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Review of Contemporary Biofield Measures including GDV: Implications for Energy Medicine and Spiritual Healing

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Abstract

With the development of sensitive and reliable biosensors and bioamplifiers it is possible to record bioelectromagnetic signals that are sometimes referred to as “subtle energy measures” and “biofields.” This paper reviews research from the Human Energy Systems Laboratory at the University of Arizona documenting the measurement of bioelectromagnetic signals that vary from low frequencies (electrostatic body-motion effects, electrocardiograms and electroencephalograms) to high frequencies (12 giga-hertz microwave signals, high frequency X rays, and gamma rays). Both intrapersonal and interpersonal biofield interactions are discussed. Research on the subjective and behavioral detection of biofields is also reviewed. New data using a coronal visualization discharge system is presented that documents possible effects of human intention on physical-chemical properties of water. Implications for developing new biomagnetic field measurement technologies using the MRI are briefly considered, and an energy systems framework for integrating bioelectromagnetics with spiritual healing is proposed.

Introduction

Prior to the development of contemporary biosensors and bioamplifiers, clinicians and healers used terms like “qi,” “prana,” and “subtle energies” to refer to presumed energetic interactions in all living (as well as non-living) systems. It was speculated that invisible fields played a fundamental role in health and healing, and that sensitive human beings could register and manipulate these subtle yet significant energetic processes.

Contemporary research in bioelectromagnetism, as extensively reviewed in Oschmann’s (2000) comprehensive book *Energy Medicine*, provides a compelling approach to scientifically understanding and investigating various energy medicine and “spiritual energy healing” techniques.

This paper provides an overview to research conducted in the Human Energy Systems Laboratory at the University of Arizona that illustrates the promise of applying energy systems concepts and bioelectromagnetic technologies to energy medicine and spiritual healing.

Following a brief review of definitions of terms and concepts, empirical research recording bioelectromagnetic signals is reviewed. The signals are organized from low frequencies to high frequencies. The bioelectromagnetic findings are followed by recent research documenting the capacity of humans to subjectively and behaviorally detect human biofields. New research using coronal visualization discharge technology documents potential effects of human intention on physical-chemical properties of water. Possible directions for future research, including extensions of MRI technology, are suggested, as well as the potential application of energy systems science for

integrating conventional medicine and spiritual healing.

Defining Terms and Concepts

In conventional physics, energy is defined as the capacity to do work and overcome resistance (Russek and Schwartz, 1996). Any process that has the capacity to do work and overcome resistance, by definition, can be defined as energy – be it known or unknown in conventional science.

Information refers to pattern or form, whereas energy refers to power or force (Rubik, 1997). Simply stated, information without energy is “powerless” and energy without information is “purposeless.” What is quantified bioelectromagnetically can be defined as “informed energy” – a combination of information (pattern) and amplitude (power) (Schwartz and Russek, 1999).

A system is a set of interacting units (or subsystems) (Miller, 1978; Russek and Schwartz, 1996). Information, energy, and matter, are circulated within and between the component units. The units are interconnected and interdependent. Through their recurrent interactions (termed recurrent feedback loops), holistic properties occur which are novel / emergent (Schwartz and Russek, 1997; 1999).

All systems, regardless of their level in nature - atomic, chemical, biochemical, cellular, physiological, etc. – are classified as “open” systems in the sense that they receive and release information, energy, and matter, to various degrees, in a dynamic fashion. Material systems are therefore “organized energy systems” – in quantum physics, matter is defined as “organized energy” (Schwartz and Russek, 1997).

To summarize, dynamical energy systems theory integrates concepts of information, energy, and systems – emphasizing (1) interconnection, (2) sharing of information, energy, and matter, (3) self-regulation, and (4) dynamic change and evolution.

These fundamental terms and concepts provide a scientific framework for energy medicine, and by extension, spiritual medicine. Table 1 summarizes five dynamical energy systems hypotheses and their applications to the hands.

TABLE 1. Five Dynamical Energy Systems Hypotheses and their Applications to the Hands (from Schwartz, Russek and Beltran, 1995)

DYNAMICAL ENERGY SYSTEMS HYPOTHESES	HAND ENERGY SYSTEM HYPOTHESES
1. Systems are expressions of organized energy and emit energy.	1. The hands are a dynamic energy generating system.
2. Energy activates and regulates systems interactively.	2. Energy from the hands may regulate organs and cells in the body interactively.
3. Energies (types and frequencies) are emitted simultaneously, including the quantum level.	3. The hands generate patterns of energy. The hand energy pattern includes electrical, magnetic, sound pressure, temperature (infrared) and electrostatic energies.
4. Energy is transmitted between systems dynamically and interactively.	4. Hand energy patterns may have interactive effects interpersonally and environmentally as well as intrapersonally.
5. Levels of consciousness may modulate patterns of energy in health and illness, and conversely, patterns of energy	5. Levels of consciousness may modulate hand energy patterns in health and illness, and conversely, hand energy patterns may modulate levels

may modulate levels of consciousness.

of consciousness.

Electrostatic Body-Motion Effects

The simplest way to demonstration human energy systems interactions is to measure electrostatic body-motion effects. All biological systems, to various degrees, have an electrostatic charge. When an electrostatic charge is moved in space, the movement creates an electromagnetic (EM) field. The EM field perturbation travels at the speed of light. The EM field can be measured with sensitive microvolt bioamplifiers.

In a set of experiments (Schwartz, Nelson, Russek, and Allen, 1996), subjects moved their hands in space over an electrode box attached to Neuroscan amplifiers. A dowel was marked for visual limits for vertical hand movement trials. The distance from the plastic surface of the box to the first mark was 5 cm and to the second mark 25 cm. Hand movements occurred within the 20 cm distance between the two marks.

Three experiments were conducted. The first experiment demonstrated hand-motion effects generated by six subjects, and illustrated how the signals could be attenuated using a wire mesh shield placed over the electrode box. The second experiment demonstrated hand-motion effects generated by the experimenter (Nelson); it showed how the hand-motion effect could be attenuated by distance, and how the human body (of the subjects) could serve as an antenna-receiver for electrostatic hand-motions (generated by the experimenter). The third experiment demonstrated foot-motion effects generated by the experimenter, and that the human antenna-receiver effect could be measured without requiring that the subjects make direct electrical contact with the amplifiers.

Figure 1 displays the basic electrostatic hand-motion findings for Experiment 1; Figure 2 displays the attenuation of these effects when the electrode box was shielded.

Figure 1

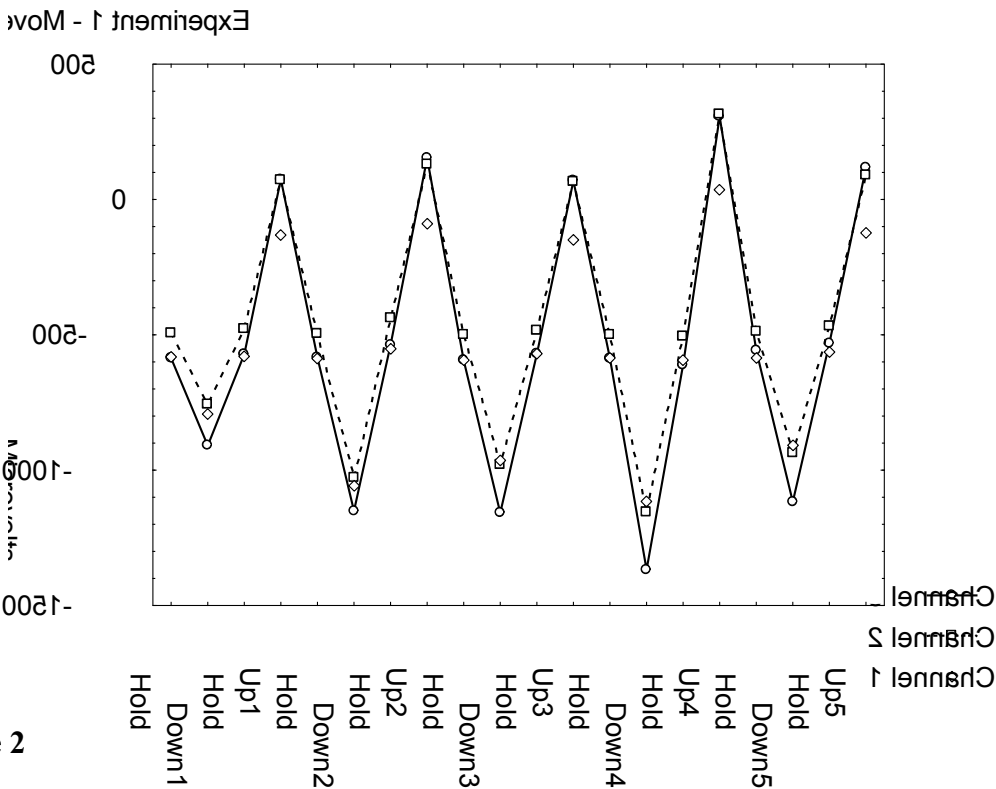
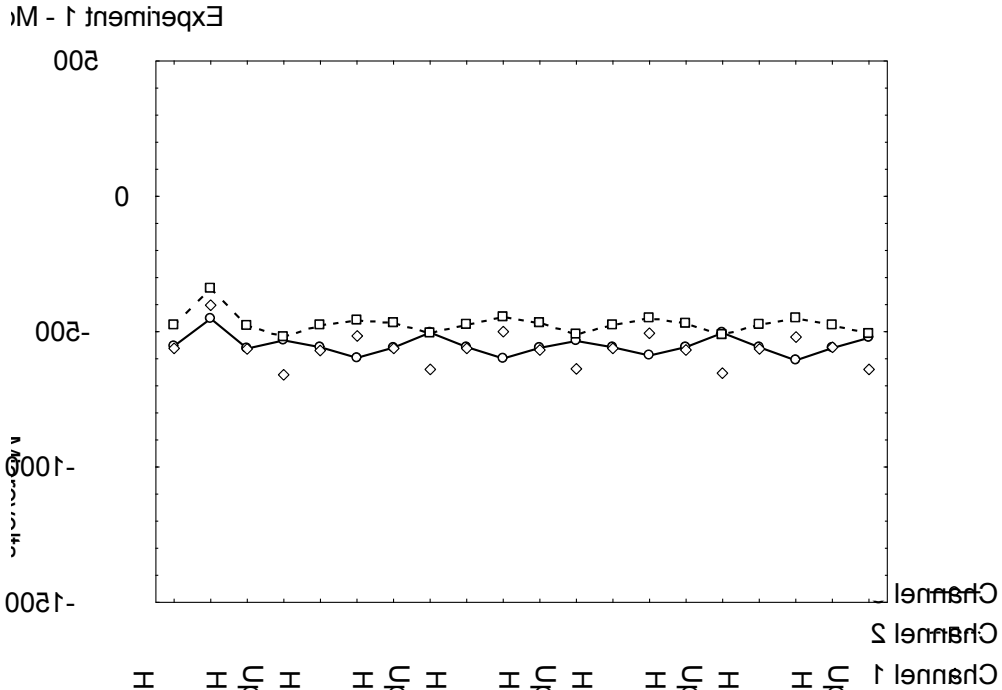


Figure 2



The measurement of electrostatic body-motion effects have direct implications for studying human energy interaction effects, including the effects of contact and non-contact energy healing techniques. Individual differences in the energy generation of healers, and energy reception of patients, can be investigated. Future research can be conducted to determine if electrostatic body-motion interactions play a role in the healing effects of various energy techniques.

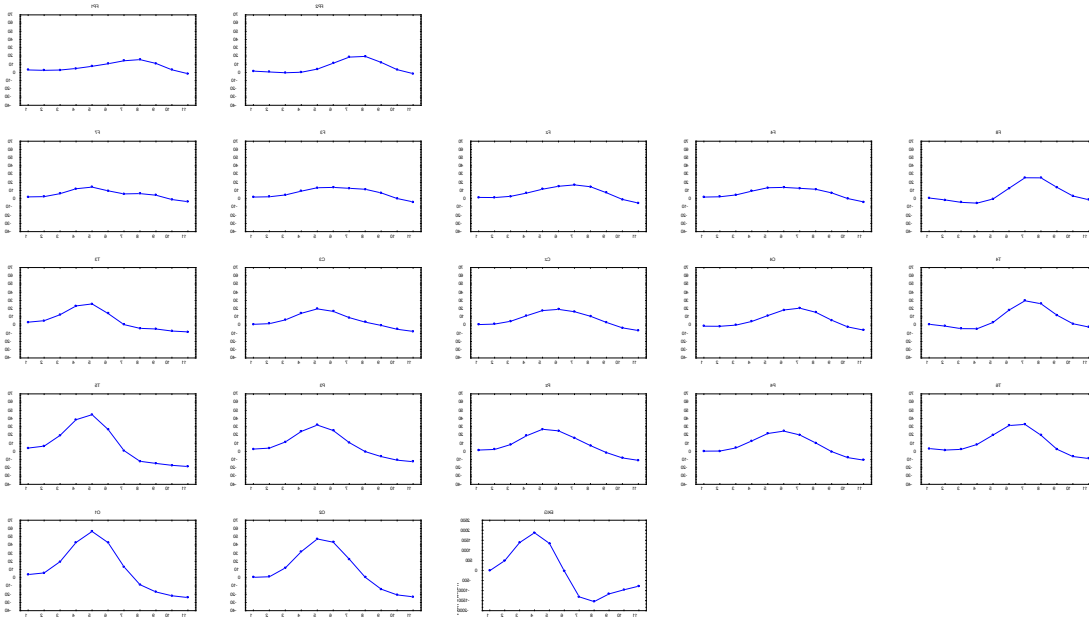
Intrapersonal and Interpersonal Heart-Brain Energy Synchronization Effects

The EM field effects of the heart are substantially larger than those of the brain. Electrocardiograms (as well as magnetocardiograms) can be recorded in combination with electroencephalograms (as well as magnetoencephalograms). It is possible to record bioelectromagnetic heart-brain interaction effects within and between individuals.

It is possible to record the presence of signal averaged ECGs (electromagnetic signals generated by the heart) in a subject's EEG despite the fact that linked ear references are used to subtract much of the ECG from the EEG. We developed cardiac evoked potential software (termed cardiac synchronized energy patterns) and examined the presence of the ECG in the EEG within and between individuals (Russek and Schwartz, 1994).

The topographic pattern of these within subject, intrapersonal cardiac synchronized info-energy patterns during two-minute eyes closed, resting baselines, are displayed in Figure 3 (next page, from Russek and Schwartz 1994). The top two waveforms represent averaged anterior EEG sites (FP1 and FP2), the two waveforms next to the bottom represent averaged posterior EEG sites (O1 and O2), and the bottom waveform represents the averaged ECG. It can be seen that the R spike (the largest peak) of the ECG is largest in the back (posterior) of the head, larger in the right frontal region, and somewhat larger in posterior peripheral EEG sites compared to the central EEG sites. The explanation for this replicable pattern is not known.

 FIGURE 3: Averaged EEG and ECG waveforms synchronized with the *Subject's* ECG R spikes (n=20). The top two waveforms are FP1 and FP2, the next to the bottom two waveforms are O1 and O2, the bottom waveform is the *Subject's* averaged ECG. The scale for the EEG waveforms is +70 to -40, the ECG waveform is +2500 to -2000.



We have found that when subjects pay attention to heart sensations, evidence of EEG amplification of the P wave of the ECG is observed, a bioelectromagnetic signal that occurs before peripheral feedback from ventricular contraction has occurred (Song, Schwartz, and Russek 1998).

FIGURE 4: Averaged EEG and ECG waveforms synchronized with the *Experimenter's* ECG R spikes in *High* perception of parental caring subjects (n=11). The top two waveforms are FP1 and FP2, the next to the bottom two waveforms are O1 and O2, the bottom waveform is the *Experimenter's* averaged ECG. The scale for the EEG waveforms is +12 to -3, the ECG waveform is +2500 to -2000.

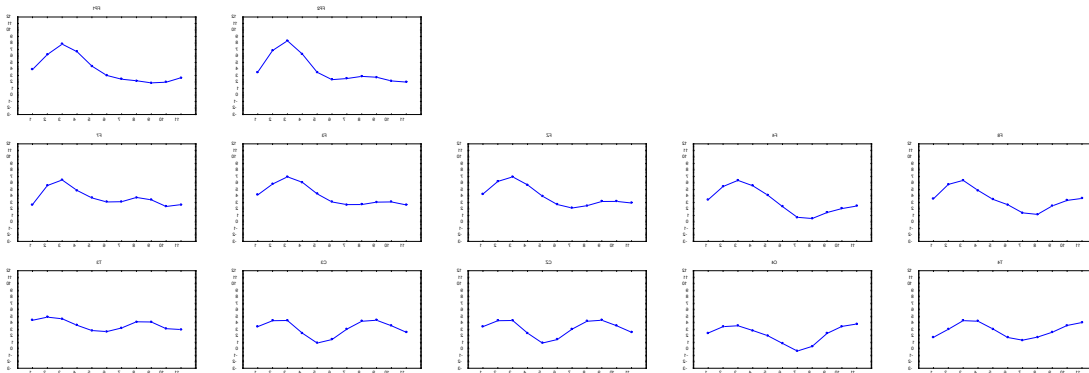
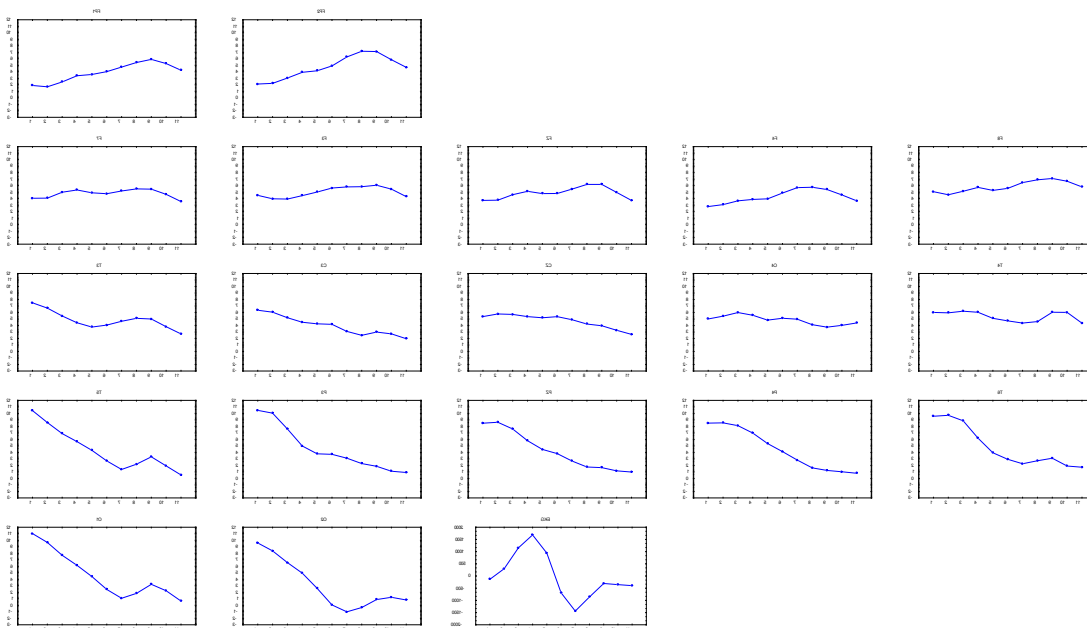


FIGURE 5: Averaged EEG and ECG waveforms synchronized with the *Experimenter's* ECG R spikes in *Low* perception of parental caring subjects (n=9). The top two waveforms are FP1 and FP2, the next to the bottom two waveforms are O1 and O2, the bottom waveform is the *Experimenter's* averaged ECG. The scale for the EEG waveforms is +12 to -3, the ECG waveform is +2500 to -2000.

-2000.



Figures 4 and 5 illustrate how the ECG of one person can be detected in the EEG of a second person during two minute eye closed resting baselines, especially if the second person rates their parents as being high in loving and caring (Russek and Schwartz, 1994). This finding was observed as part of a 42-year follow-up to the Harvard Mastery of Stress study.

Between people, interpersonal ECG-EEG registration effects have been replicated in energy healers; the ECG of the “sender” can be registered in the EEG of the “receiver”, even during trials where the receiver misidentifies which hand was receiving the hand biofield (Nelson, Schwartz, Russek, et al 2001 in preparation).

Bioelectromagnetic heart-brain synchrony measures have important potential applications to researching important interpersonal energy systems hypotheses concerning intention, mind-body healing, energy healing, and spiritual healing.

12 Giga-hertz Microwave Signals

As stated earlier, the human body generates electromagnetic signals that range in frequency from the ultra low (e.g. electrocardiograms and electroencephalograms, typically less than 100 hz) to the ultra high, including microwave (e.g. from hundreds of megahertz to giga-hertz) and beyond. Measurements of mega-hertz and giga-hertz activity from the human body have been limited by the lack of low cost, sensitive, and stable equipment. However, it is now possible to construct a low cost system for monitoring 12 giga-hertz signals coming from the human body (Schwartz and Russek, 2002).

The system uses readily available hardware: (1) an 18 inch satellite dish with an LNB detector, (2) a signal strength meter with visual and auditory feedback, and (3) an analogue output to a digital voltmeter whose values can be stored on a computer. The system readily detects 12 giga-hertz signals emitted from the hands and body more than 20 feet from the dish. The signals travel through a ½ stack of paper and they decrease with distance from the low noise block down converter (LNB).



Figure 6 shows how the LNB detector can be used without the dish to detect microwave signals coming from the hand.

Figure 6

The technology has potential applications to a wide variety of research and clinical areas in psychophysiology and energy medicine.

High Frequency X Rays and Gamma Rays

Using Princeton Gammatech gamma ray spectrometers with sodium iodine detectors, we (Schwartz, Jones et al, 2002) have replicated in four experiments findings that the human body passively absorbs and/or scatters cosmic gamma radiation and emits high frequency X-rays. The closer a person is to the detector, the greater the decrease in recorded gamma radiation and the greater the increase in recorded X-ray emission.

These observations have been independently replicated using identical detectors by Dr. Joie Jones in the Department of Radiology at UC Irvine (Schwartz, Jones, et al, 2001). Tanks containing various levels of water produce graduated decreases in recorded gamma radiation (Schwartz et al, 2001 in preparation). Biological organisms contain relatively solid materials (e.g. bones) as well as fluids (the body is 70-80% water).

Passive gamma and X-ray effects are well established in physics. However, human beings are dynamic systems whose states can change biologically and psychologically (Benford, Schwartz, et al 2000). Preliminary findings suggest that states of relaxation are associated with dynamic increase gamma radiation absorption and/or scatter, as well as well as increases in emission of high frequency X-rays (Schwartz, Jones, et al 2002).

It is possible that X ray emission and / or gamma ray absorption may play a role in energy healing mechanisms.

Electromagnetically Shielded Quantum Electron Studies:

States of consciousness have been shown to reliably influence quantum electron effects in an

electrically and magnetically shielded computerized electronic device (provided by the Princeton Engineering Anomalies Research Laboratory in the department of electrical engineering at Princeton University) (Nelson and Schwartz, 2001). Biofields from the hands influence the movement of a highly sensitive mechanical device whose rotations are precisely tracked on-line by computer (Nelson and Schwartz, 2002).

Hand Energy Detection Studies: Resistance to Biofield Therapies

Biofield therapies are sometimes viewed as a challenge to conventional medicine, including research on potential energy systems mechanisms. The resistance to biofield therapies, though understandable, can be corrected through responsible and dedicated research that integrates the best of mainstream methods with contemporary science. This includes addressing the conscious and unconscious psychological biases of experimenters interacting with practitioners and patients.

JAMA published a paper by Rosa et al (1998) that attempted to examine the theoretical foundation of therapeutic touch (TT). The experimenter was a female child; the study was her science fair project. Her co-authors were senior members of an organization extremely critical of CAM. The authors reported that 21 practitioners of TT could not identify above chance which of their hands was closest to the child's hand (44% of 280 trials) – actually, performance was statistically below chance. Placement of the experimenter's hand above the subject's right or left hand was determined by coin toss of the child. Fourteen practitioners received only 10 trials, 7 practitioners received 20 trials over two separate sessions.

Rosa et al concluded from their findings that experienced TT practitioners were unable to detect the child's energy field and that their failure to substantiate TT's "most fundamental claim" is "unrefuted evidence that the claims of TT are groundless and that further professional use is unjustified." The findings were interpreted by the media, including the *New York Times*, as unrefuted evidence that biofield therapies were groundless and unjustified.

Though on first reading Rosa et al's review of the TT literature appears to be thorough – including TT research published in the peer reviewed journal *Subtle Energies* – close examination reveals that their review of the relevant human energy systems literature was incomplete. Had they been cognizant of published basic science studies testing their hypothesis, they would have known that the available scientific evidence requires a more appropriately cautious, if not potentially positive, interpretation of biofield phenomena (e.g. Achterberg 1998; Leskowitz 1998).

Rosa et al did not cite two previously published studies in *Subtle Energies* that predated their research using completely counterbalanced designs, with 300% more subjects, 240% more trials per subject, 523% more trials total, and 22 different experimenters (who were unbiased with regard to CAM). Schwartz, Russek, and Beltran (1995) reported that blindfolded college students could significantly identify above chance which of their hands was closest to the investigator's hand (66% of 1464 trials, $p < .00001$, compared with Rosa et al's 44% of only 280 trials).

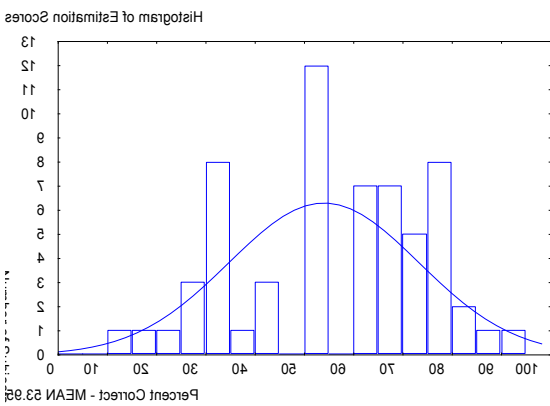
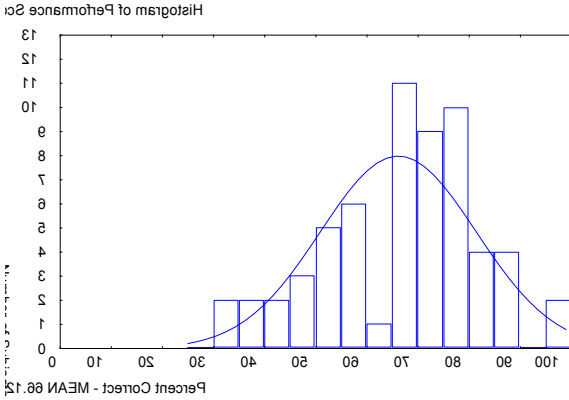
In two studies involving 20 and 41 subjects (and 1 and 21 different experimenters, respectively), placement of the investigator's hand was completely counterbalanced over trials for hand of the experimenter (right versus left) in addition to hand of subject (right versus left). Each subject received 24 counterbalanced trials. Interestingly, subject's estimates of their performance were only slightly above chance (54%) and were uncorrelated with their actual correct identifications. Histograms of the subject's Estimates of Performance and their Actual Detection Accuracy are displayed in Figures 7a and 7b (both studies combined – next page).

Figure 7a

Figure 7b

Estimates of Performance Accuracy

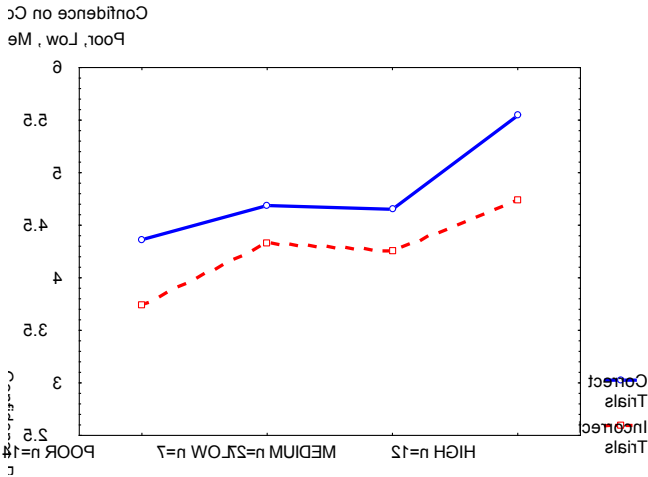
Actual Detection Accuracy



Subjects not only indicated which of their hands was closest to the investigator’s hands, they rated the confidence of each guess using the numbers 0 to 10. Importantly, even in those subjects whose performance was at chance levels, it was found that correct identification trials were associated with significantly higher confidence ratings when compared with incorrect identification trials. (Figure 8 is shown on the next page). Subject’s estimates of their performance were not correlated with actual detection; detection is not explained by expectancy or placebo.

Schwartz et al concluded that these two studies provided empirical evidence for “implicit performance and perception” of “interpersonal hand-energy registration” as well as “an empirical and conceptual foundation” for viewing some of the claims of TT and related biofield therapies. Evidence for significant implicit performance and perception in a different biofield detection paradigm was subsequently replicated in three more rigorously controlled, within-subject, counterbalanced experiments using a total of 102 subjects and 102 different experimenters (Schwartz and Russek, 1998).

Figure 8 – Evidence for Hand Biofield Perception on Correct Trials (Solid Line), even in subjects whose overall accuracy was at or below chance (the Rosa et al observations) From Schwartz, Russek, Beltran (1995)



POOR <=50%, **LOW** 50%<>67%, **MEDIUM** 67%<>79%, **HIGH** =>79%).

It is important to note that Schwartz et al (1995) proposed that possible mechanisms of hand-energy detection might include well known and established biophysical fields such as (1) electrostatic body-motion field effects, (2) skin temperature (infrared fields) and micro breezes, and (3) bioelectromagnetic fields such as hand muscle tension. In other words, aspects of biofield detection and intervention could involve a set of measurable biophysical fields that offer a possible biomedical explanation for the significant hand-energy detection data obtained under controlled experimental conditions.

Exploring New Technologies: Gas (Coronal) Discharge Visualization (GDV) System

New technologies are emerging for recording (1) biofields in humans, as well as (2) electromagnetic fields in chemicals (a possible mechanism of action for understanding human biofield / chemical interactions). Often these new technologies are controversial – they require careful and systematic research evaluation.

We have initiated new research using an evolving measurement system developed by Professor Konstantin Korotkov that may have promise in future biofield research. Dr. Korotkov is a distinguished Professor of Physics at Saint-Petersburg Federal Technical University in Saint Petersburg, Russia. The principle of obtaining information using the GDV is as follows:

The electric impulse on the camera plate stimulates biological subjects (or chemicals in contact with it) and generates a response in the form of an excited gas plasma. This plasma emits both light and other electromagnetic fields over a wide frequency band due to the short electrical impulse used (10 mcs). The emissions are directly measured by a charge-coupled device (CCD), the state of the art in measuring low-level light that is used in astrophysics and other scientific endeavors. The CCD registers the pattern of photons detected over time. This digital data is transmitted directly into a computer for data processing, and each image from the light emitted is stored as a graphics file. These two-dimensional images of the light are then used to calculate the area, emission intensity, density, fractality, and other parameters. On the basis of the calculated parameters, experimental conclusions are drawn.

Reportedly, the GDV has overcome the experimental obstacles of older forms of electrophotography. What were previously considered as confounding parameters, such as pressure, finger size, sweating or changes in physical conductivity in the older forms of electrophotography have been demonstrated by Dr. Korotkov and colleagues to be overcome by the new GDV method. To date, they report replicability of findings across different experimenters, different cameras, and different countries, but the findings have not been published in accessible mainstream journals. Our research team is now performing experiments to evaluate these claims.

Schwartz, Lewis II, Lewis, and Bell (2002) performed a series of studies exploring water as a possible vehicle for measuring biofield and intention effects. In one experiment, a biofield practitioner (who is also a Ph.D. student in the Human Energy Systems Laboratory) attempted to impart “energizing” versus “relaxing” information and energy to three types of water: (1) pharmaceutical grade purified water (HPLC brand), (2) regular purified water, and (3) tap water. On some trials the water was held in syringes specifically designed to fit into the GDV device, on other trials the water was held in amber bottles and then taken into syringes for analysis.

Measures were taken pre-biofield intervention, immediately post-intervention, and one hour after intervention. The biofield intervention lasted approximately 5 minutes per sample. This resulted in a complex factorial design: 2 (energizing vs. relaxing) x 2 (replication of biofield intention) x 2 (syringe versus bottle) by 3 (pre, immediate, and one hour) by 3 (3 drops) by 10 (ten pictures per drop). Analyses were performed on summary averages.

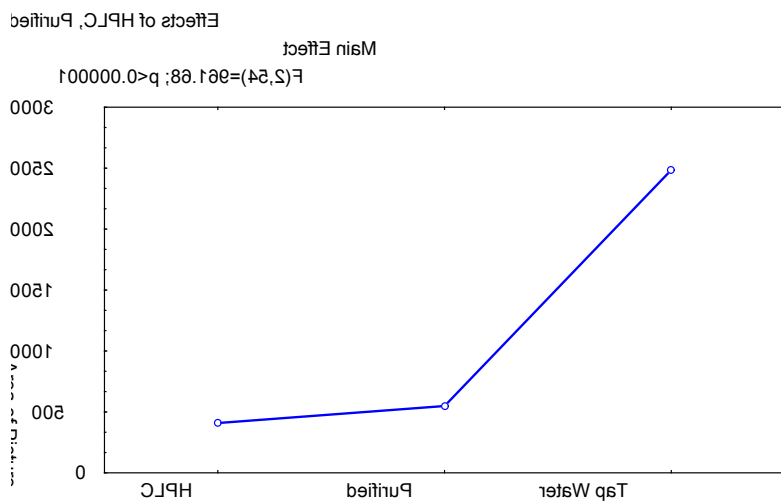
The size of each drop is controlled by releasing (and recording) the distance of the syringe moved to create a given drop. It has been established that the differences in size of the areas of the patterns obtained are a function of the concentration of impurities in the water and not drop size (using the procedures developed by Korotkov).

Replicating the Russian studies, we observed highly replicable differences in GDV measures as a function of type of water. Sample pictures of drops of HPLC water, purified water, and tap water are displayed below (Figure 9).

Figure 9

HPLC Purified Tap Water

The differences are apparent to the naked eye. Purified water is slightly larger and more complex than HPLC, and tap water is substantially larger and more complex than purified.



The software calculates a number of measures, including area, “color” (Dr. Korotkov’s term, actually a measure of gray-scale intensity), and an indirect measure of biophoton emission.

Figure 10 displays the average area measures for the three types of water.

Figure 10

The curves quantify what can be seen with the naked eye. The difference between HPLC and purified, though small in comparison to tap water, is highly significant ($p < .00001$).

Figure 11 displays the effects of energizing versus relaxing intention on area measures,

averaged over the HPLC and purified water. It can be seen that differential effects appear in area one hour after the biofield intervention.

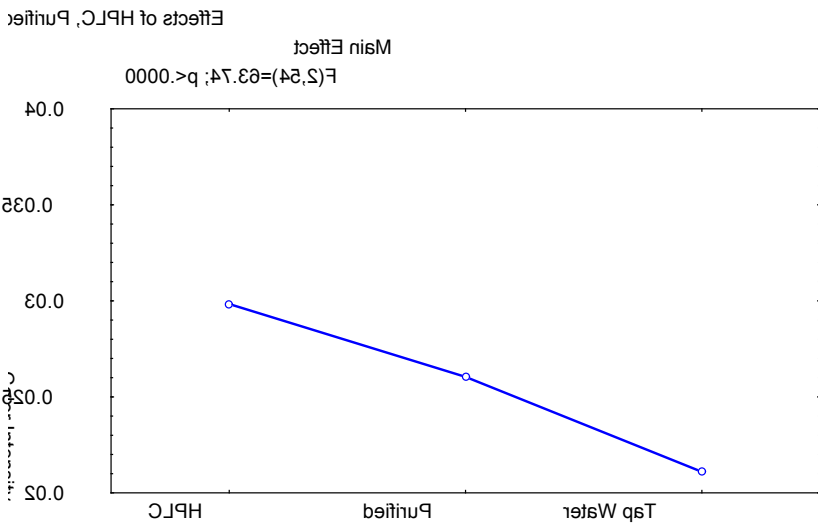
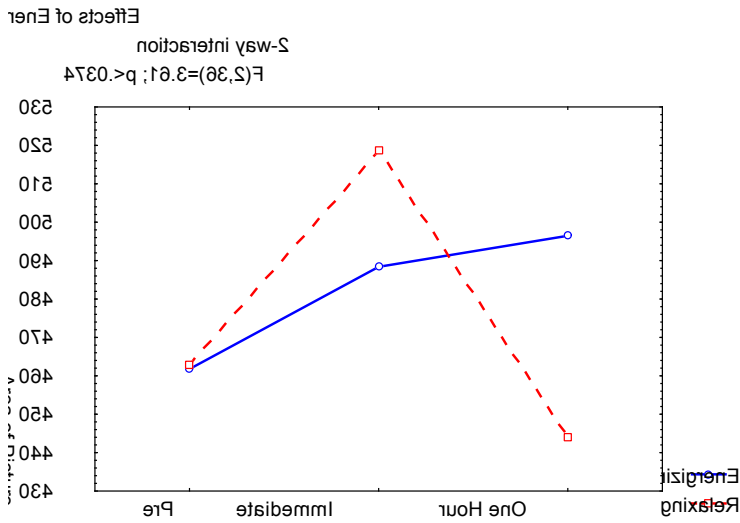


Figure 11

Figure 12 displays the average “color” measures for the three types of water. It can be seen that for this parameter, the less pure the water, the lower the score. Since the “color” parameter is calculated as “percentage of the particular color to the whole area of colors” (this is translated from the Russian, the correct term should be gray-scale intensity), and total area increases (Figures 9 and 10), the decrease in this parameter is not surprising.

Figure 12

However, intensity information provides additional information when viewed in the context

of biofield intention.

These findings suggest that the energizing intention has an immediate – and apparent short-lived effect – on this measure of light intensity that is replicated across HPLC, purified, and tap water (the two-way interaction is significant at $p < .00001$). Moreover, the effect is largest in the tap water (the significant three-way interaction).

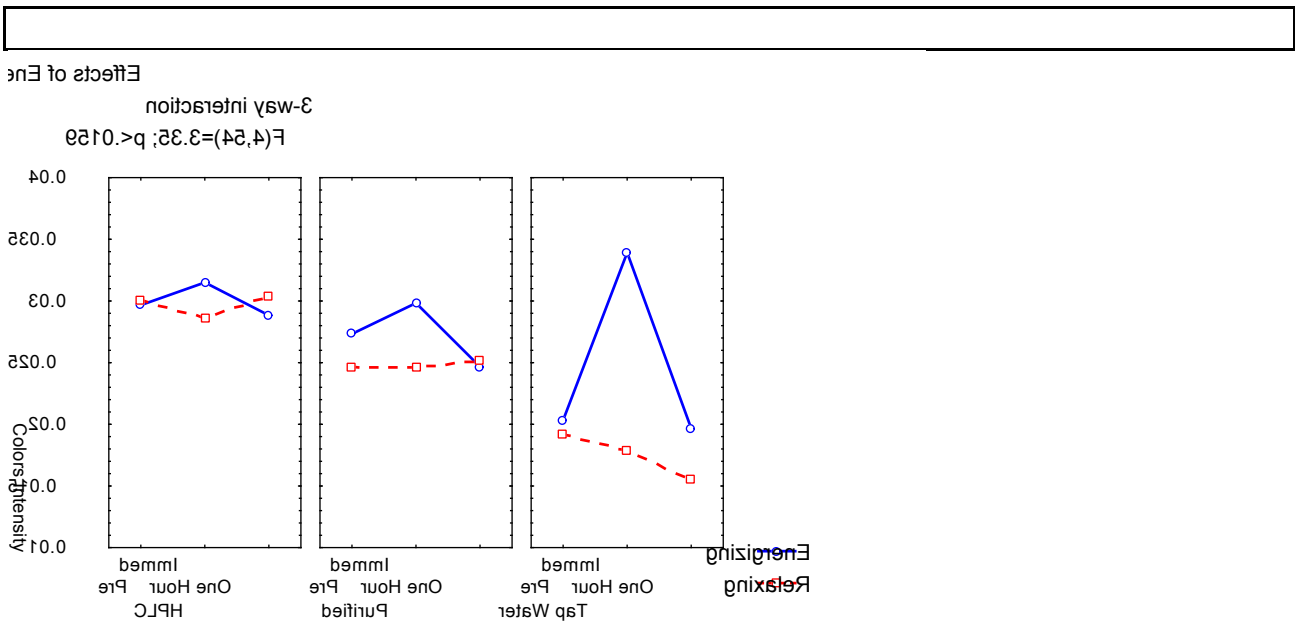
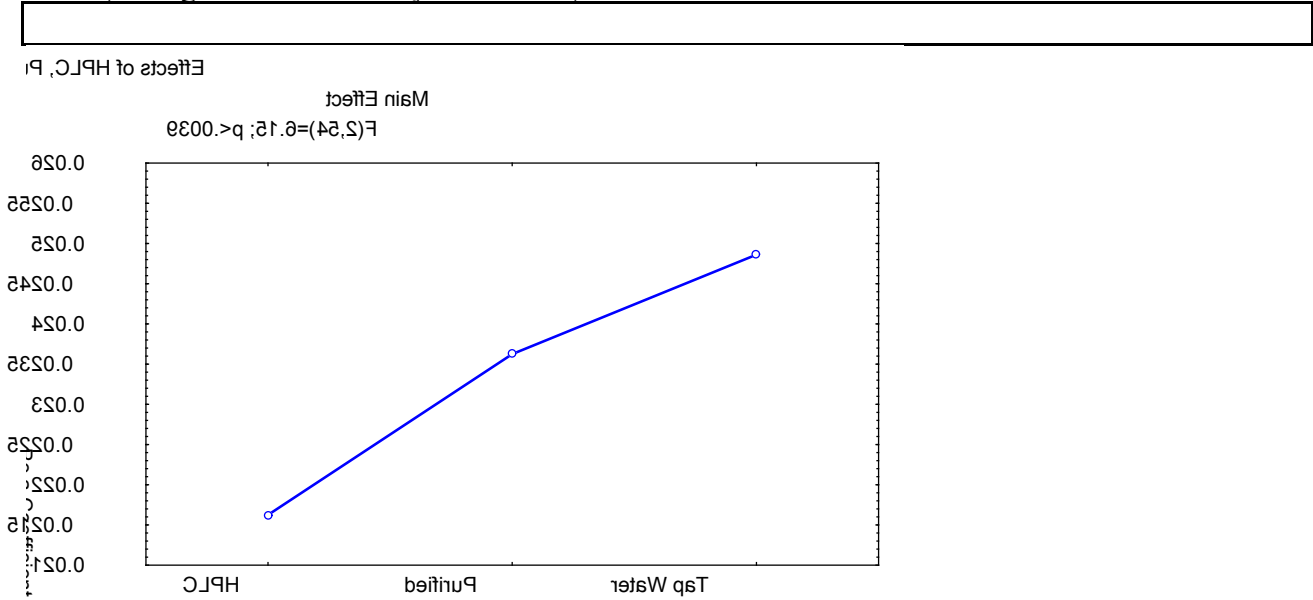
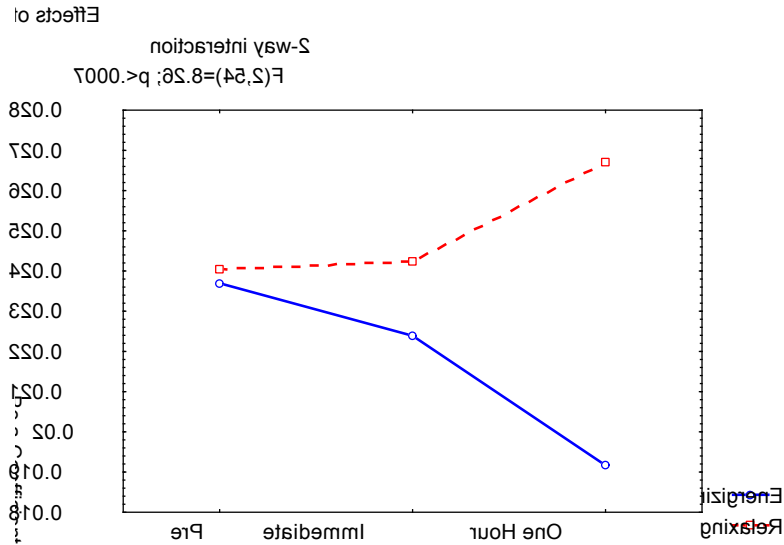


Figure 13 displays the findings for what Korotkov terms “BE ∞ Coefficient” (biophoton emission alpha) – a measure of intensity of scattered light that according to Korotkov is an indirect measure of biophoton emission – for the three types of water. [Note: We are not suggesting that Dr. Korotkov’s labels or interpretations of these parameters are necessarily correct. For example, correlational studies of direct biophoton measurements with Korotkov’s derived biophoton parameter have yet to be performed. What we are suggesting is that the calculated parameters provide replicable information of potential importance to biofield science.]



It can be seen that the purported biophoton emission alpha parameter is observed to increase from HPLC to tap water.

Interestingly, the purported biophoton emission alpha parameter is observed to *increase* with relaxing intention, and this effect is observed in all three types of water. The average intention effect is displayed in Figure 14.

These findings replicate and extend findings reported by Korotkov and colleagues in Russia. They suggest that the GDV system may serve as an important research tool in integrative biofield science as well as other areas in CAM.

We are currently extending the present findings to Johrei biofield techniques using multiple practitioners and two control conditions (control sample in the same room versus distant room). We are also applying the GDV method to double blind, split sample studies of homeopathic remedies and solvent controls.

Examples of future research questions include:

- Do all biofield techniques have similar effects in altering properties of water measured by the GDV, or do different biofield techniques (and different intentions), have different effects on water?
- Do GDV measures of water treated by biofield practitioners correlate with GDV measures of the fingertips of their hands (the conventional way of obtaining GDV recordings from the human body)?

Speculation and Integration: From Extended MRI's to Spiritual Healing

It appears that bioelectromagnetic technology is evolving as a rapid rate, and that opportunities for systematic and integrative biofield research is now possible. Rollin McCraty (2001, personal communication) has observed systemic “errors” in MRI recordings (typically dismissed as recording error) which he suggests may reflect genuine magnetic fields that can be visualized outside the brain that reflect extended biofield field effects. The opportunity exists to bring bioengineers, psychophysicologists, physician scientists, and energy healers together to conduct innovative biofield research, in the process extending available biomedical instruments in novel ways.

As described in Schwartz and Russek (1999) *The Living Energy Universe: A Fundamental Discovery that Transforms Science and Medicine*, the contemporary concepts of energy and information map on to ancient concepts of “spirit” and “soul.” We have proposed that “soul is to spirit as information is to energy” (Schwartz and Russek, 1999).

Moreover, drawing on contemporary “info-energy systems” analysis, it possible that controversial topics such as survival of consciousness after death and “spirit-assisted healing” can be

reconceptualized in light of contemporary findings in energy systems science.

The challenge is for science and medicine to keep an open mind as new data are revealed and new technologies are developed.

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