver's responses may be predicted by this model. A goodness of fit statistic (r squared) indicates the degree of fit between the hemodynamic model and the actual brain activity during the time course recorded. Both positive and negative beta coefficients can result from this analysis.

The final step was to create the group maps from the individual fMRI analyses and co-register the group z-score map to the MRIcro atlas (see `ch2bet.hdr` and `aal.hdr` from software package <http://www.psychology.nottingham.ac.uk/staff/cr1/mricro.html>) for the location and function of significant areas of activation. Then, software developed by one of the authors, TR, was used to quantify the average z-score and pixel activation counts within each of the 116 different brain regions in the MRIcro atlas.

Data were analyzed for both the intra-individual comparisons for the On/Off conditions (experimental versus control) and for the group effect as a whole during these procedures. Ten subjects from Group 1

and twelve subjects from Group 2 were used in a direct fMRI statistical parametric map comparison. Note that one participant from each group was omitted from the group analysis because of slight variations in the data collection procedures. For the intra-individual comparisons, all participants were analyzed, i.e., eleven in Group One and 13 in Group 2. First of all, each individual subject's fMRI data were analyzed using FSL's FEAT described above (FMRI Expert Analysis Tool) to compute the contrast of parameter estimates (COPEs) and the variance of the COPEs (VARCOPEs). The COPEs and VARCOPEs come from the regression analysis (General Linear Model) of the statistical comparison between the On condition and the Off condition during the fMRI scan. The On condition for the contrast was the time when the healer was instructed to focus on DHI, and the Off condition was when the healer was instructed to stop the DHI. These resultant individual COPEs and VARCOPEs were merged into two large files for the fMRI group analysis.

Group analysis was carried out using FEAT (FMRI Expert Analysis Tool) Version 5.1, part of FSL (FMRI's Software Library, www.fmrib.ox.ac.uk/fsl). Higher-level analysis was carried out using OLS (ordinary least squares simple mixed effects). Z (Gaussianised T/F) statistic images were thresholded using clusters determined by $Z > 2.3$ and a (corrected) cluster significance threshold of $p = 0$.

Results

The FSL software produces a quantitative table of cluster results which includes: cluster size, probability for each cluster, z scores, $x y z$ coordinates of the cluster in Talaraich space and contrast of parameter estimates (See Table 1). If a cluster is significant in a group-difference analysis it means that there were specific brain regions where the combined subjects in the two groups had enough activation-difference to raise the z -score above the noise level threshold. In other words, if all of the subjects had random activation at different places in the brain, then there would be no group-difference activation. The software performs a statistical operation similar to calculating a t -test (comparing the mean fMRI activation of two groups using the General Linear Model) at each brain voxel but then corrects for multiple comparisons by using the extent of the cluster size (based on both the number of adjacent voxels and the t score within that voxel). In other words, for each brain voxel, there is comparison between the 10

individual fMRI activation values from Group 1 and the 12 individual fMRI activation values from Group 2 (one of the subjects was omitted from each group analysis due to slight irregularities in the collection process, as noted earlier).

TABLE 1.
Cluster Table for the Group Comparison Group 1 > Group 2²

Cluster Index	Voxels	<i>p</i>	Max Z	COG x (mm)	COG y (mm)	COG z (mm)
2	1055	0.00592	3.9	10.6	-59.1	20.4
1	875	0.019	3.78	14.6	-69.2	-34.4

Analysis of Group 1 showed that 9 of the 11 individual scans had significant activation in several areas of the brain during the On condition. The areas of significance were variable in the individual analyses. In analyzing the group as a whole, one of the clusters was highly statistically significant ($p = 0.000127$), Activation in the anterior cingulate cortex, frontal superior areas, and the precuneus was identified for the group. (See Figure 1) Anatomic locations are based on the Tzourio-Mazoyer atlas. This atlas was produced as a segmentation of the MNI atlas, and is available in MRICro as ANALYZE files.

Analysis of the 13 individuals independently in Group 2 revealed that 8 recipients of DHI showed significant differences between the On and Off conditions, and 5 did not. The analysis of the effect of Group 2 as a whole did not show significant differences.

Using FSL's statistical group analysis, there was a significant fMRI activation difference ($p < .01$, corrected) between Group 1 and Group 2, with Group 1 having significantly more activation in certain areas of the brain during the On condition. The group difference maps are shown in Figures 1 and 2; the cross hairs are centered on the significant cluster that occurred when Group 1 was compared with Group 2. The first figure shows significant activation in a cluster centered in the posterior/cingulate/precuneus region, ($p = .019$) and the second figure

² Column 1 = Cluster index which uniquely identifies each cluster; Column 2 = # of activated voxels within the cluster; Column 3 = probability that the cluster occurred randomly by chance; Column 4 = Maximum Z-score within the cluster; Columns 5,6,7 = X, Y, Z Talaraich coordinates of the center of gravity of the cluster

shows significantly more activity in the cerebellum ($p = 006$); both values were corrected for multiple comparisons using extent of cluster size. Table 2 represents a cluster table for the group comparison.

TABLE 2.

Brain Region Activation Report. These are the brain regions where there was a significant difference between the two groups (Group 1 > Group 2)

Brain region	number of activated voxels within region
Rolandic_Oper_R	23
Cingulum_Post_R	30
Calcarine_R	202
Cuneus_R	559
Lingual_R	1186
Occipital_Sup_R	170
Occipital_Mid_R	17
Fusiform_R	25
Precuneus_L	1681
Precuneus_R	2065
Heschl_R	27
Temporal_Sup_R	31
Cerebelum_Crus1_R	222
Cerebelum_Crus2_R	95
Cerebelum_4_5_R	54
Cerebelum_6_R	492
Cerebelum_8_R	358
Cerebelum_9_L	16
Cerebelum_9_R	14
Vermis_7	54
Vermis_8	111
Vermis_9	26

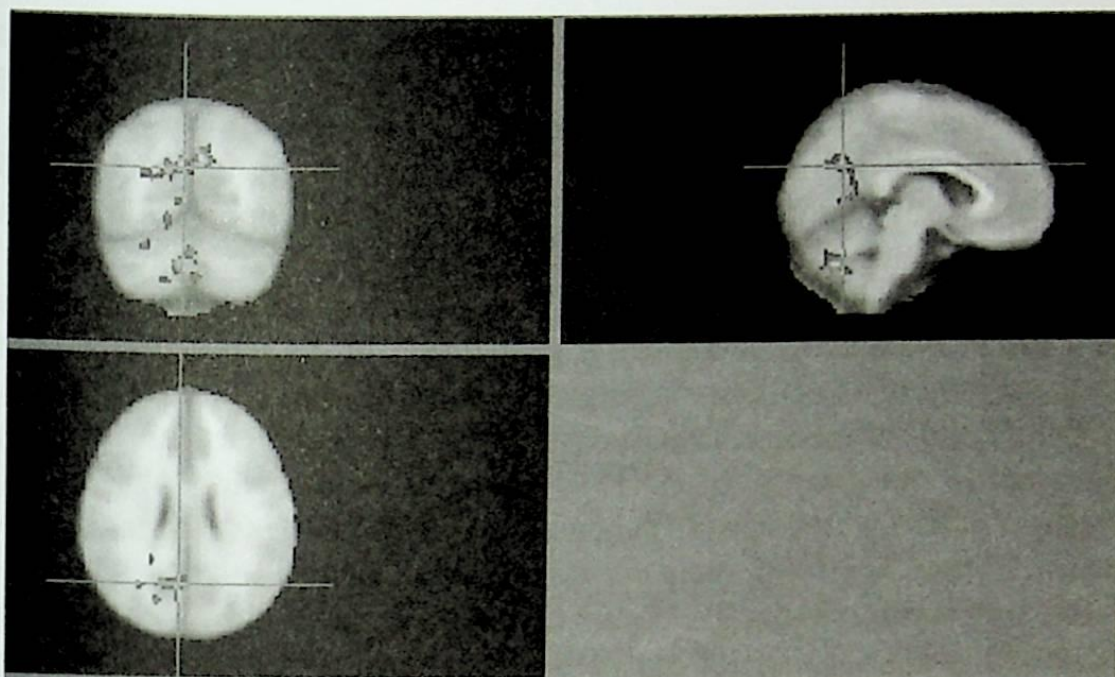


FIGURE 1.
fMRI group statistical map for the comparison test group 1 > group 2. The green cross hairs are centered on a significant cluster in the posterior cingulate/precuneus region.

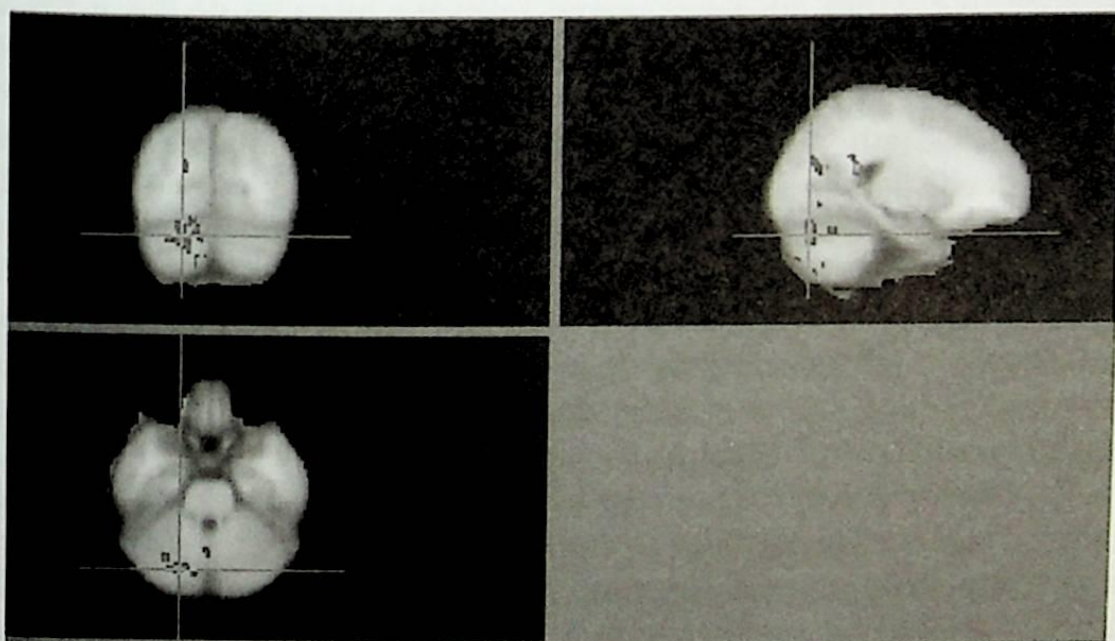


FIGURE 2.
fMRI group statistical map for the comparison test group 1 > group 2. The green cross hairs are centered in a significant cluster in the cerebellum.

Discussion and Conclusions

In this study, two groups of healers who practiced some form of Distant Healing Intentionality (DHI) were compared using fMRI changes in the recipients of DHI. The healers in Group 1 were paired with a person with whom they felt bonded or had a close personal or empathic connection. In Group 2, the healers were paired with a person they did not know. The research questions guiding the design of the study and the results in answering each question are addressed below:

Question: "Is there evidence for correlations between DHI and brain function in recipients of DHI who are tested using fMRI?" The question will be answered, below, with (A) intra-individual, and (B) overall group, or group average, correlations.

A. In the analysis of intra-individual scans, individual pairs in both groups showed significant activations during the DHI or On segments. Nine of the 11 pairs in Group 1 were statistically significant; 8 of the 13 pairs in Group 2 showed significant activation in brain areas during the On condition of DHI, as compared to the Off condition of DHI. The nonsignificant results in Group 1 were both from recipients of Qi Gong. There was significant movement artifact during the onset of the On sessions that could not be removed from the analysis of the scans and they had to be invalidated and omitted from the analysis. Ironically, the Qi or life energy associated with work by Qi Gong Masters is said to cause a motion or startle reflex. These participants may have experienced a most unusual degree of nonlocal stimulation, but had to be excluded from the significant research findings because the technology required by the fMRI could not correct the artifact.

In Group 2, two of the five non-significant pairs involved the same healer who said the DHI modality was Psychic Healing, two healers practiced Reiki, and the fifth used Healing Touch. The latter was a participant in Group 1 and had a highly significant result.

B. When pairs in each group were combined and analyzed, Group 1 showed significant group or overall activation during the DHI segments but Group 2 did not; i.e., a group effect was apparent for Group 1, but not Group 2. The group analysis for Group 2 did not demonstrate a significant treatment effect, as mentioned above, indicating that on the whole, DHI was not significantly correlated with changes in brain function. Although 8 of the individual scans for Group 2 were statistically significant when the On condition was compared with the

Off condition, the individual effect was not robust enough to achieve significance for the group.

Question: "Are there significant differences in correlated brain function during On conditions and DHI between bonded or empathically linked pairs, versus non-linked pairs?"

When the two groups were compared to one another, they were found to be functionally and statistically significantly different in outcome, with Group 1 showing greater activity in several brain areas during the On or DHI. This would indicate that a close or bonded connection would engender a more pronounced mind-to-mind connection.

Issues of Causality and Function

Although there were significant areas activated for Group 1 as a whole, and 9 of the 11 scans were significant, the individual scans showed high variation in the brain areas activated during DHI. The question that arises from these findings is whether the areas that are activated are a function of the DHI modality, the healer, the recipient, or the nature of the relationship between members of the pair. In pilot work such as this, it is impossible to address this factor with any certainty. To do so would require larger numbers of participant pairs, with a cross comparison of DHI modalities.

From the existing data, Reiki, the most frequently used form of DHI in Groups 1 and 2, was related to extremely diverse individual brain scans. Two healers—one a practitioner of Healing Touch, and the other a practitioner of an eclectic form of DHI—were in both Group 1 and Group 2. Their individual results in terms of brain areas activated during DHI were different in the two groups. These very tentative findings suggest that the brain areas activated are more likely to be an idiosyncratic function of the relationship between the healers and their paired recipients, as opposed to being correlated to the DHI modality or the skills employed by the healers.

Overall, then, the healer/recipient pairs who felt a bonded, close or empathically linked relationship with one another were more likely to have significant findings when the individuals were analyzed, as well as in the analysis of group averages, and when the two groups are compared.

Speculation on Functions of Brain Areas Activated

For Group 1 as a whole, the brain areas included the rostral anterior cingulate cortex, which has been shown to be activated during the height of opioid and placebo response. (Petrovik, Kalso, Petterson, *et al.*, 2002). The frontal lobes were also activated in this group and are generally regarded as modulating information processing, judgment, and decision-making. Little is known about the function of the precuneus; however, it has been recently argued that it, along with the anterior cingulate gyrus, may be a part of a neural network that is involved in resting consciousness and self-reflection (Kjaer, Nowak, & Lou, 2002).

The anterior cingulate cortex, active during the On condition for Group 1 also, may serve as a type of executive control. Decision making at this level determines both verbal and motor responses. It has rich interconnections with many cortical and subcortical brain areas. Mirror neurons in the anterior cingulate cortex have also been identified. Iacoboni and his research group (2005) Ramachandran (2000), Rizzolati & Craigher (2004) and other neuroscientists believe that the mirror neurons may provide a unifying framework to help explain mental abilities that have thus far eluded explanation, including what appears to be precognitive recognition of intention of others (and therefore a forthcoming goal) and other phenomena associated with parapsychological function; and, as these researchers note, reading other peoples' minds. "The psycho-constant in all remote healing studies that work is empathic bonding and compassion. Perhaps, as scientists get comfortable with mirror neurons, they may finally open up to a form of bonding that occurs even when people are outside sensory contact—mirroring without the mirror" (Dossey, 2006, Personal Communication). The importance of human interconnectedness or relationship between members of healer/recipient pairs was suggested in the introduction to this study. If there is a demonstration of mirror neuron activity in humans for the emotions of love and compassion, this would be a highly significant contribution to the field.

When Group 1 was compared to Group 2, the cerebellum was another area of activation where there were group differences. The cerebellum, once believed to be exclusively associated with motor behaviors, now is known to have many expanded functions. It is densely packed with neurons—more than all other areas of the brain combined—and approximately 40 million nerve fibers connect it to the

cerebral cortex. The cerebellum reacts with more speed than any other part of the brain, and possibly mediates language. It may, in fact, coordinate mental activities and be involved in decision resolution when conflicting information is being presented.

Both the anterior cingulate cortex and the cerebellum have been shown to be related to empathy, which may account for the strong action in those areas for Group 1 in which the pairs felt a close or bonded relationship with one another. Singer, Seymour, O'Doherty, Kaube, Dolan, & Frith (2004) investigated brain activity in a scenario involving couples and pain-related empathy, using fMRI. The empathy pathways are therefore highly similar to what we found in the bonded healer/ recipient group.

The anterior cingulate cortical activations as well as those in the cerebellum coincident with the On sessions of DHI in the bonded Group 1, offer a preliminary demonstration of a possible biological mechanism involved in nonlocal connections.

Limitations and Delimitations of the DHI findings

The objections to this work from within the field of consciousness and fMRI have been interesting and occasionally irrational. Most of the direct criticism has come from individuals who do not have experience with fMRI, and do not understand the technology or the analysis software.

Because this study is novel in both design and outcome, the limitations and delimitations of this current work need to be seriously considered. Criticisms and caveats are given below, which generally involve internal validity—whether the healer was causing the effect or was it due to extraneous variables. For each point, I have countered or supported the critique, as necessary.

(1) One of the criticisms of the reported findings of Group 1 was that someone must have been signaling the person in the scanner/MRI unit regarding the sequence of the On and Off events. The findings therefore must have occurred as a result of auditory or visual cues, or tricks sent from someone in the control booth.

My comment: Signaling a randomized clue to a person who is in the MRI scanner and isolated visually, auditorally, and from every other sensory function that we know of is impossible.

(2) Another criticism concerned the possibility of flawed data analysis software, or software that could manipulate data at intervals.

My comment: The FSL software that was used to analyze the data is regarded as standard for the fMRI technology and as providing robust corrections for false positives, autocorrelation, multiple voxel testing comparison, and cluster size detection. Given the random series of On/Off trials, no software package could be deliberately manipulated to reflect the data at 2-minute or any discrete and random intervals.

(3) A challenge to internal validity is to question who or what was actually causing the significant effect. There were four people in the control booth for Group 1: the healer, the radiology technician, the principle investigator, and the nurse research associate. The principal investigator was not in the control booth for every trial in Group 2.

My comment: The possibility of an 'experimenter effect' must be considered. If someone other than the healer was creating the positive effect, then the results are still of interest and importance in terms of shared or correlated consciousness or nonlocal effects of DHI. This possible violation of internal validity does not negate the positive findings. It merely challenges who was creating the effect.

(4) Studies of DHI have been summarily dismissed by scientists, journal editors, reviewers, mainstream health care professionals who state there is no known biological mechanism to account for the results and therefore cannot exist.

My comment: This objection is a weak argument in that it is used to discount novel research findings that challenge the existing scientific models of the nature of reality. These models are not static. They change drastically over time and across cultures.

Entanglement Theory, posed by quantum physicists (Einstein, Podolsky & Rosen, 1935), provides a possible description or explanation for the connectedness results. This theory asserts that once photons came into contact, their subsequent activities are inexplicably connected in nonlocal fashion. Explaining the results of nonlocal human connections with quantum physics has been a fad in the popular literature for many years. Explanations at the quantum level were either 'thought' experiments or related to microsystems, but there was no evidence that complex systems, such as brains, behaved in this manner. However, Pizzi and colleagues (2004) found evidence for nonlocal connections between separated preparations of human neurons, suggesting that the theory of Entanglement may be relevant to macrosystems as well. In our study which found that people who knew and cared for one another had stronger findings than did those who did

not may provide justification for the application of Entanglement theory to nonlocal healing.

Recommendations for Future Research

The results of this study pose many questions for additional research. For instance, one frequently asked question is whether similar strong findings as were noted in Group 1 might also be found in pairs of nonhealers who sent prayers or thoughts to someone that they loved who was receiving a scan. We have completed a pilot study of this nature, and preliminary analysis shows positive findings.

Another direction for study is to investigate a single type of DHI. We cast out a broad net in this pilot research, not wishing to restrict the research reported in this paper to one form of DHI. Further research might consider a test of prayer, Reiki, Healing Touch or Therapeutic Touch. Qigong, while one of the most frequently studied forms of DHI, proved problematic in the fMRI research, as mentioned earlier, due to movement artifact. Master practitioners of Qigong are often credited with being able to cause muscle movements in recipients—even when the Qi is sent nonlocally. Therefore, other instrumentation that measures movement—such as the ballistocardiograph—is recommended.

Whether there is concordance of actual brain activity between the pair is also a question for future research. This would require the capability of measuring brain function in both members of the pair at the same time. Based on previously cited research, EEG technology might be a more appropriate and readily available form of instrumentation than the fMRI. One of the serendipitous findings of our research was that, with a single exception, the healers were not willing to have a scan. Some would not even go into the room where the scanner was located. The single healer who was willing to undergo a scan (the Qigong Master) was instructed to send Qi in a random sequence related to her by the research associate through headphones. She sent Qi to the principal investigator (Achterberg), who was in the control booth. The healer's scans were remarkable in terms of the sizable number of activated brain areas during the On sessions (Figure 3). The red and yellow areas in this brain indicate significant activation, and the areas in the cross hairs are the most pronounced.



FIGURE 3.
fMRI results from a Qi Gong Master during the DHI/On condition, indicating widespread activation (yellow areas).

Another possibility is to study people who are already trained in self-healing in a standardized fashion, such as Metta. Metta is also known as 'loving-kindness meditation'. They could practice their own loving and compassion or healing intentionality on themselves while they are in the scanner to identify neural correlates and compare the findings to the research reported in this paper.

Currently, the results of these studies are being reanalyzed by Dean Radin and Todd Richards to identify whether there was an anomalous anticipatory response to the randomized outcomes. If so, this would indicate a precognitive ability to detect the On sessions prior to their onset, and validate other work that Radin has done in this area.

In summary, the work reported in this paper supports a body of previous research that suggests that human intentions may directly affect others in ways that are not fully understood. Care, compassion, and knowledge of the recipient appear relevant to have an effect of DHI on neural substrates. These findings challenge the existing paradigm of science and medicine which holds that nonlocal effects of correlated consciousness are impossible and therefore unworthy of investigation.

The implications of this research for training and clinical work in all forms of health care are monumental. If it is true that intentions create a physical effect in others, even when the recipients are unaware of these intentions, then we have a certain responsibility to consciously monitor our thoughts, not only as health care providers, but as members of the human family. Whether care and compassion can be learned or taught effectively remains to be seen, but denying or ignoring the idea could rob health and healing of its most fundamental and vital ingredients.

Acknowledgements

The research described in this paper was conducted at North Hawaii Community Hospital in Waimea, Hawaii (Big Island), and graciously funded through a grant from the Earl and Helen Bakken Foundation from 2001-2006. I acknowledge the most able assistance of Karin Cooke, my research associate; Todd Richardson, Leanna Standish, James Lake, Leila Kozak, and David Paul who all provided valuable input in various phases of the studies. This paper is an extension, modification, and an expansion of research and theory based on a published pilot study: Achterberg, J., Cooke, K., Richards, T., Standish, L., Kozak, L., & Lake, J. (2005). Evidence for correlations between distant intentionality and brain function in recipients: A functional magnetic resonance imaging analysis. *The Journal of Alternative and Complementary Medicine*, 11(6), 965-971.

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DISCUSSION

NARANJO: Thank you very much for your interesting presentation. I have just a couple of questions. The first one is based on my own experiences with this kind of research; when I was doing EEG studies I remember to my surprise the results of the experiments reflected mainly suppressions rather than activations. My first question is: do the colors in the illustrations you presented actually represent activations compared to the baseline or de-activation to the baseline?

ACHTERBERG: Activations. I didn't have time to go into detail, but one pair was analyzed for deactivation and those were blue areas. So there were some instances of deactivations, and they were significant deactivations.

NARANJO: My other question was relating to the activations you found that might be related to empathy. Are those activations that you found consistent over all subjects? Was it an average over all subjects?

ACHTERBERG: That was a group effect; it didn't happen in every single one, but happened frequently enough to be statistically significant.

ROLL: This is not really a question, but a comment and some sage advice concerning the area of replicability. So far the motivation in your own life and working with others has been healing; now there could be a sudden change — that your purpose may now include replicability, and that could dilute the healing intention.

ACHTERBERG: I'm not sure I could replicate it myself!

ROLL: Don't try and replicate it — just go on with your work!

KOKUBO: How many measurements are averaged in the data you presented?

ACHTERBERG: With the technology of MRI you are comparing 'on' sessions with 'off' sessions so that each patient serves as their own control. We were using 12, 2-minute segments.

VAN DE CASTLE: I would certainly go along with what you are saying about the importance of intentionality and love. In my talk I gave a brief example of the dream helper work, and that is how it always starts up there: we get together with the person, we dedicate ourselves to

them and let them know that unconditional love is going to be there for them, and we offer our dreams up for them that night. It is nothing you can get real statistics on, but knowing the kinds of material that comes up with dreams I can objectively evaluate it with the Van de Castle system, and it is unusual imagery that comes up. Usually the person the next morning is moved to tears because we made them such a central part of it, because that person is worthy, and deserves to have that love, and people think 'wow! You did that for me?' Now it's not healing in the sense of an organ change, although some do report they are less anxious or depressed, so we don't have that kind of measure but it seems clear that doing the work in a love context is so critical.

ACHTERBERG: I agree, it is a wonderful feeling, I had one of my training groups do dream work on me one night and they stayed up all night. I had forgotten the date, yet I felt itchy all night — it was an interesting sensation. I was very touched that they spent so much time using their dream work on me, and I was stunned by what they reported.