Report

ELECTROSTATIC BODY-MOTION REGISTRATION AND THE HUMAN ANTENNA-RECEIVER EFFECT: A NEW METHOD FOR INVESTIGATING INTERPERSONAL DYNAMICAL ENERGY SYSTEM INTERACTIONS

Gary E. R. Schwartz, Ph.D., Lonnie Nelson, B.A.,
Linda G. S. Russek, Ph.D. & John J. B. Allen, Ph.D.

ABSTRACT

This paper documents that it is possible to measure electromagnetic fields created by physical movements of the human body—termed electrostatic body-motion effects—using readily available EEG amplifiers, and that it possible to measure the human body's capability to serve as an antenna and/or receiver for these electrostatic movements—termed the human antenna-receiver effect. Following the observation by Green et al (1991)[1] that small body-motions could be detected by electrometers attached to copper walls, three experiments were conducted measuring the effects of hand-motions and foot-motions using DC amplifiers (the Synamps System by Neuroscan). Clear hand-motion and foot-motion effects could be recorded using a standard electrode box as an antenna. The electrostatic motion effect was attenuated as a function of distance of the motions from the electrode box, and by placing a wire mesh shield over the electrode box. The human body was discovered to function as a strong antenna and/or receiver for electrostatic body-motions. The findings indicate that electrostatic body-motions and the human antenna-receiver effect are easily measurable, and may serve as a new method for investigating interpersonal dynamic energy system interactions in psychology, medicine and healing.

KEYWORDS: Electrostatic body-motion, dynamical energy systems, interpersonal registration, non-contact Therapeutic Touch, energy medicine

INTRODUCTION

This paper documents that it is possible to measure electromagnetic fields created by physical movements of the human body—termed electrostatic body-motion effects—using readily available psychophysiological amplifiers (for example, EEG and ECG amplifiers), and that it possible to measure the human body's capability to serve as an antenna and/or receiver for these electrostatic movements—termed here the human antenna-receiver effect. The research was inspired by dynamical energy systems theory (the perspective that all open systems dynamically generate and process energy and information).[2,3] Dynamical energy systems theory was applied to the observation of electrostatic body-motion artifacts reported in the research by Green, Parks, Guyer, Fahrion, & Coyne[1] using a single copper wall (Experiment 1) to measure electrostatic phenomena in exceptional subjects.

A foundational concept in the physics of basic electricity is that the movement of electrostatically-charged bodies in physical space creates electromagnetic fields that travel at the speed of light and can be measured at a distance (e.g. Orear).[4] Living tissues and organs act as dynamic capacitors since they store and discharge electric charges.[5] It follows that dynamic movements of living tissues should create dynamic electromagnetic fields that can be measured using modern electronic amplifiers. Theoretically, the nature of these electrostatic body-motion effects should be influenced by many factors, including moment to moment changes in the strength of the charge as a function of the state of the system, the trajectory of the movements involved, and environment surrounding the movement (e.g. the presence of other charged bodies in proximity to particular movements being investigated).

If two charged bodies are in relative proximity, electrostatic motion effects created by one of them should interact in complex ways with the electrostatic fields created by the other. From a dynamical energy systems perspective[2,3] each may potentially influence the other in a complex dynamic fashion. Each may serve as an "antenna" (a passive detector of the other's electromagnetic fields) and/or "receiver" (an active processor and amplifier of the other's electromagnetic fields).

Note that the terms passive and active are relative terms—from a dynamical energy systems perspective, all systems are dynamically responsive to various degrees, and therefore can develop interactive relationships with other systems to various degrees. Hence, the individual bodies (*i.e.,* the individual systems), as they interact energetically, should create a more complex dynamical energy system. We use the combined term antenna-receiver to emphasize that the human body may have both antenna (relatively passive) and receiver (relatively active) effects.

Electrostatic body-motion effects are typically treated as noise to be removed from measurement systems. Even in the emerging field of energy medicine, electrostatic body-motion effects, if they are considered at all, are not usually the focus of investigation—that is, they are not routinely considered to be a possible source of energetic communication (energy and information) that may play a role in interpersonal interactions, healing and health.

Dynamical energy systems theory[2,3] encourages the inclusion of all possible sources of energies generated by living tissues as potential mediators of information and energetic interaction. Table I illustrates five dynamical systems hypotheses and their applications to energy generated by the hands—a typical source of biophysical energy in clinical energy medicine.[6] Hypothesis three (that complex patterns of energies are emitted simultaneously by complex systems) leads to the inclusion of electrostatic charge as a potential source of biophysical energy and information.

The decision to research electrostatic body-motion effects in our laboratory was inspired by the pioneering research of Green and colleagues measuring "anomalous electrostatic phenomena in exceptional subjects."[1] Green et al were also interested in the effects of bar magnets in their study, a mechanism not addressed in the present paper. Stimulated by the meditation literature of the last century that included a ". . . curious reference to electrical isolation of student monks from ground while they sit in front of a copper wall. . . ," Green et al raised two questions:

1. Was the body isolated from ground in order to conserve an electrostatic charge that built up during meditation?

2. If so, could a technology be developed (instrumentation, procedures, data handling, etc.) for detecting what they termed "body-potential" phenomena in and around the bodies of experimental subjects?

TABLE I

Five Dynamical Energy Systems Hypotheses and their Applications to the Hands (from Schwartz, Russek and Beltran[6])

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 may modulate levels of consciousness.	5. Levels of consciousness may modulate hand energy patterns in health and illness, and conversely, hand energy patterns may modulate levels of consciousness.

Green et al first built a single insulated copper wall that was "wired to an electrometer" (Experiment 1). They subsequently built a copper walled room attached to multiple electrometers. They reported encountering two signals that were not the focus of their research. Using a differential amplifier, they noted that it was possible to detect on the wall:

1. "remarkably small body-motion (capacitive electric field effects, such as respiration and cardioballistically-superimposed heart beats)," (which were first described by Bentov[7] in his early exploratory research using a small antenna), and

2. "slight body movements (less than 3.0 cm)" that "caused the differential electrometer to saturate."

Since these signals were not the focus of Green et al's research, they revised their procedures to minimize the recording and scoring of these body-motion effects (e.g. subjects were monitored by video recorders and no signals were scored that were accompanied by a body movement).

However, these signals are of interest from a dynamical energy systems perspective.[2,3] In 1994, Schwartz and Russek contacted Green et al about replicating and extending the Green et al findings, and plans were set to conduct collaborative research in the copper walled laboratory. However, with the impending dismantling of the laboratory, it was not possible to conduct the research. In consultation with Green, Schwartz and Russek decided to build their own single wall and attempt to replicate the Green et al findings using EEG amplifiers in their laboratory at the University of Arizona.

Schwartz and Russek built a 3 foot square single metal wall, and determined that body movements could, in fact, be recorded from the wall using EEG amplifiers (signals were readily detected using Lexicor's NeuroSearch System and Thought Technology's ProComp+ System). Schwartz and Russek observed that the closer a body-motion was to the wall, the larger was the signal observed (likely reflecting the well known inverse square law). They observed that larger motions were accompanied by larger signals, and that "harder, faster" motions were accompanied by larger signals. They observed that the signals could be attenuated when subjects were grounded, and the signals increased when subjects were isolated from ground (using a wooden floor suspended on glass blocks). However, since these particular amplifiers were AC coupled (AC amplifiers filter out low frequency shifts and do not display steady DC signals), a phenomena observed by Schwartz and Russek could not be interpreted—namely, when a given hand-motion was halted, the signal returned to a baseline, more or less independent of the distance of the hand from the wall.

The experiments described below were designed and conducted when EEG amplifiers capable of recording DC signals (Neuroscan's Synamps System) became available to the authors of this paper. In process of conducting the pilot research (partially described above), we realized that the electrode box itself could serve as an antenna, thus simplifying the experimental setup. Moreover, it became clear that secondary antennas and receivers (e.g. additional preamplifiers) could be attached to the electrode box, and that one particular antenna-receiver was especially convenient and conceptually important—*a human being.*

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

GENERAL METHODS

SUBJECTS

The subjects were six healthy volunteers. Three were males (ages 21, 34 and 53 years), and three were females (ages 21, 27 and 40 years). Subjects were instructed to wear short sleeved shirts and pants. Jewelry was removed prior to data collection. Subjects were seated on a swivel desk chair in front of a table. Subjects were instructed to keep their feet off the ground, resting comfortably on the legs of the desk chair. This procedure potentially increased the possibility that the subjects would maintain their capacitance (and hence electrostatic charge) during the experiment. Though the experimenters participated as subjects in the pilot studies, they did not participate in the formal experiments reported below except as indicated (Nelson as experimenter).

EQUIPMENT

Electrostatic movement effects were recorded using Neuroscan Synamps. The Neuroscan System was selected because it could be operated to record DC signals and therefore could detect whether relatively steady non-motion segments of each trial were associated with distinct voltages. Three separate channels (1-3) of data were recorded at 500 samples per second and analyzed off-line. The reference and ground were connected to wires that were open ended approximately 40 cm from the electrode box. No electrodes were attached to channels 1-3. Hence the amplifiers were "open" and therefore sensitive to environmental "noise" (*i.e.*, possible electrostatic movement effects).

The plastic electrode box measured 4 cm high by 18.5 cm wide by 18 cm long. The spaces between electrode pin holders were 1.5 cm. The total length of the shielded electrode cable from the box to the Synamps was 360 cm. The electrode box was approximately 114 cm from the computer and 110 cm from the experimenter (for Experiments 1 and 3). The electrode box was placed on a formica table with metal legs 49 cm high.

A dowel was marked for visual limits for the 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.

When the subjects were not touching the box their hands were at least 15 cm from the box. When the experimenter moved his foot (Experiment 3), the up front movement (heel remained touching the floor) was 13 cm.

Data collection occurred in a room in the Department of Psychiatry at the University of Arizona School of Medicine. The dimensions of the room were 325 cm long by 295 cm wide by 256 cm high.

General Instructions

When subjects engaged in hand movements (Experiment 1) the experimenter spoke out loud the word "down," paused approximately 1.5 to 2 seconds, spoke out loud the word "up," and then paused approximately 1.5 to 2 seconds. The experimenter silently thought the words "one" and "two" after saying the word "down" and also after saying the word "up." The "down (one two) up (one two)" sequence was repeated 5 times—the 5 trials comprised a movement condition.

Each movement condition in Experiment 1 began with the subject holding her or his right hand 25 cm above the electrode box, then moving it down 20 cm when instructed to do so and holding it down for approximately 1.5 to 2 seconds, then moving it back up and holding it for 1.5 to 2 seconds—for five consecutive trials per condition. Hence, the "down (one two) up (one two)" sequence was replicated five times per condition.

When the experimenter engaged in hand movements (Experiment 2) and foot movements (Experiment 3), the movements were performed in silence. The hand movements began in the up position (replicating the subject movements in Experiment 1). The foot movements began in the down position.

The detailed procedures for each experiment precede the results of each experiment.

Data Reduction and Analysis

For each experiment, the raw signals from two representative movement sequences for a representative female and male subject were graphed and displayed below. The five movement sequences per trial were epoched using Neuroscan software and scored using EEG Analyst software. Baseline values (pre values for down and up movements), as well as peak values for the actual down and up movements, were scored and saved in ASCII text files. The three channels were scored separately at points yolked in time. The numbers from the text files were entered into Statistica for Windows 95 for analysis. Separate repeated measures analyses of variance were performed on each channel and each condition. Graphs displaying the three channels for each condition for the movement sequences over the 20 data points (4 values per trial, 5 trials per condition) were displayed in two ways: (1) to visualize the replicability over trials (x axis displaying all 20 data points) and (2) to visualize possible changes over trials (x axis displaying 5 data points, one per trial). The importance of the individual channel analyses occurs in Experiments 2 and 3 where selective touching of one of the channels was predicted to have relatively selective effects. Analyses of variance with channels and trials as factors were also performed per condition per experiment to address the channel selectivity hypothesis.

RESULTS—EXPERIMENTS 1-3

EXPERIMENT 1—ELECTROSTATIC HAND-MOTIONS WITHOUT AND WITH A SHIELD

Procedure. The purpose of Experiment 1 was to document the measurement of electrostatic hand-motion effects (generated by six subjects) and to determine whether the effects could be attenuated using a metal mesh shield.

Two conditions were analyzed for Experiment 1. In the first condition, the subjects moved their right hands down and up five times over the electrode box as described above. In the second condition, the subjects repeated their movements over the electrode box that was shielded with a piece of wire mesh (1 x 1 cm squares). The wire mesh (30 cm x 22 cm by 7 cm) was bent so that it covered the box without touching it, the edges of the shield rested on the table. The shield was not grounded. It was predicted that a clear electrostatic hand-motion effect would be observed in the absence of a shield and that the electrostatic hand-motion effect would be attenuated or eliminated with the addition of the shield.

Results. Figure 1A displays two representative hand-motion sequences for a female subject, Figure 1B displays two representative hand-motion sequences for a male subject. The Y axis scale for the female subject was approximately -3000 to +2500 microvolts, the Y axis scale for the male subject was approximately -1000 to +100 microvolts. The Neuroscan software displays negative values up and positive values down.

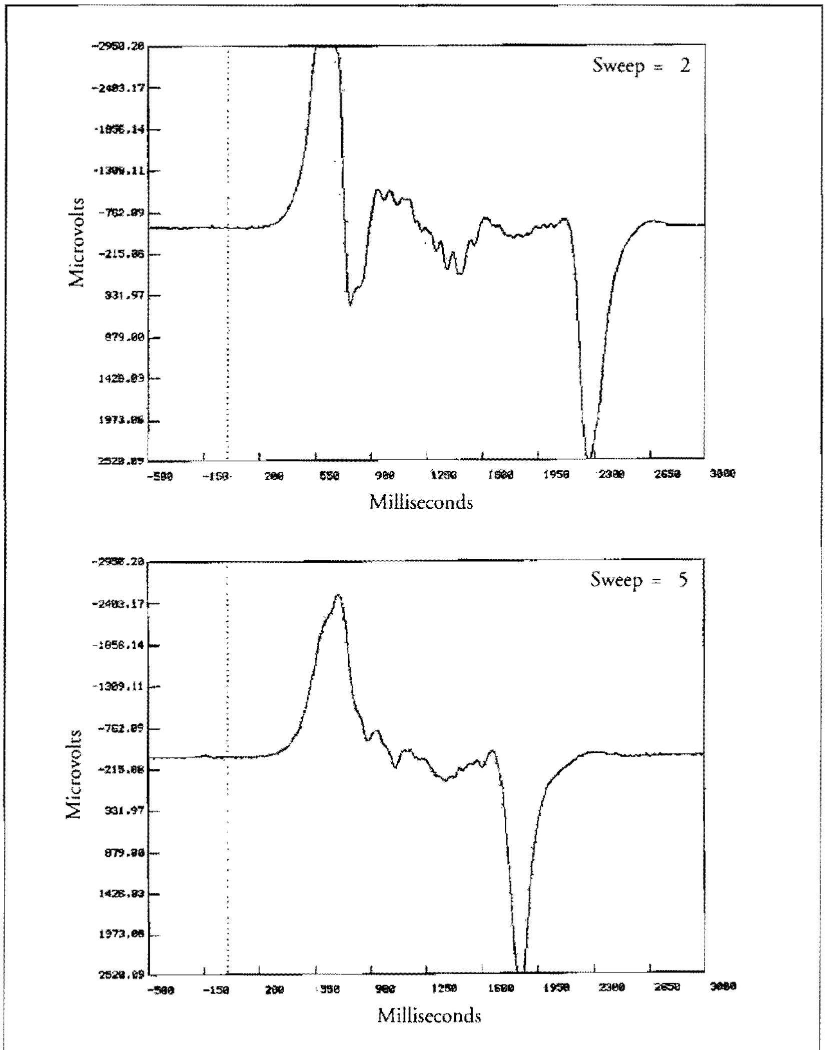

Figure 1A. Experiment 1. Representative female subject, two sample hand movements.

Subjects clearly differed from one another in the magnitude of their overall electrostatic hand-motion effects. The present study was not designed to investigate individual differences. Subjects showed similar patterns of changes with down and up movements. Down movements were typically associated

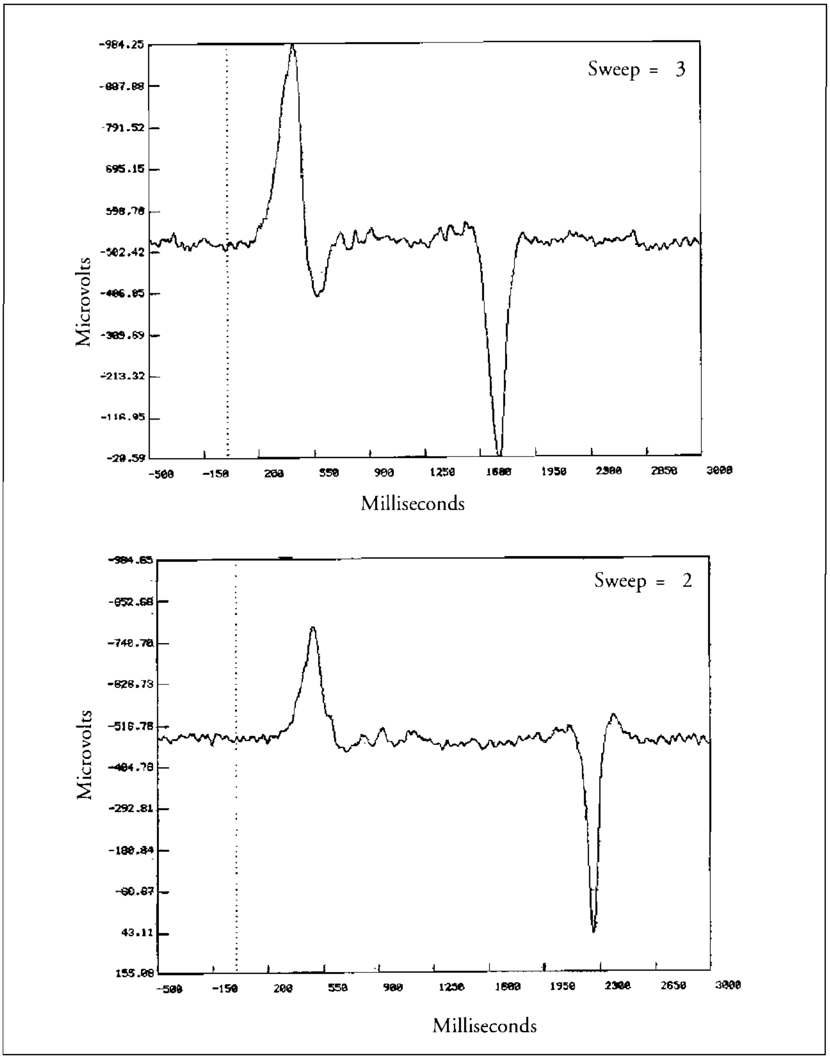

Figure 1B. Experiment 1. Representative male subject, two sample hand movements.

with increased negative shifts (up deflections), up movements were typically associated with increased positive shifts (down deflections). When the hands were relatively motionless (during the 1.5 to 2 second hold periods), it was often observed that small motion effects could be seen following the down

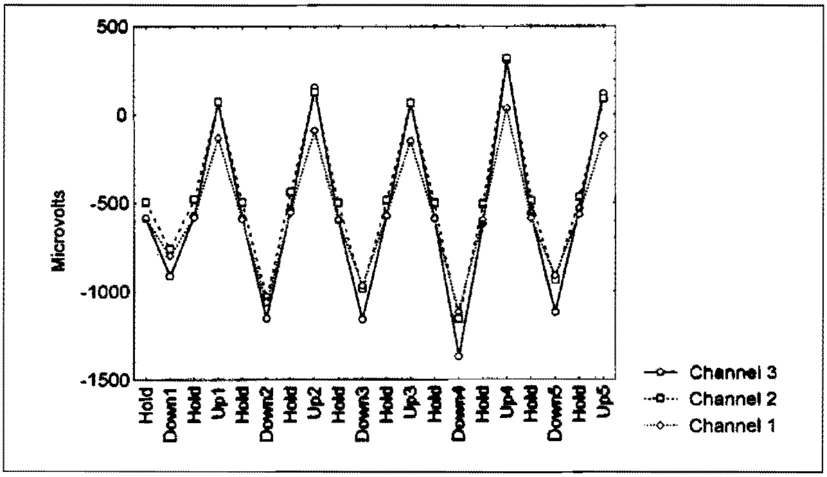

Figure 2. Experiment 1. Movements—no shield, averaged over subjects.

movement but not following the up movement. This could be due to (1) the down position being closer to the electrode box and/or (2) more actual small motions in the down position. These small motion effects were not analyzed in the present study. It is also clear that signals associated with the movements were relatively transitory—the signals followed the actual movements, and then returned to a "baseline" while the subjects were holding their hands relatively still in the "up" or "down" positions. Because of the use of DC amplifiers, this recovery to baseline is not an artifact of the amplifiers (*i.e.*, not due to AC filtering in most EEG amplifiers).

Figure 2 displays the scored hand-motion effects, averaged over the six subjects, separately for the three channels (recall each channel is a different location on the box). In these graphs negative values are displayed down and positive values are displayed up. It can be seen that down movements were associated with increased negative shifts, and up movements were associated with increased positive shifts. Baselines (hold) periods were similar preceding up and down movements. The pattern was replicated for each of the five trials. Analyses of variance for the separate channels revealed significant main effects for movement (channel 1: $F\ (19{,}95) = 2.686$, $p < .001$; channel 2: $F\ (19{,}95) = 2.452$, $p < .002$; channel 3: $F\ (19{,}95) = 2.362$, $p < .003$). There were no significant interactions of channels with trials.

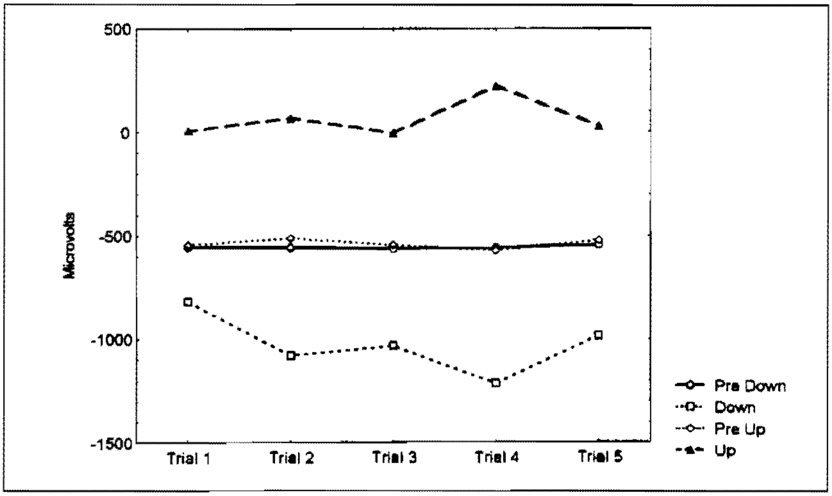

Figure 3. Experiment 1. Movements by trial—no shield, averaged over subjects.

Figure 3 displays the scored hand-motions separately for the pre-down, down, pre-up and up values, over the five trials, averaged across the three channels. Though the curves suggest a slight increase in the magnitude of the hand-motion effects over time, separate movements (4) by trials (5) analyses of variance did not yield significant movement by trial interactions (channel 1: F (12,60) = 1.409, p < .200; channel 2: F (12,60) = 1.430, p < .178; channel 3: F (12,60) = 1.202, p < .303). The movement patterns appear quite stable over the 5 trials.

Given the apparent robustness of the hand-motion effects—clearly visible in the raw data (Figures 1A and IB) and the summary scoring of the data (Figures 2 and 3), Experiment 1 addressed the question of whether the signals could be attenuated by a wire mesh shield placed over the electrode box. Figures 4 and 5 display the scored data for the condition with the shield in place. It is obvious that the signals were dramatically attenuated. Analyses of variance for the separate channels revealed no significant main effects for movements (channel 1: F (19,95)=0.871, p < .618; channel 2: F (19,95) = 0.742, p < .766; channel 3: F (19,95) = 1.306, p < .198). The electrostatic effects were successfully reduced by the presence of a wire mesh shield. There were no significant interactions of channels with trials.

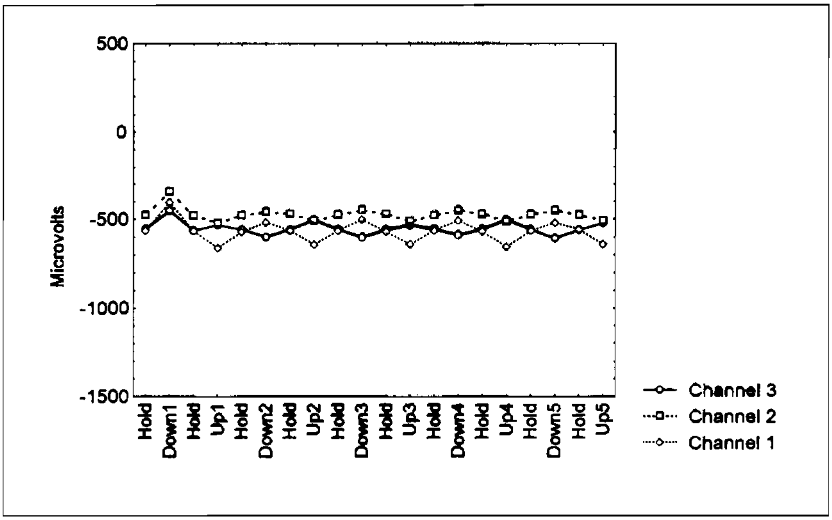

Figure 4. Experiment 1. Movements—shield present, averaged over subjects.

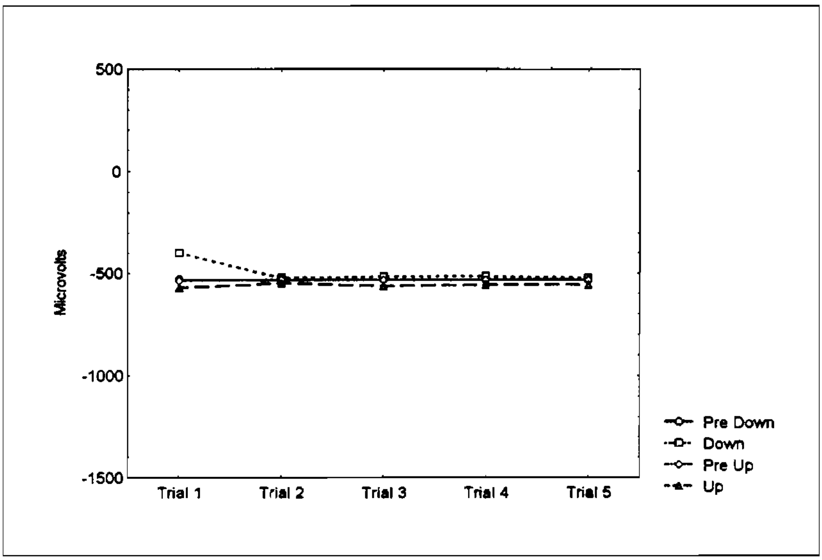

Figure 5. Experiment 1. Movements over trails—shield present, averaged over subjects.

EXPERIMENT 2—HUMAN ANTENNA-RECEIVER EFFECT FOR ELECTROSTATIC HAND-MOTIONS

Procedure. The purpose of Experiment 2 was to replicate the measurement of electrostatic hand-motion effects (this time generated by the experimenter), to determine the effect of distance from the electrode box in decreasing the size of the measured electrostatic hand-motion effect, and to examine the possibility of a human antenna-receiver effect in six subjects for electrostatic hand-motions generated by the experimenter.

Three conditions were analyzed for Experiment 2. In the first condition, the experimenter moved his right hand over the electrode box replicating the same procedure used by the subjects (except the words "down (one two) up (one two)" were all thought silently by the experimenter). In the second condition, the subject held her or his hand that was furthest from the box up about 53 cm from the floor and 40 cm from the electrode box and the experimenter moved his right hand above their extended hand. Hence the experimenter's hand movements were now approximately 2 feet away from the electrode box. In the third condition, the subject took her or his hand that was closest to the electrode box and placed her or his index finger so that it made contact with the plastic of the electrode box over the empty hole for the electrode that would connect either channel 1 or channel 3. Four of the subjects touched the hole for channel 1, two subjects touched the hole for channel 3. Four of the subjects touched the box with their left hands; two of the subjects touched the box with their right hands. The intent was to discern that the antenna/receiver effect was not specific to a given hand or channel. The experimenter again moved his right hand over the subject's extended hand that was approximately 2 feet from the electrode box.

It was predicted that the experimenter would show a clear electrostatic hand-motion effect directly over the electrode box (the first condition) replicating the first condition effect observed in Experiment 1, that this effect would be greatly diminished if not eliminated when the experimenter made the same movement approximately two feet away from the electrode box (the second condition), and that a clear electrostatic body-motion effect would be observed when the experimenter was a couple of feet away from the box if the subjects were touching a given channel of the electrode box and therefore were serving as an antenna/receiver (the third condition).

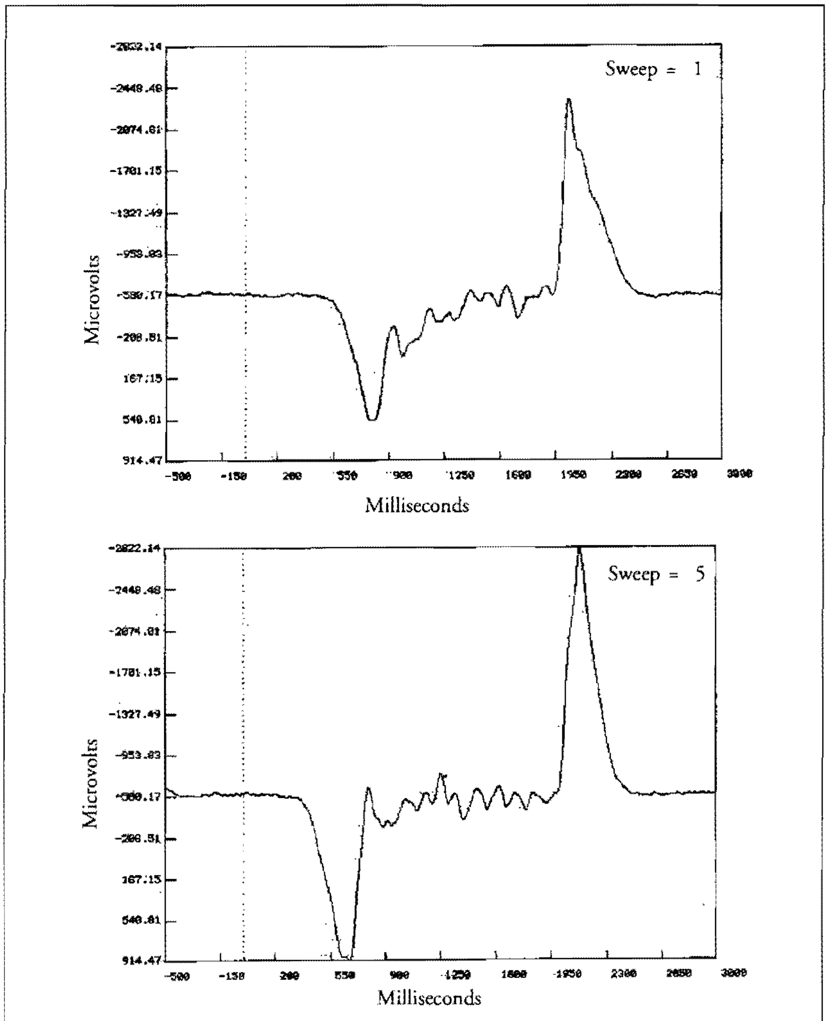

Figure 6A. Experiment 2. Two sample hand movements, pre antenna, female subject.

Results. Figure 6A displays two representative hand-motion sequences for the experimenter in the presence of a female subject, Figure 6B displays two representative hand-motion sequences for the experimenter in the presence of a male subject. The Y axis scale for the female subject was approximately -2900 to +900 microvolts, the Y axis scale for the male subject was approxi-

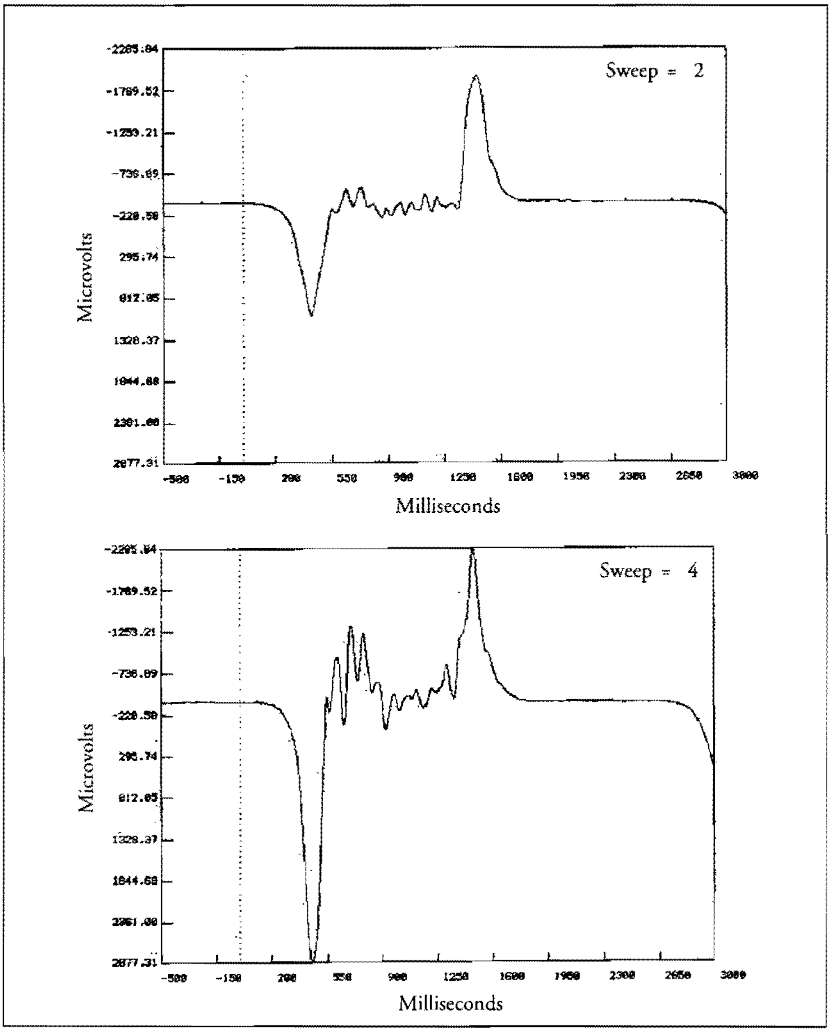

Figure 6B. Experiment 2. Two sample hand movements, pre antenna, male subject.

mately -2300 to +3000 microvolts. The Neuroscan software displays negative values up and positive values down.

The experimenter clearly differed in the magnitude of his overall electrostatic hand-motion effects across subjects. The present study was not designed to investigate stability of hand-motion effects over days in a single subject (the experimenter) or in the presence of different subjects. The experimenter showed similar sequences of changes for up and down movements within and across subjects. His movement pattern was highly replicable. However, his specific pattern of electrostatic hand-motion effects turned out to be reversed from the pattern observed in Experiment 1. In this experiment, down movements were typically associated with increased positive shifts (down deflections), up movements were typically associated with increased negative shifts (up deflections).

There are at least three possible reasons why the experimenter's pattern was the reverse of the subject's pattern which can be addressed in future research: (1) the experimenter was "grounded" (feet touching the floor) and was in a standing position whereas the subjects were not directly "grounded" (feet were not directly touching the floor) and were in a sitting position, (2) the experimenter made his hand-motions in close physical proximity to the subjects whereas the experimenter was some distance from the subjects (a few feet) when the subjects made their hand movements, and/or (3) the experimenter may have had a unique electrostatic hand-motion signature.

When the experimenter's hands were relatively motionless (during the 2 second hold periods), it was again often observed that small motion effects could be seen following the down movements compared to following the up movements. This could due to (1) the down position being closer to the electrode box and/or (2) more actual small motions in the down position. These small motion effects were not analyzed in the present study. Again, it is also clear that signals associated with the movements were relatively transitory—the signals followed the actual movements, and then returned to a "baseline" while the experimenter was holding his hands relatively still.

Figure 7 displays the scored hand-motion effects, averaged over the six repetitions (one per subject), separately for the three channels (channel A refers to the channel that was ultimately selected to be the antenna-receiver channel (1 or 3), channel B refers to channel 2, and channel C refers the channel that was furthest away from the channel selected to be the antenna-receiver channel (3 or 1)—see below). In these graphs negative values are displayed

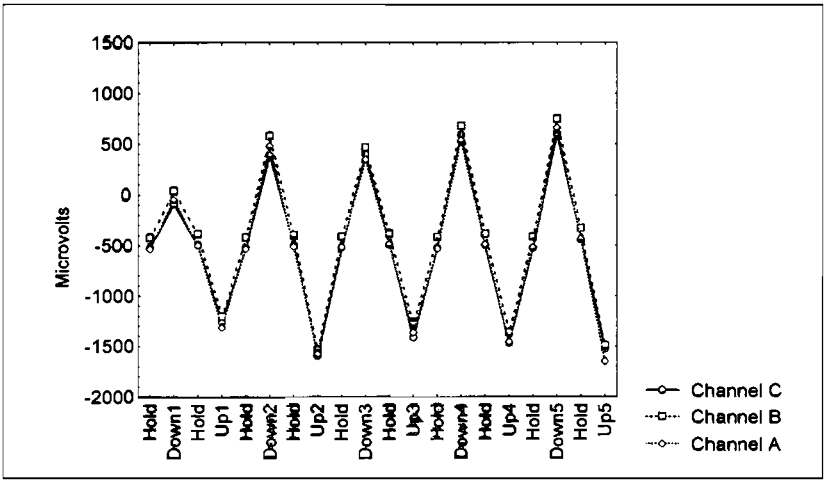

Figure 7. Experiment 2. Movements over box—no antenna, averaged over subjects.

down and positive values are displayed up. It can be seen that down movements were associated with increased positive shifts, and up movements were associated with increased negative shifts. Baselines (hold) periods were similar preceding up and down movements. The pattern was replicated for each of the five trials. Analyses of variance for the separate channels revealed highly significant main effects for movement (channel A: F (19,95) = 8.043, $p < .001$; channel B: F (19,95) = 8.521, $p < .0000001$; channel C: F (19,95) = 8.127, $p < .001$). There were no significant interactions of channels with trials.

Figure 8 displays the scored hand-motions separately for the pre-down, down, pre-up and up values, over the five trials, averaged across the three channels. Like Experiment 1, the curves suggest a small increase in the magnitude of the hand-movement effects over time. This time, separate movements (4) by trials (5) analyses of variance did yield significant movement by trial interactions (channel A: F (12,60) = 2.952, $p < .003$; channel B: F (12,60) = 3.067, $p < .002$; channel C: F (12,60) = 3.482, $p < .001$). The movement patterns appear quite stable and grew over the 5 trials. There are at least three possible reasons for this finding which can be addressed in future research: (1) the size, speed and/or force of the movements may have increased over trials, (2) moving the hands may have increased their electro-

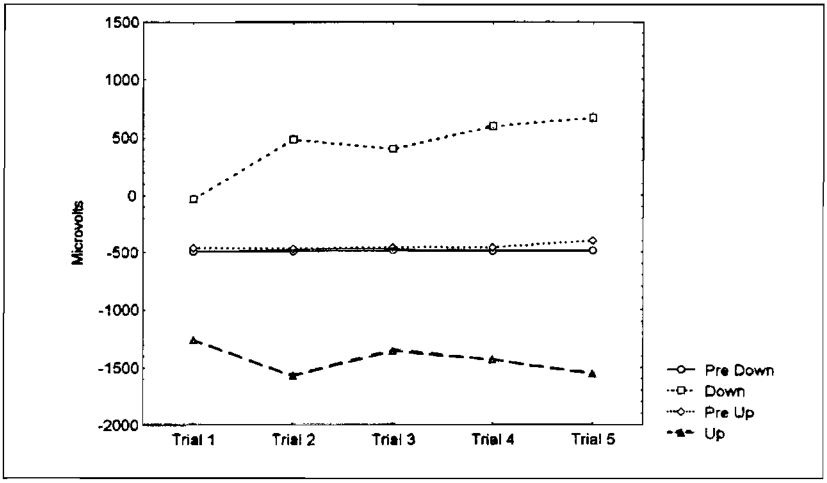

Figure 8. Experiment 2. Movements over box over trials—no antenna, averaged over subjects.

static charge over trials, and/or (3) there may have been an energetic interaction between the experimenter and the subjects (especially in this experiment where the subjects were sitting next to the experimenter) which could have increased with repeated movements.

Given the replicated robustness of the hand-motion effects—clearly visible in the raw data (Figures 6A and 6B) and the summary scoring of the data (Figures 7 and 8), Experiment 2 addressed the question of whether the signals could be attenuated by moving the hands approximately 2 feet from the electrode box. Figures 9 and 10 display the scored data for the condition when the experimenter was moving his hand 40 cm from the electrode box and the subjects were not touching the box. It is obvious that the signals were dramatically attenuated. Analyses of variance for the separate channels revealed no significant main effects for movements (channel A: F (19,95) = 0.060, p < l; channel B: F (19,95) = 0.144, p < l; channel C: F (19,95) = 0.418, p < .983). There was no significant interaction of channels with trials. The electrostatic effects were clearly reduced by distance. However, since the subject was sitting somewhat between the electrode box and the experimenter, it is possible that the subject served as a "shield" as well (either deflecting the electrostatic fields, or absorbing them—see below).

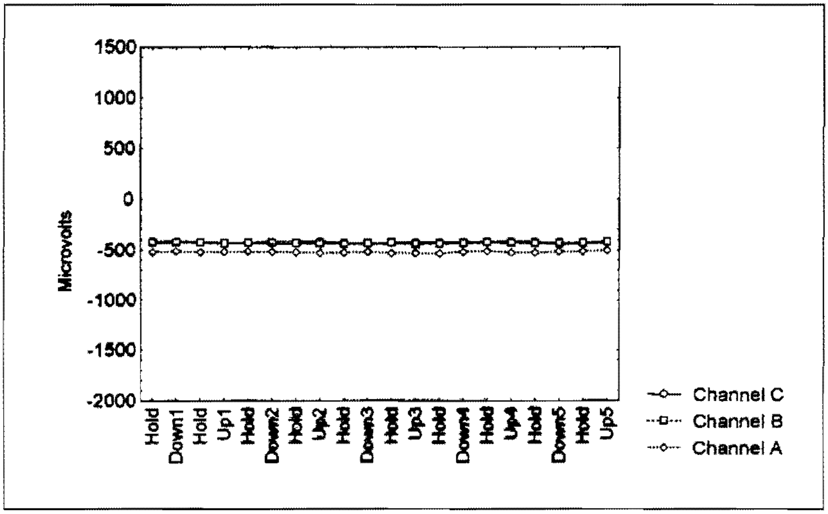

Figure 9. Experiment 2. Movements away from box, no antenna, averaged over subjects.

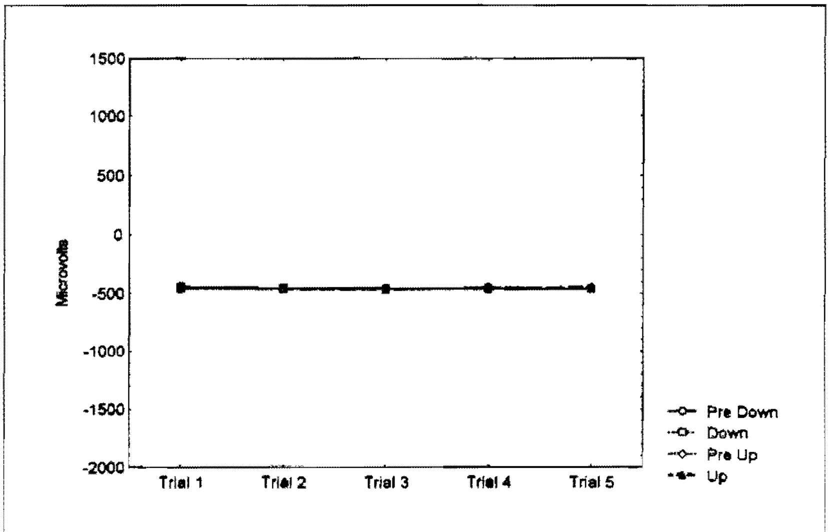

Figure 10. Experiment 2. Movements away from box over trials—no antenna, averaged over subjects.

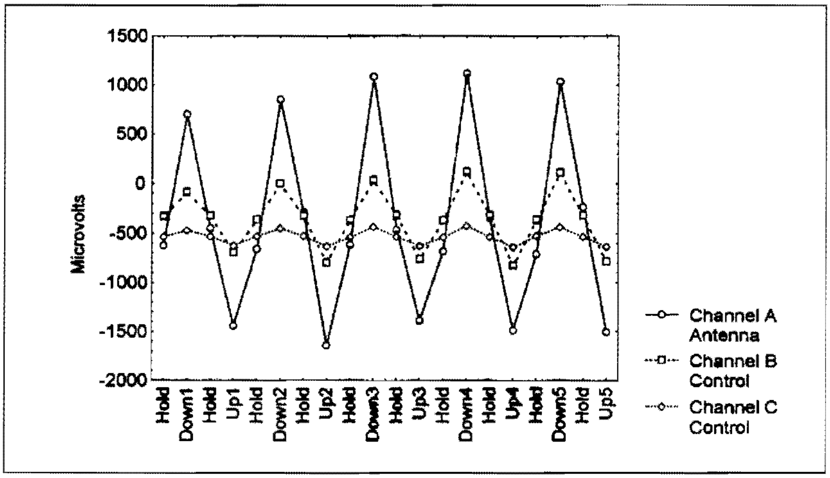

Figure 11. Experiment 2. Movements away form box—antenna channel 1, averaged over subjects

Since Figure 10 clearly shows that the signal decreases with distance (in the presence of the subject), the next question arises—what happens if the subject takes her or his hand closest to the electrode box and places his index finger so that it touches the hole of channel 1 or 3—will the subject function as an antenna-receiver for the experimenter's hand-motions? Note that this finger placement did not result in subjects making direct electrical contact with the metal receptacle for the electrode pin beneath the plastic surface.

Figure 11 displays the scored hand-motion effects, averaged over the six repetitions (one per subject), separately for the three channels (channel A again refers to the channel that was selected to be the antenna-receiver channel, channel C refers to the channel that was furthest away from the channel selected to be the antenna-receiver channel). A clear and selective antenna-receiver effect is observed. It can be seen that down movements were associated with increased positive shifts, and up movements were associated with increased negative shifts, very strongly on channel A, moderately strongly on channel B, and least strongly on channel C (in terms of magnitude of signal). The pattern was replicated for each of the five trials. Analyses of variance for the separate channels revealed highly significant main effects for movement (channel A: F (19,95) = 4.787,

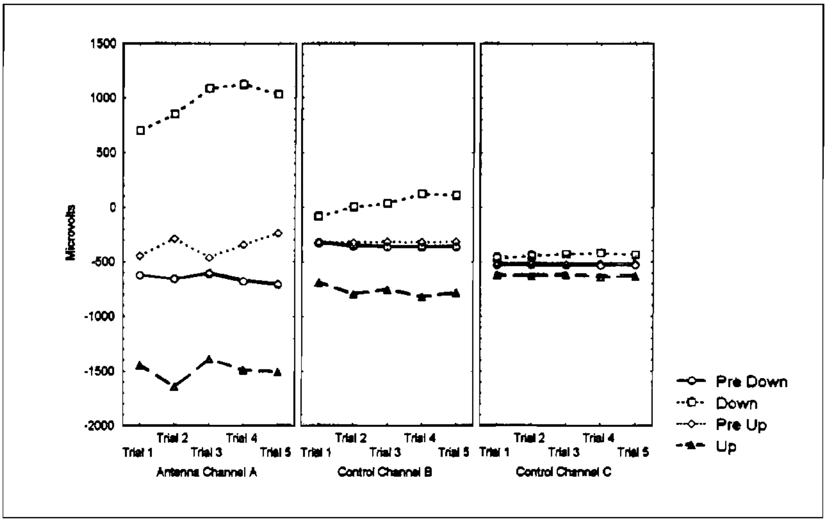

Figure 12. Experiment 2. Movements away from box over trials, antenna channel 1, averaged over subjects.

$p < .001$; channel B: F (19,95) = 2.878, $p < .001$; channel C: F (19,95) = 5.91, $p < .001$). In addition, there was a highly significant interaction of channels and trials (F (38,285) = 2.815, $p < .001$).

Figure 12 displays the scored hand-motions separately for the pre-down, down, pre-up and up values, over the five trials, averaged across the three channels. Similar to Figure 6, Figure 12 suggests a small increase in the magnitude of the hand-movement effects over time in channels A and B. Separate movements (4) by trials (5) analyses of variance yielded a significant movement by trial interaction for channel B (channel A: F (12,60) = 0.949, $p < .506$; channel B: F (12,60) = 1.960, $p < .04$; channel 3: F (12,60) = 1.195, $p < .308$).

The movement patterns appear quite stable and grew somewhat over the 5 trials. The body clearly served as a functional antenna or receiver. Since the subjects were not actually making contact with metal receptacle designed to receive the pins of electrode leads, the signals could have been transferred through the plastic (which possibly has some electrostatic charge itself) and/or the air.

EXPERIMENT 3—HUMAN ANTENNA-RECEIVER EFFECTS FOR ELECTROSTATIC FOOT-MOTIONS

Procedure. The purpose of Experiment 3 was to extend the measurement of electrostatic motion effects to the movements of the feet (generated by the experimenter), to replicate the human/antenna receiver effect in six subjects for electrostatic foot-motions generated by the experimenter, and to determine whether touching the plastic of the electrode box near a given channel would enable the recording of an antenna/receiver effect as touching the hole over the channel itself was predicted to do.

Three conditions were analyzed for Experiment 3. In the first condition, the experimenter raised and lowered the front portion of his right foot 5 times following the sequence "up (one two) down (one two)." The subject was not touching the electrode box. In the second condition, the subject took her or his right index finger and touched the plastic cover of the electrode box 1 cm from the hole for channel 1. In the third condition, the subject took her or his right index finger and touched plastic over the empty hole for channel 1. Unlike Experiment 2 where some subjects touched channel 3, in Experiment 3 all subjects touched channel 1.

It was predicted that minimal electrostatic foot-motions effects would be observed when the experimenter moved his foot a few feet away from the electrode box and the subject was not touching the electrode box (the first condition), that a moderate foot-motion effect would be observed in channel 1 when the subject touched the plastic near channel 1 (the second condition) on the electrode box, and that a large foot-motion effect would be observed when the subject touched the hole directly over channel 1 on the electrode box.

Results. Figure 13A displays two representative foot-motion sequences for the experimenter in the presence of a female subject, Figure 13B displays two representative foot-motion sequences for the experimenter in the presence of a male subject. Since the signals were fairly small using the electrode box alone (with no human antenna), the raw values are shown for touching the hole over channel 1 (the bottom panels) and touching the plastic near the hole over channel 1 (the top panels). For the top panels, the Y axis scale for the female subject was approximately -3000 to +2800 microvolts, the Y axis scale for the

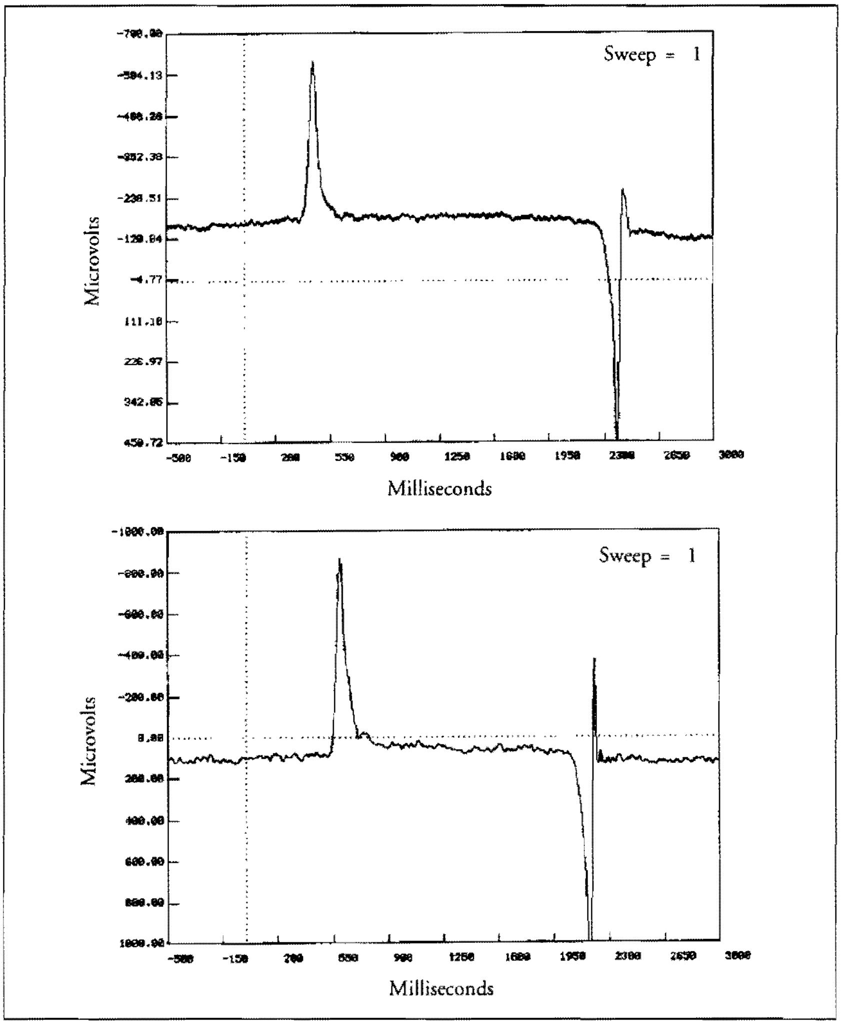

Figure 13A. Experiment 3. Two sample foot movements, antenna. female subject.

male subject was approximately -1400 to +1000 microvolts. For the left panels, the signal was attenuated, the Y axis scale for the female subject was approximately -700 to -250 microvolts, the Y axis scale for the male subject was approximately -700 to +800 microvolts. The Neuroscan software displays negative values up and positive values down.

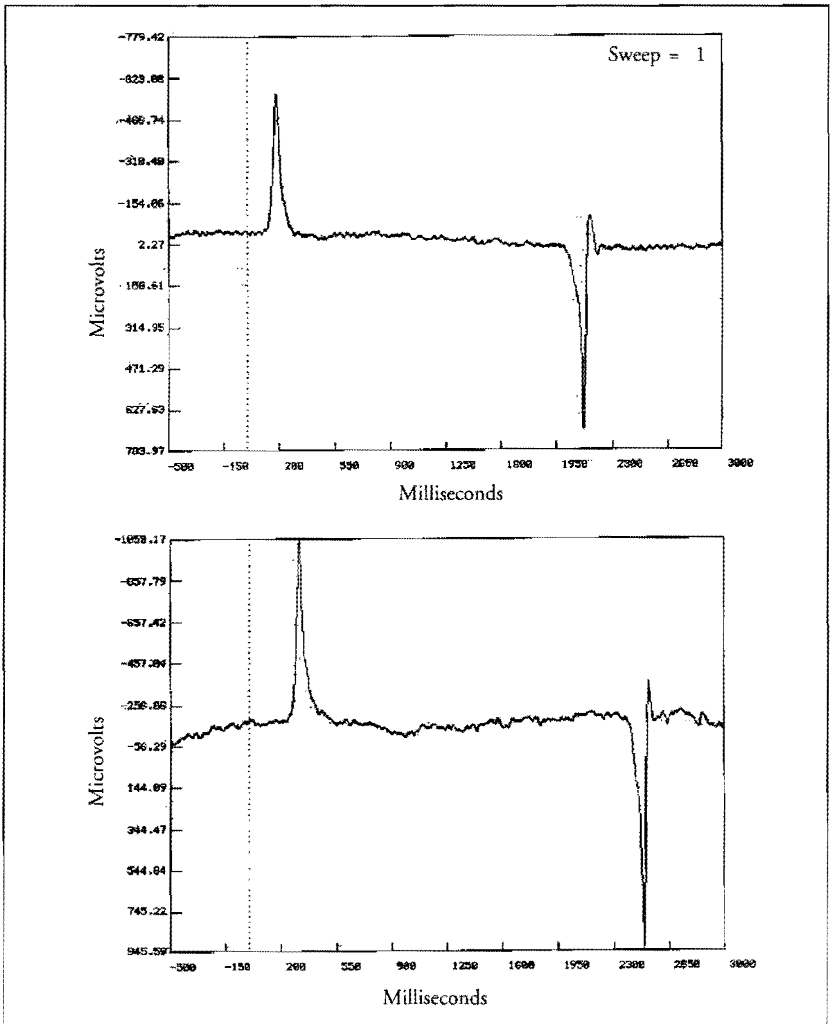

Figure 13B. Experiment 3. Two sample foot movements, antenna, male subject.

Again, the experimenter clearly differed in the magnitude of his overall electrostatic motion effects across subjects. The present study was not designed to investigate stability of foot-motion effects over days in a single subject (the experimenter) and in the presence of different subjects. The experimenter showed similar sequences of changes in the recorded signals within and across subjects. His pattern was highly replicable. Moreover, his foot-motion patterns paralleled his hand-motion patterns. Up movements were typically associated with increased negative shifts (up deflections), down movements were typically associated with increased positive shifts (down deflections). It should be recalled that the sequence was "up (one two) down (one two)" for the foot-motions compared to the "down (one two) up (one two)" sequences for the hand-motions. Since the experimenter was seated during these trials (like the subjects), and was some distance away from the subjects (a few feet), the primary difference between him and the subjects was that he was "grounded" (feet touching the floor) and the subjects were not directly "grounded" (feet were not directly touching the floor).

Again, it is clear that signals associated with the movements were relatively transitory—the signals followed the actual movements, and then returned to a "baseline" while the experimenter was holding his feet still. There was little evidence for "small post-motion" effects, probably because it is easy to keep one's feet stable (when they are down), and relatively easy to hold one's toes up (heel's down).

Figure 14 displays the scored foot-motion effects, averaged over the six repetitions (one per subject), separately for the three channels in the no antenna conditions. In these graphs negative values are displayed down and positive values are displayed up. It can be seen that up movements were associated with increased negative shifts, and down movements were associated with increased positive shifts. Baselines (hold) periods were similar preceding up and down movements. The pattern was replicated for each of the five trials. Analyses of variance for the separate channels revealed significant main effects for channels 1 and 2 (channel 1: $F\,(19{,}95) = 3.967$, $p < .001$; channel 2: $F\,(19{,}95) = 1.906$, $p < .02$; channel 3: $F\,(19{,}95) = 1.080$, $p < .383$). There were no significant interactions of channels with trials.

Figure 15 displays the scored foot-motions separately for the pre-up, up, pre-down and down values, over the five trials, separately for the three channels. Unlike the previous experiments showing a trend for increased signals over trials for hand-motions, the curves here suggest a slight decrease in the magnitude of the foot-motions effects over time. However, separate movements

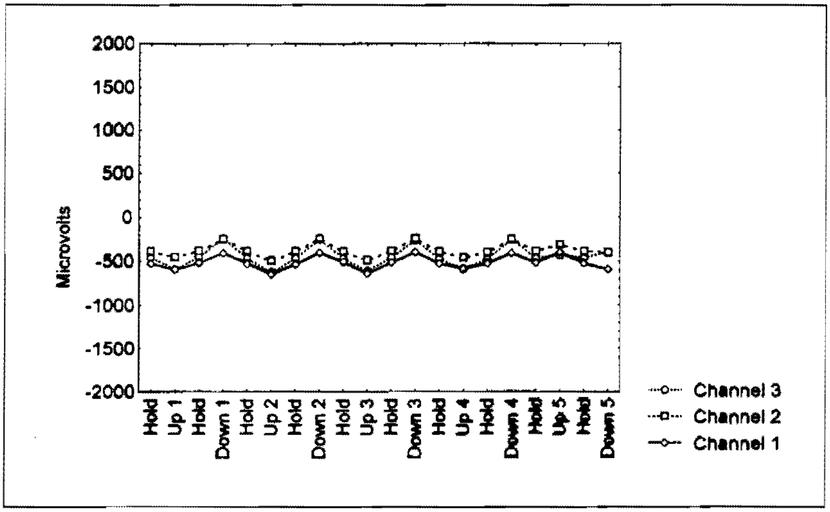

Figure 14. Experiment 3. Foot movement, no antenna, averaged over subjects.

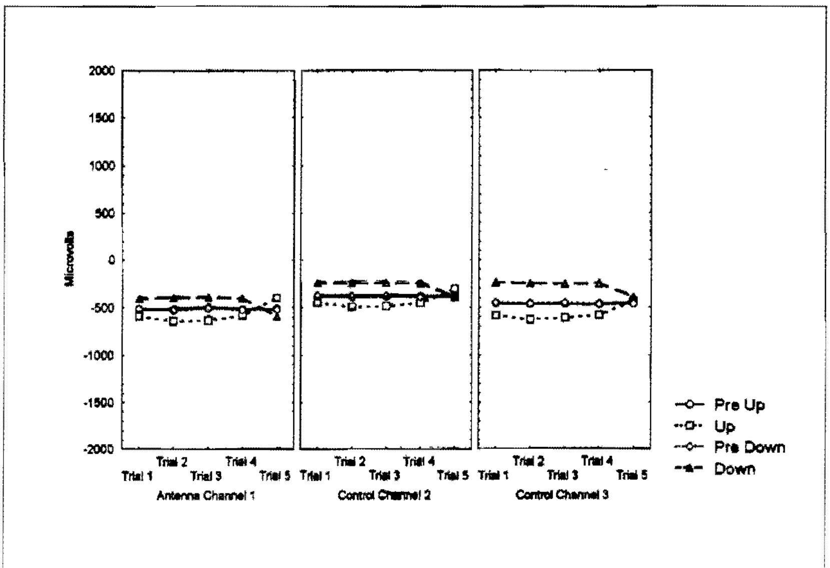

Figure 15. Experiment 3. Foot movement over trials—no antenna, averaged over subjects.

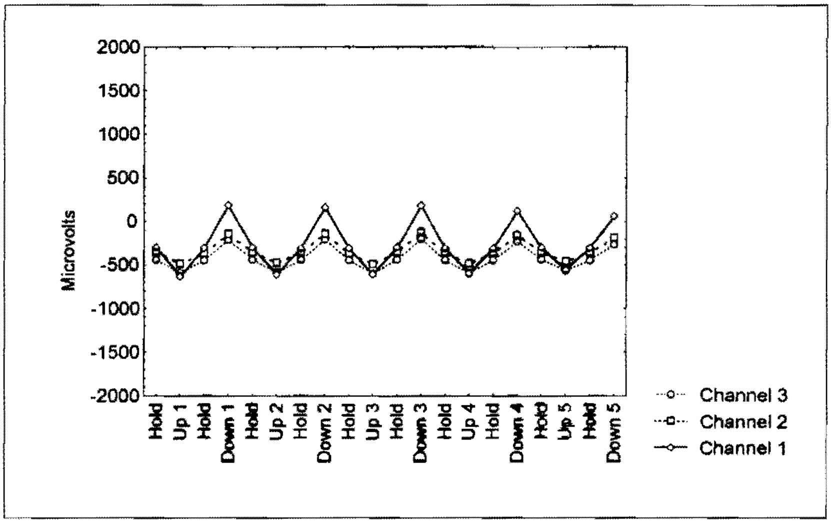

Figure 16. Experiment 3—foot movement—antenna channel 1 plastic, averaged over subjects.

(4) by trials (5) analyses of variance did not yield significant movement by trial interactions (channel 1: F (12,60) = 1.022, p < .440; channel 2: F (12,60) = 1.081, p < .391; channel 3: F (12,60) = 1.002, p < .459).

When the subjects touched the plastic near the electrode hole for channel 1, the magnitude of the signal at channel 1 increased, indicating an antenna-receiver effect. Figure 16 displays the scored foot-motion effects, averaged over the six repetitions (one per subject), separately for the three channels in the touch the plastic near the hole condition. It can be seen that up movements were associated with increased negative shifts, and down movements were associated with increased positive shifts, replicating Figure 14. The magnitude was clearly larger for channel 1. Baselines (hold) periods were again similar preceding up and down movements. The pattern was replicated for each of the five trials. Analyses of variance for the separate channels revealed highly significant main effects (channel 1: F (19,95) = 11.961, p <.001; channel 2: F (19,95) = 5.352, p < .001; channel 3: F (19,95) = 6.750, p < .001). In addition, there was a significant interaction of channels and trials (F (38,285) = 1.832, p < .004).

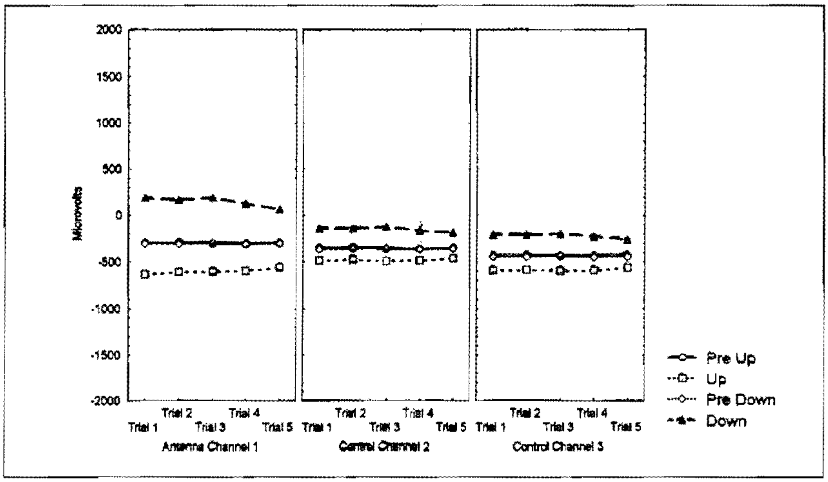

Figure 17. Experiment 3—foot movements over trials--antenna channel 1 plastic, averaged over subjects.

Figure 17 displays the scored foot-motions separately for the pre-up, up, pre-down and down values, over the five trials, separately for the three channels. Replicating Figure 15, Figure 17 suggests a slight decrease in the magnitude of the foot-movement effects over time. Separate movements (4) by trials (5) analyses of variance yielded significant movement by trial interactions (channel 1: F (12,60) = 3.452, $p < .001$; channel 2: F (12,60) = 2.028, $p < .04$; channel 3: F (12,60) = 2.372, $p < .01$). Future research will be needed to determine whether such decreases in electrostatic foot-motion effects over time are due to changes in foot movements over time, changes in electrostatic charge of the shoes and feet over time, and/or changes in the subjects as antenna-receivers over time.

When the subjects touched the hole directly over channel 1, the magnitude of the signal at channel 1 increased further, replicating and extending the antenna-receiver effect. Figure 18 displays the scored foot-motion effects, averaged over the six repetitions (one per subject), separately for the three channels. It can be seen that up movements were associated with increased negative shifts, and down movements were associated with increased positive shifts, replicating Figures 14 and 16. The magnitude was very large for

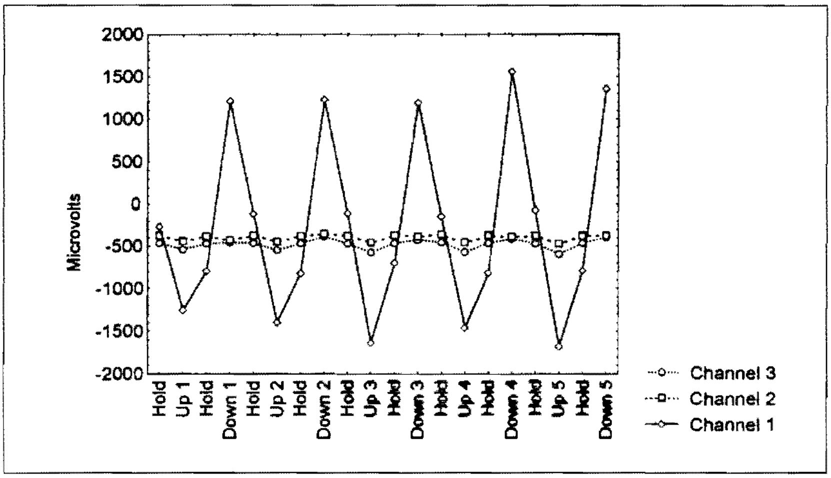

Figure 18. Experiment 3. Foot Movement—touching antenna channel 1, averaged over subjects.

channel 1, and was very small for channels 2 and 3. Baselines (hold) periods were again similar preceding up and down movements. The pattern was replicated for each of the five trials. Analyses of variance for the separate channels revealed a highly significant main effect only for channel 1 (channel 1: F (19,95) = 10.437, $p < .001$; channel 2: F (19,95) = 0.202, $p < .998$; channel 3: F (19,95) = 0.503, $p < .956$). In addition, there was a highly significant interaction of channels and trials (F (38,285) = 8.701, $p < .001$).

Figure 19 displays the scored foot-motions separately for the pre-up, up, pre-down and down values, over the five trials, separately for the three channels.

Replicating Figures 15 and 17, Figure 19 suggests a slight decrease in the magnitude of the foot-movement effect (primarily in channel 1) over time. Separate movements (4) by trials (5) analyses of variance yielded marginally significant movement by trial interactions in channels 1 and 3 (channel 1: F (12,60) = 1.666, $p < .098$; channel 2: F (12,60) = 0.770, $p < .681$; channel 3: F (12,60) = 1.820, $p < .065$).

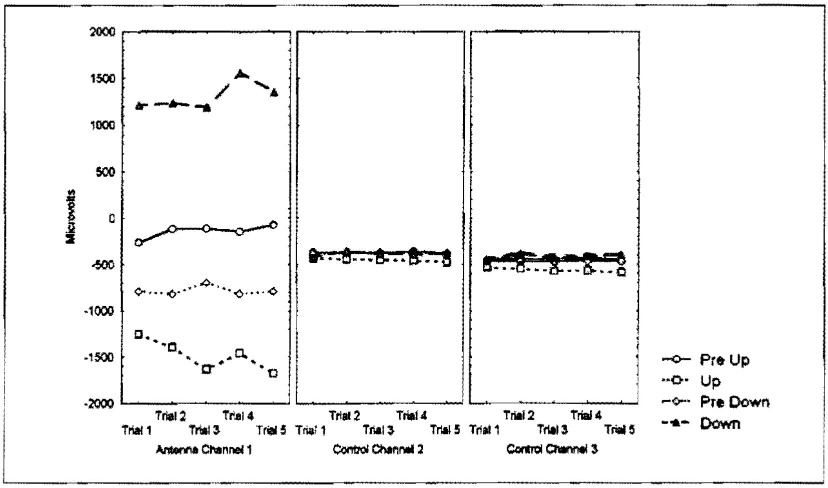

Figure 19. Experiment 3. Foot movement over trials—touching antenna channel 1, averaged over subjects.

DISCUSSION

Green et al's[1] observations of body-motion effects using copper walls as antennas and electrometers as amplifiers can be readily replicated using electrode boxes and human beings as "antennas" and modern DC (or AC) biophysical recording instruments (e.g. EEG or ECG) as amplifiers. These observations, interpreted from the perspective of dynamical energy systems theory, have the potential to stimulate far reaching research on the role of electrostatic body-motion effects in psychology, medicine, and healing.

As shown in the representative raw tracings for each experiment displayed in Figures 1A and 1B, 6A and 6B, and 13A and 13B, electrostatic body-motions can be observed with the naked eye. DC amplifiers are preferable because they do not filter out low frequency signals/movements (or the absence of movements).

However, it is readily apparent that many factors influence the magnitude and shape of the signals. A partial list of possible influences includes:

1. The size of the movements.

2. The distance of the movements from the "antenna" (e.g. the electrode box).

3. The speed and force of the movements.

4. The nature of the moving object (e.g. a finger movement versus a hand movement versus the movement of one's head and hair).

5. The charge of the moving object (e.g. if the subject is grounded, the charge be dissipated).

6. The nature of the antenna (e.g. an electrode box versus a human antenna - see below).

7. The clothing worn by the subjects.

Parametric studies on these and related variables are clearly needed in future research.

In addition, following the logic of dynamical energy systems theory,[2,3] it is plausible to entertain the hypothesis that individual differences such as cognitive states (e.g. conscious intention such as openness versus defensiveness) and emotional states (e.g. relaxation versus anxiety) may influence to some degree the magnitude and variability of a person's electrostatic charge as well as a person's sensitivity and ability to serve as an antenna-receiver for electrostatic body-motions. Future research will be needed to determine whether the human body is primarily a "passive" antenna for electrostatic body-motion effects, or whether the human can function as an "active" receiver for electrostatic body-motion effects as well (e.g. through conscious intention and emotional state of the receiving person).

For example, one wonders whether "loving movements" are associated with distinct electrostatic body-motion effects, and whether being in a receptive, loving state enables one to function as a more sensitive antenna-receiver. In the Russek and Schwartz[8] experiment investigating the registration of one person's ECG in a second person's EEG, it was discovered that subjects who had rated their parents high in loving and caring while in college (and who were significantly healthier 42 years later than subjects who rated their parents low in loving and caring while in college), showed significantly greater registrations of the interviewer's ECG in their EEG's (the data were collected during an eyes closed, pre-interview resting baseline). It is possible that electrostatic interactions between individuals may show similar effects. Further, the ECG-EEG effects described above may interact with the electrostatic effects described in this paper.

Many factors (including sex, family history, personality, climate, clothing, energy sources in the vicinity, etc.) may influence the magnitude of the electrostatic charge and hence the expression of this charge in movement. Similar factors may influence the magnitude of the registration of the electrostatic body-motion effects by others (serving as a human antenna-receiver). Also, the nature of the social relationships may influence the degree of interaction. For example, loving relationships (e.g. intimate or bonded relationships) may be associated with greater electrostatic body-motion effects, greater antenna-receiver effects, and therefore, greater dynamical energy systems interaction effects.

The present series of experiments were designed to establish the possibility of measuring electrostatic body-motions and the human antenna-receiver effect. It is conceivable that the anomalous electrostatic effects observed following meditation, especially in people who practiced non-contact therapeutic touch methods, may reflect the build up of electrostatic charges as hypothesized by Green et al.[1] In addition, noncontact healing touch may operate in part through the electrostatic body-motion effects created by the movements of the healer's hands over the body (accompanied by their intentional and emotional/loving state) and the receptivity of the patient as well the healer to this energy and information.[6] Of course, electrostatic body-motion effects are probably not involved in purported distant healing effects (or healing that has occurred when the patient or tissue culture was electromagnetically shielded from the healer)—however, the information carried by the electrostatic body-motion effects (which expresses the intention behind the movements) may still play a role and should not be ignored.

It is possible that the build up and dissipation of electrostatic charge may have played a role in the so-called "orgone energy" therapy (and "boxes") investigated by Wilhelm Reich.[9] His controversial work may profit from being reexamined in light of modern advances in theory and method suggested in this paper.

Electrostatic effects can sometimes be readily witnessed by the naked eye. Moving one's hand over one's arm can sometimes cause visible movements of the hairs of the arm or the head. Hair serves as a both a generator of electrostatic motion effects and an antenna-receiver of this energy and information. The most endearing expression of the method explained in this paper was observed anecdotally when we were piloting the procedures using a portable EEG system (Thought Technology's ProComp+ System) in the first author's home office. Russek was making various body-motions from a distance of a few feet, Schwartz was serving as the antenna-receiver. Our 2 year old West Highland White Terrier happened to enter the study, causing the EEG amplifiers to saturate. We requested that "Freudy" (our Westie's name) sit down in the doorway. He did so, but he continued to wag his tail. His tail wags were clearly visible as regular up and down signals on the computer screen!

Furry animals are veritable electrostatic generators. When they move, they create electrostatic body-motion effects, not only as they move their tissues, but also as they wave their hair. Electrostatic body-motion signals may be important in communication. Claims that people can sense the "movement" and "energy" of others from a distance with their eyes closed may involve the registration and perception of electrostatic body-motion effects. Animals may be especially good at this. Current research underway in our laboratory is exploring factors that influence the registration and potential perception of electrostatic body-motion effects.

Of course, local and systemic circulation of the blood, since it involves the continued movement of charged particles, should create electrostatic effects that accumulate over time (since the tissues can function as a capacitor).[5] It follows that disease may involve alterations in local electrostatics. Dynamic "capacitive electric field effects" described by Green et al[1] have the potential to modulate biochemical processes and hence electromagnetically massage, so to speak, cellular processes. Physical contact between loved ones (including the stroking of the hair of pets) may provide a form of electrostatic treatment. The ancient practice of parent's "kissing a child's wounds" may have electrostatic effects in addition to emotional effects (this hypothesis was suggested by Mrs. Elayne Russek).

Though research on electrostatic body-motion and the human antenna-receiver effects is clearly in its infancy, we believe that it opens a wide window to basic and clinical research that may have important technological applications to clinical practice (e.g. future electrostatic body-motion biofeedback for diagnostics and treatment). Hopefully it will shed new light on dynamical energy systems interactions in health and healing, and in the process, expand our vision of the role of consciousness, information and energy in everyday life.

• • •

ACKNOWLEDGEMENT: We dedicate this paper to Elmer E. Green, Ph.D., a visionary physicist, who encouraged the pursuit of the research reported here.

CORRESPONDENCE: Gary E. R. Schwartz, Ph.D. • Department of Psychology, University of Arizona • P.O. Box 210068, Tucson, AZ 85721-0068 • Phone: 520-621-5497 FAX: 520-621- 9306 E-mail: GSCHWART@u.arizona.edu

REFERENCES & NOTES

1. E. E. Green, P. A. Parks, P. M. Guyer, S. L. Fahrion, S. L. & L. Coyne, Anomalous Electrostatic Phenomena in Exceptional Subjects, *Subtle Energies* 2,3 (1991), pp. 69-94.
2. L. G. Russek & G. E. Schwartz, Energy Cardiology: A Dynamical Energy Systems Approach for Integrating Conventional and Alternative Medicine, *ADVANCES: The Journal of Mind-Body Health* 12,4 (1996), pp.12-24.
3. G. E. Schwartz & L. G. Russek, Dynamical Energy Systems and Modern Physics: Fostering the Science and Spirit of Complementary and Alternative Medicine, *Alternative Therapies in Health and Medicine* 3,3 (1997), pp. 46-56.
4. J. Orear, *Fundamental Physics* (John Wiley & Sons, New York, NY, 1962).
5. J. Malmivuo & R Plonsey, *Bioelectromagnetism* (Oxford University Press, New York, NY, 1995).
6. G. E. Schwartz, L. G. Russek & J. Beltran, Interpersonal Hand-Energy Registration: Evidence for Implicit Performance and Perception, *Subtle Energies* 6,2 (1995), pp. 183-200.
7. I. Bentov, *Stalking the Wild Pendulum: On the Mechanics of Consciousness.* (Bantam Books, New York, NY, 1979).
8. L. G. Russek & G. E. Schwartz, Interpersonal Heart-Brain Registration and the Perception of Parental Love: A 42 Year Follow-up of the Harvard Mastery of Stress Study, *Subtle Energies* 5,3 (1994), pp. 195-208.
9. W. Reich, *The Discovery of the Orgone. Vol. I, The Function of the Organism* (T. P. Wolfe, Translator, Orgone Institute Press, New York, NY 1942), 2nd Ed. Farrar, Straus & Giroux, New York, NY, 1961).

∞ ∞ ∞