PHYSIOLOGICAL CONCOMITANTS OF THE LAYING-ON OF HANDS: CHANGES IN HEALERS' AND PATIENTS' TACTILE SENSITIVITY

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ABSTRACT

Nine traditional Healers, 12 of their Patients, 11 Healer Simulators, and 20 Patient Controls participated in a study to examine a variety of physiological concomitants of the "laying-on of hands." Focused ultrasound was used to obtain participants' tactile-sensitivity thresholds. Tactile thresholds were re-examined: (1) after healing interactions (Healers, Patients), (2) after simulated healing interventions (Healer Simulators), or (3) after rest intervals with no prior healing-related activity (Patient Controls). Presession to postsession changes for the four groups of participants were examined with Repeated Measures Analysis of Covariance (ANCOVA), controlling for age. The ANCOVA found a significant Main Effect of Group ($F = 31.20$, $df = 3,34$, $p < .0001$). Post-hoc Tukey tests determined that changes in Healers' right-hand fingertip thresholds were significantly different from changes in the right-hand fingertip thresholds of Patients, Healer Simulators, and Patient Controls. Patients' right-hand fingertip-threshold change also differed significantly from that of Patient Controls. Repeated Measures ANCOVA performed on Healers' and Patients' right- and left-hand palm sensitivity thresholds showed a significant Main Effect of Time (Before vs. After) ($F = 5.78$, $df = 1,9$, $p = .04$), and a significant Time x Group interaction ($F = 7.04$, $df = 1,9$, $p = .02$). No significant task-dependent changes were found in auditory reaction-time tests conducted with the four groups of participants. Discussion includes pilot data from a variety of supplementary tests.

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The *laying-on of hands* is a psychic healing tradition rooted in antiquity that continues to be practiced, in various guises, in diverse cultures. Whether or not this healing intervention truly succeeds (see Solfvin, 1984, for a discussion of the difficulties attending the assessment of psychic healing regimens), the virtue of the laying-on of hands technique is presumed by its adherents to reside in cutaneous sensibility and in an anomalous form of healing power or energy that is transferred through the hands from the healer to the recipient.

Physiological sensations of various kinds have been reported by self-described “healers” who introspect about their alterations in perceptual awareness when attempting to heal. A content analysis, drawn from interviews and autobiographical texts of psychic healing practitioners (Cooperstein, 1992), included reports of both hyperarousal and hypoarousal; somatic oscillations and/or rhythmic reverberations; thermal changes of warmth and/or coldness; wavelike sensations; a quasi-ineffable energy layer about the body; and flowing currents described as moving through the body from the feet to the hands. In addition, Cooperstein’s healing practitioners reported subjective alterations in emotional responsiveness and a shift towards nonanalytical, noncritical thinking. The perception of hand differences in presumed healing potential has also been reported in another recent compilation of the introspections of healers (Benor, 1992).

Despite widespread popular interest in the laying-on of hands and its potential benefits, relatively few parapsychologists have attempted to examine this phenomenon in the laboratory (see Benor, 1992; Krippner and Villoldo, 1986; and Murphy, 1992/1993, for contemporary summaries of laboratory research). Such studies as there are have been proof- rather than process-oriented, and they have attempted to measure the effects of such healing on plants and/or lower animals or bacterial organisms (Grad, 1965; Macdonald, Hickman, & Dakin, 1977; Rauscher, 1990; Rauscher and Rubik, 1980; Watkins and Watkins, 1971); on enzymes (Edge, 1980; Krieger, 1976; Rein, 1986; Smith, 1972); or on an inanimate intervening substance (Dean, 1986; Dean and Brame, 1975; Grad, 1965; Miller, 1977; Schwartz, De Mattei, Brame, & Spottiswoode, 1990). Only two studies employing double-blind laboratory techniques have attempted to measure its effects directly on humans (Wirth, 1990; Wirth and Mitchell, 1994). Although significant results have been reported in nearly all of these studies, it is not clear whether the effects stem purely from healers’ mental intentions, an anomalous form of energy flowing from the healers’ hands, some combination of both, or other factors altogether. The experiments of Braud (1978, 1979), Braud and Schlitz (1983, 1989); and Braud, Shafer, and Andrews (1993a, 1993b) have demonstrated that mental intention alone can affect human physiology at a distance. Although the implication of this finding for the study of psychic healing is immense, there may be paranormal components unique to a traditional laying-on of hands encounter that would necessarily be overlooked in the study of distant mental influence. Progress in conceptualizing human healing potential and its interface with physical and/or mental factors can only come from research conducted from a variety of empirical perspectives.

The present study examined physiological concomitants of the laying-on of hands to determine whether any factor associated uniquely with healers could be identified. A process- rather than proof-oriented approach was adopted, with an intent to study selected physiological changes that might attend the healing activity. Participants were evaluated with a variety of tests. Of particular interest was tactile sensitivity, because it seemed reasonable to suppose that the fingertips and/or palms of healers might show some effect from a healing force or energy, if there

was one. We also wished to look at auditory sensibilities to compare how an alternate sensory system might be affected. Pilot tests with electrocardiography (EKG) were also performed. A clinical neuropsychologist evaluated healers and their patients with a battery of hemispheric laterality and emotional status tests. Formal hypotheses were not advanced, but the heuristic intent of the study was to determine whether healers who practiced the laying-on of hands could be differentiated from their patients and/or normal controls on the basis of physiological concomitants of the healing activity.

METHOD

Experimental Participants

Healers. Healers were 9 residents of St. Petersburg, Russia (5 females and 4 males, ranging in age from 18 to 84), who actively engaged in the laying-on of hands on a professional basis. Healers were admitted to the study only if their reputations in the community suggested that they were motivated by a sincere desire to benefit their clients.

Patients. Patients were 12 clients of the healers (all females, ranging in age from 22 to 53) who suffered from hypertension and other medical problems. The patients, without exception, displayed confidence in the ability of their healers to improve their physical conditions.

Healer Simulators. This group was composed of 11 healthy normals (10 females and 1 male, ranging in age from 20 to 55). Members of the laboratory staff where the research was conducted (see Appendix) participated as Healer Simulators, as did friends, relatives, and associates of the experimenters.

Patient Controls. Patient Controls were 20 healthy normals (16 males and 4 females, ranging in age from 20 to 58) who were employed at a nearby factory. Workers from the factory routinely participated in laboratory testing as a means of augmenting their incomes. The purpose of this group was two-fold. Tests were conducted to gather background normative data against which the data of the other groups of participants could be compared. The factory workers also served as experimental controls for Patients because they were retested after rest intervals during which no healing-related activity occurred. There were 5 factory workers in each of four age groups (20-29 years; 30-39 years; 40-49 years; and 50-59 years). The factory workers were tested prior to the other groups of participants and were not aware that they were participating in a study of psychic healing.

Tasks

Performing Healing. Healing interventions were performed according to a laying-on of hands technique popular in Russia, where the healer makes rapid hand passes simultaneously with both hands, approximately 3 to 6 inches from the patient's skin surface, moving from the top of the head downward along the contours of the recipient's body.

Receiving Healing. Patients presumably adopted an attitude that was receptive to being healed, but otherwise they sat passively during the healing interventions.

Simulating Healers. Healer Simulators engaged in simulated healing interventions with real or
imaginary patients by mimicking the hand motions that were employed when Healers performed the laying-on of hands.

Simulating Patients. Patient Controls sat quietly in the laboratory while waiting to be retested.

Tests

Tactile thresholds. A method of focused ultrasound was used to obtain participants' tactile-sensitivity thresholds. Briefly, the method consists of a focused beam of high-frequency ultrasonic oscillations, mechanically applied through water to the surface of the skin (see Gavrilov et al., 1976, 1977, for full descriptions of the technique). In our tests, ultrasonic stimuli with a resonant frequency of 1.9 Mhz were applied to the skin surface at the glabrous center of the primary phalange of each finger tested. Palms were tested at the center of the palm. The area of stimulation was equal to 1mm in diameter. Rectangular ultrasonic pulses of 1 ms duration were delivered at the rate of one pulse per two seconds (0.5 Hz), the intensity gradually increasing in one dB steps until tactile sensation appeared. The stimulus intensity (in dB) that produced sensation in at least two of three stimulus presentations was used as the threshold.

Tactile thresholds were collected by the ascending method of limits from the five fingers of each hand (F1 being the thumb and F5 being the smallest finger) for the group of 20 factory workers, before and after a rest interval. This 10-finger data collection procedure, although thorough, was deemed impractical by the experimenters because it was too time consuming. It was also decided, at this juncture, that Healers' and Patients' palm-site thresholds might be of theoretical interest, and that the lengthy 10-finger protocol would preclude the collection of palm-site data. Therefore, the procedure was modified, and thresholds for Healers, Patients, and Healer Simulators were obtained from the index (F2), middle (F3) and ring (F4) fingers of each hand. Thresholds for left- and right-hand palm sites were also collected from Healers and Patients. (Additional palm-site data, collected from three Healer Simulators, was not sufficient for group analysis.)

Left- and right-hand fingertip thresholds, before and after the tasks (performing healing, receiving healing, simulating healing, or resting), were collected and compared for 6 Healers, 7 Patients, 6 Healer Simulators, and 20 Patient Controls. Left- and right-hand palm-site thresholds, before and after the tasks, were collected and compared for 5 Healers and 7 Patients. (Preliminary analyses included a priori threshold data provided by 3 additional Healers who were tested on the right hand only; and 1 Patient and 2 Healer Simulators who did not complete the primary tasks.)

Auditory Reaction Time. An insulated acoustical (soundproof) chamber was utilized to collect data on simple manual reaction time (RT) to auditory stimuli. The chamber, 62.6 cubic meters, contained a special floating foundation to eliminate vibrations caused by city transport vehicles. The noise level within the chamber was 40 dB (A) RMS. The frequency range was from 20 Hz to 20 kHz. The outer signal attenuation was 45 dB at 1000 Hz. The test equipment included a generator with a sound interruptor, isodynamic earphones, a response button that the subject pushed when the stimulus was detected, and an electronic timer (accuracy 0.1 ms). The earphones had sound pressure oscillations of no more than 1 dB within the range from 500 to 2000 Hz, the step from one frequency to another being 50 Hz. Pure-tone stimuli were delivered monaurally (duration 0.5 seconds; frequency 1000 Hz). The average RT, calculated from nine out of ten stimulus presentations, was used as the measure of auditory RT. Simple auditory RT to acoustical stimuli was tested before and after healing interactions (6 Healers, 8 Patients), simulated healing interactions or tasks (5 Healer Simulators), or rest intervals with no intervening healing related activity (19 Patient Controls).

Procedure

On arriving, participants were greeted by M.C.M. and I.A.V. and taken to I.A.V.'s office where they responded to questionnaires that solicited background information. Healers were asked to describe their healing activities and to introspect about their physiological sensations when attempting to heal. The experimental tests were described, and depending on participants' schedules (and/or willingness to take part in the various tests), they were assigned to one or more of the test conditions. Some participants were assigned only to tactile or auditory conditions; others took both tactile and auditory tests. (Some participants also engaged in blood pressure and EKG evaluation, hemispheric laterality and emotional status tests, and/or auditory thresholds tests—see Supplementary Tests section below.) Several participants visited the laboratory on more than one occasion to take part in the various tests.

Participants who were to engage in tactile-threshold testing were then ushered to the laboratory on the floor below for the initial testing. The participant sat at a table that held the focused-ultrasound device. The ultrasound technician filled the tube of the device to the brim with water. After positioning one of the participant's fingers on the mouth of the tube, the technician retreated to the experimenter's module (out of view of the participant) to administer the stimuli. When participants detected a stimulus on the surface of their fingertip, they gave an oral response. After a series of stimuli had established the fingertip threshold, the technician returned to remove the participant's finger from the device. Water was added to the tube to compensate for any spillage that might have occurred when the participant's finger was removed. The technician then positioned a second finger on the mouth of the tube, and retreated to administer the stimuli. Palm-site data were obtained after the fingertip thresholds had been established.

Participants who were to engage in auditory testing were ushered to the soundproof chamber for the initial auditory tests. The auditory RT tests were automated, with the participant seated at a table which held a response button. The stimuli were presented through earphones. The first presentation served to accustom the participants to the procedure and was not used in the calculation of performance. The experimenter presented the stimuli and monitored the responses from the adjacent laboratory.

Healers then met with their Patients (Healer Simulators met with their assigned Patients). Immediately after the healing interventions (or simulations), participants were retested on the tactile-threshold tests or on the auditory RT tests. Patient Controls were retested after a rest interval.

Statistical Analyses

Statistical analyses were conducted by M.C.M. and R.R. on a DEC 333c PC-AT computer using SAS (v. 6.04) software. Tests included correlations between tactile-threshold measurements of different fingers, and analysis of variance (ANOVA) and covariance (ANCOVA), controlling for age (using Type III sums of squares). ANCOVA evaluated tactile and auditory RT thresholds for the Main effects of Group (Healers, Patients, Healer Simulators, and Patient Controls), Hand (Right vs. Left), and/or Time (Before vs. After), and their interactions. Post-hoc pairwise comparisons between groups were conducted by Tukey's HSD test, controlling the Type I error rate at $p < .05$ within each analysis.

RESULTS

Tactile Threshold Tests

Background Tests. Our first objective was to examine the range of fingertip sensitivities in the control group of factory workers (i.e., Patient Controls) for the purpose of establishing background norms against which the sensibilities of the other groups of participants could be compared. Pearson correlational analysis showed Patient Controls' 10 fingertip thresholds to be positively intercorrelated, with ipsilateral and contralateral contrasts ranging from $r = 0.65$ to $r = 0.93$ ($p < .002$ in all cases).

We also wished to examine fingertip-threshold changes (before vs. after the task) in the group of factory workers, who had not been exposed to any healing-related activity prior to retesting. The significant fingertip intercorrelations permitted us to reduce the large amount of fingertip data we had collected to participants' means. To facilitate the statistical analyses, and to make factory workers' data compatible with other groups' data, a fingertip threshold mean (FTM) was derived from fingertip thresholds for F2, F3, and F4 of each hand. A Repeated Measures ANOVA on data from the four age groups of factory workers examined initial and subsequent FTMs for left and right hands. The ANOVA found a significant Main Effect of Age ($F = 11.52$, $df = 3,16$, $p = .0003$).

Not surprisingly, there was a clear increase (desensitization) of tactile thresholds with the increase of subjects' ages; tactile sensitivity was greatest in younger subjects and poorest in subjects over 50. Post-hoc Tukey tests determined that the left-hand FTMs of the oldest age group (subjects over 50 years) differed significantly from all other age groups. The right-hand FTMs of the oldest age group differed significantly from each of the two age groups under 40 years. The ANOVA also showed a significant Main Effect of Time ($F = 59.84$, $df = 1,16$, $p = .0001$), with FTMs dropping (sensitivity increasing) between the initial and subsequent tests. No significant Main Effects of Hand (left vs. right) were seen in the factory workers' data. These data are presented in Figure 1.

We next examined fingertip thresholds with Pearson correlational analyses for F2, F3, and F4, within and between hands, for the group of Healers, Patients, and Healer Simulators. The

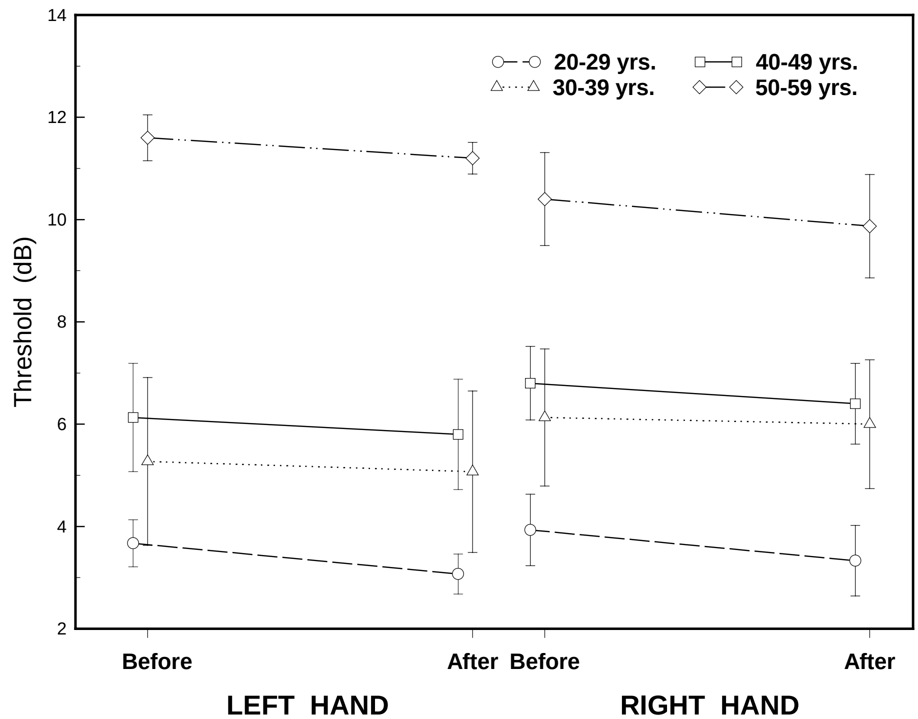

Fig. 1. Tactile-thresholds (mean + / – s.e.m.), by age group, for the control group of factory workers before and after resting.

Pearson correlations were positive and ranged from r = .49 to r = .91. All contrasts with one exception (left F4 with right F2) were significant at p < .05. Correlations between the fingers and palms tended to be lower, ranging from r = .30 to r = .90, and were nonsignificant for 1/3 of the contrasts. Left- and right-palm thresholds correlated at r = .71, p = .0005. As with Patient Controls' data, FTMs for each hand were computed for Healers, Patients, and Healer Simulators.

A priori sensitivity. Our next objective was to determine if the four experimental groups (Healers, Patients, Healer Simulators, and Patient Controls) differed in innate tactile sensitivity, as measured by participants' thresholds on their initial tests taken on their first visit to the laboratory. Given the significant age-related differences shown by the factory workers, all subsequent analyses controlled for age by using Analysis of Covariance (ANCOVA). ANCOVAs were performed separately for each hand on the four groups' initial FTMs. The left-hand FTM ANCOVA showed a significant Main Effect of Group (F = 3.76, df = 3,41, p = .019). Post hoc Tukey tests showed that Healer Simulators' left-hand thresholds were significantly lower than Patients' left-hand thresholds. The right-hand FTM ANCOVA also showed a significant Main Effect of Group (F = 4.22, df = 3,40, p = .011). Tukey tests determined that right-hand sensitivity was significantly greater for the group of Healers than for the factory workers. Means for the four groups' initial (a priori) thresholds are presented in Figure 2.

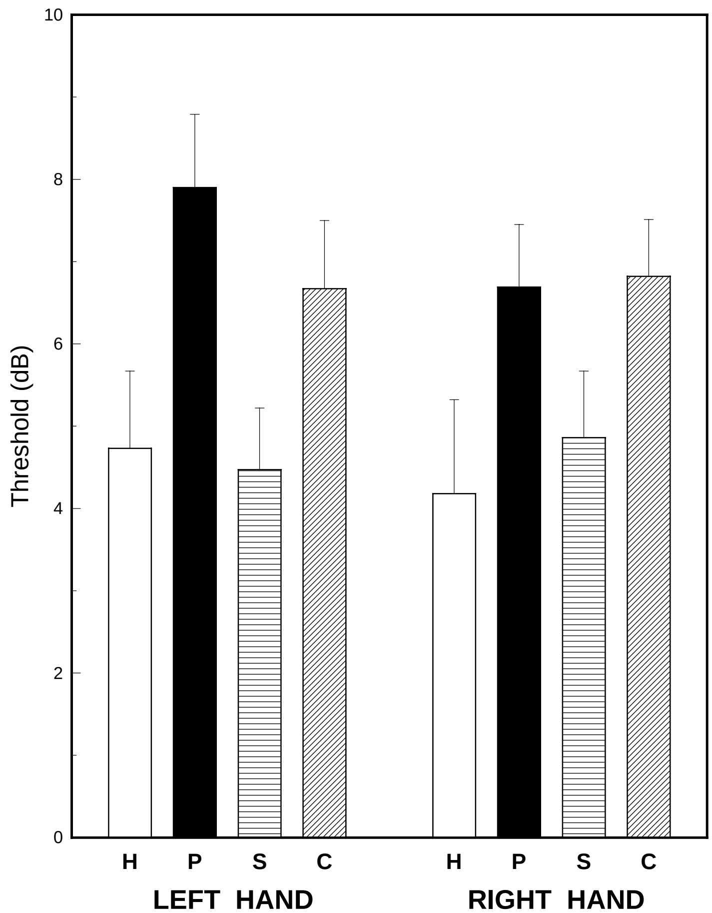

Fig. 2. A priori tactile-thresholds (mean + s.e.m.) for Healers (H), Patients (P), Healer Simulators (S), and Patient Controls (C).

Main Analysis. Having established the innate tactile-thresholds of our participant groups and noted the sensitivity differences between groups, we proceeded to our main objective. We sought to determine if the groups of Healers, Patients, Healer Simulators, and Patient Controls showed tactile-threshold changes that differed as a function of task (healing, receiving healing, simulating healing, or resting). For this analysis, FTMs were averaged within participant for task and role.

An ANCOVA with age as a covariate was performed on the left- and right-hand threshold-change scores of Healers, Patients, Healer Simulators, and Patient Controls. The change scores were computed by subtracting each participant's initial (Before) FTM score from their subsequent (After) FTM score. With this method, positive threshold-change scores indicated a raising of threshold (loss of tactile sensitivity) after the task, whereas negative scores indicated a lowering of thresholds (gain in tactile sensitivity) after the task. The ANCOVA showed a significant Main Effect of Group ($F = 31.20$, $df = 3,34$, $p < .0001$). There was no significant Main Effect of Hand (Left vs. Right), but the Hand x Group interaction approached significance ($F = 2.84$, $df = 3,34$, $p = .053$). Figure 3 presents the four groups' mean threshold changes for left and right hands.

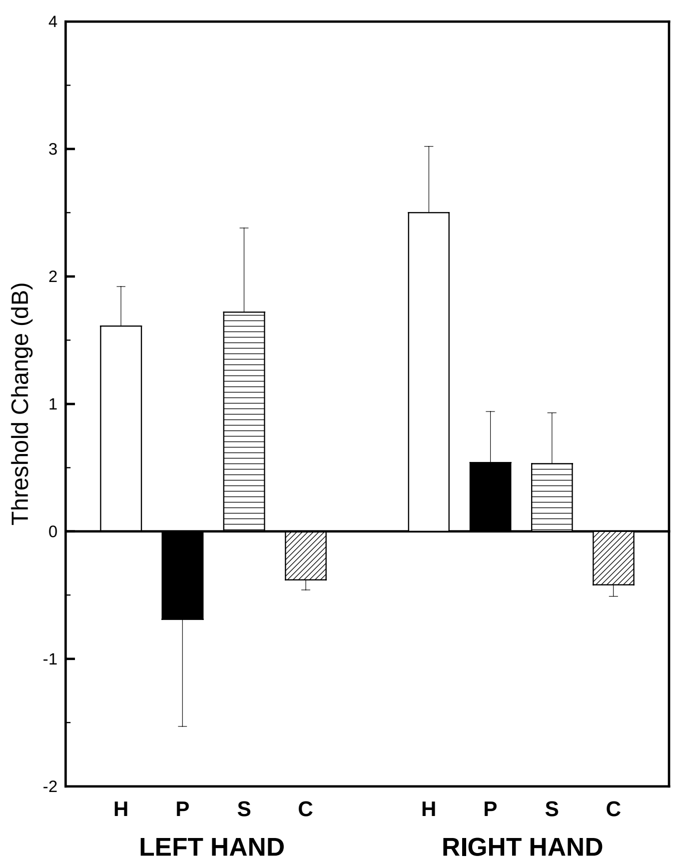

Fig. 3. Change in tactile-thresholds (mean + / – s.e.m.) for Healers (H), Patients (P), Healer Simulators (S) and Patient Controls (C).

Tukey tests demonstrated that on the left hand, Healers and Healer Simulators showed comparable changes in sensitivity after healing or simulating healing. The change for both groups constituted a rise in threshold (loss of sensitivity). Both Healers' and Healer Simulators' left-hand changes differed significantly from those of Patients and Patient Controls, who showed a lowering of threshold (gain in sensitivity) on the left hand after receiving healing or resting.

On the right hand, Tukey tests showed that Healers' thresholds changed significantly more than did the thresholds of Patients, Healer Simulators, or Patient Controls. The direction of change for healers again indicated a loss of sensitivity. Patients and Healer Simulators also showed decrements in right-hand sensitivity after the tasks, whereas Patient Controls showed an

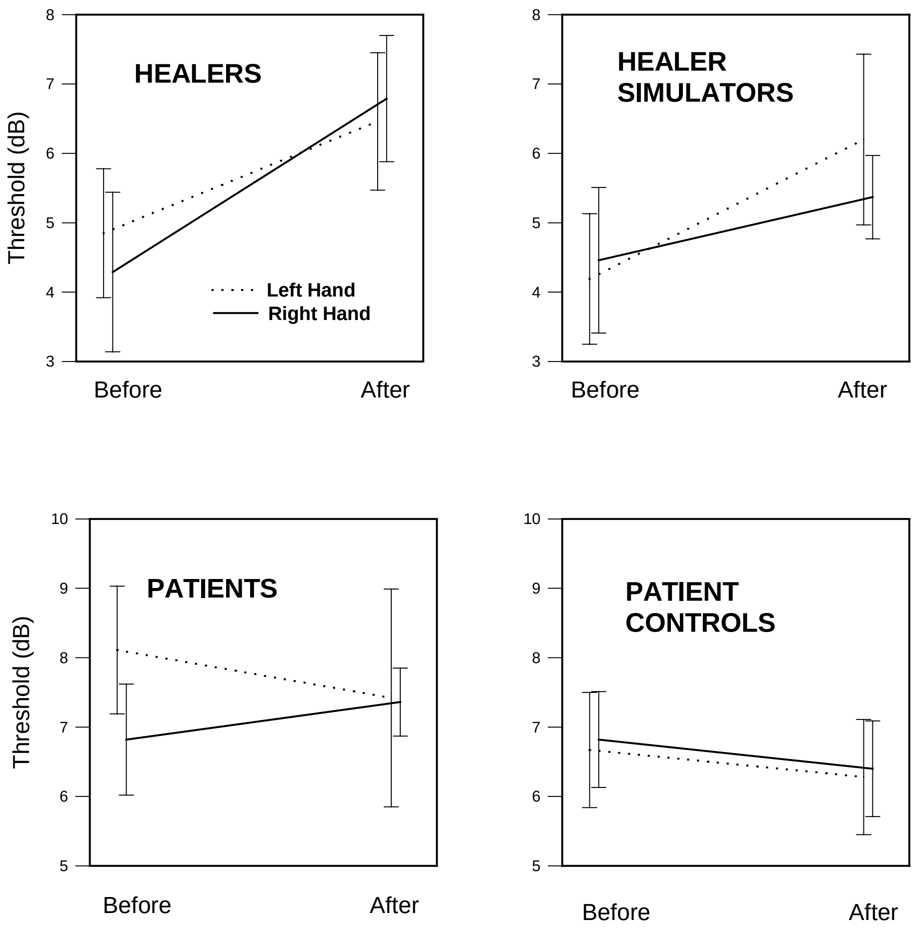

Fig. 4. Left- and right-hand FTM change (+ / – s.e.m.) for four groups of participants.

increase in sensitivity after resting. Tukey tests indicated that Patients' right-hand sensitivity change was significantly different from the right hand change in the group of Patient Controls. of Patient Controls. Figure 4 shows the direction of mean left- and right-hand changes for each of
the four groups separately.

Palm-site Analysis. A repeated-measures ANCOVA was performed on Healers' and Patients' left- and right hand palm-site threshold scores. The ANCOVA showed a significant Main Effect of Time (F = 5.78, df = 1,9, p = .040) and a significant Time x Group Interaction (F = 7.04, df = 1,9, p = .026). Figure 5 presents these data. A reciprocal interaction can be seen in the figure, with Healers' palm sensitivity on both hands decreasing after healing, while Patients' palm sensitivity increased.

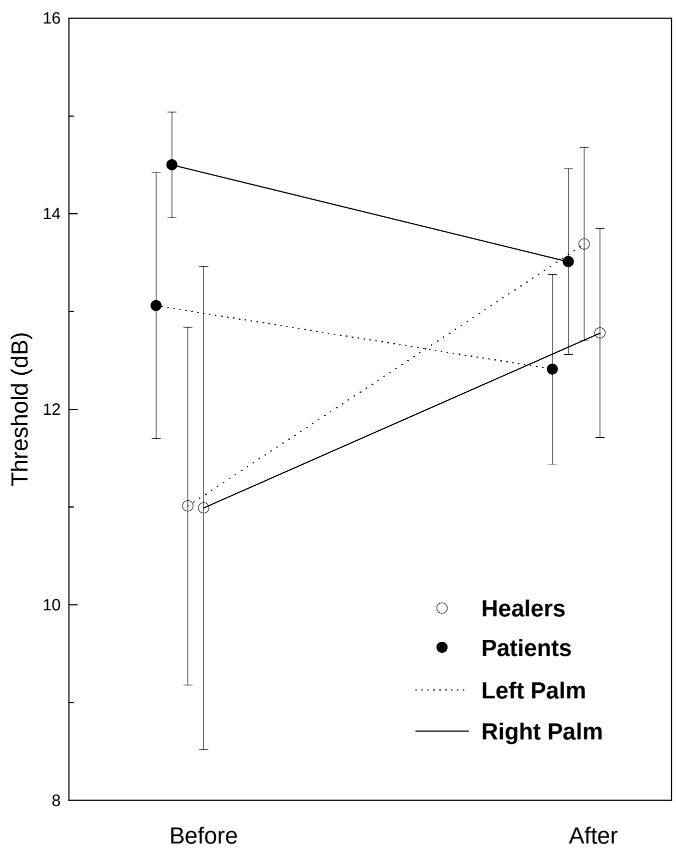

Fig. 5. Palm-site thresholds (mean + / – s.e.m.) for Healers and Patients, before and after healing interactions.

Auditory RT Tests

Auditory RT data were analyzed by Repeated Measures ANCOVA for the Main Effects of Group (Healers, Patients, Healer Simulators, and Patient Controls) and Time (Before vs. After), using Age as a covariate. The ANCOVA showed that age is a significant factor in auditory RT (F = 15.00, df = 1,33, p = .0005). As with tactile thresholds, auditory thresholds increased with age. A Main Effect of Group was also observed (F = 3.75, df = 1,33, p = .020), but post hoc Tukey tests showed that the only significant difference was between Healer Simulators and Patient Controls on their initial (a priori) tests, where Healer Simulators' reaction-time to acoustical stimuli was faster than that of Patient Controls.

SUPPLEMENTARY TESTS

Blood Pressure and Heart Rhythm Tests

A family of Healers (an 84-year-old grandmother, her 52-year-old daughter, and her 30-year-old granddaughter), accompanied by three Patients, came to the laboratory. The patients were suffering from hypertension and cardiac arrhythmia.

Blood pressure. I.A.V. (a medical doctor) monitored both Healers' and Patients' blood pressure during healing interactions (each Patient was paired with her preferred Healer). The tests confirmed that the three female Patients, A.P., A.S., and E.K., suffered from high blood pressure. From the onset to the end of seven-minute healing sessions (the 84-year-old Healer terminated her session at the end of six minutes), systolic blood pressure dropped from 180 to 150 for A.P., from 190 to 150 for A.S., and from 170 to 150 for E.K. Corresponding drops in blood pressure were seen in the three Healers. Blood pressure dropped from 130 to 100 for Healer A.B. (paired with Patient A.P.), from 130 to 100 for Healer A.P. (paired with Patient A.S.), and from 130 to 90 for Healer O.Z. (paired with Patient E.K.).

Heart rhythm. Heart Rhythm was monitored by electrocardiography (EKG). The three Patients' initial cardiograms showed abnormal spikes, indicating arrhythmic heart-beat patterns. After the healing sessions, I.A.V. noted stabilization features in the charts of A.P., A.S., and E.K. The three Healers did not report symptoms of cardiac arrhythmia and were not tested by EKG.

Auditory Thresholds

The acoustical chamber and test equipment was also used to conduct tests of auditory thresholds before and after healing interactions or simulated healing tasks. Threshold intensity was measured in decibels (dB) at 11 frequencies between 1.0 and 2.0 kHz for 2 Healers, 4 Patients, and 4 Healer Simulators. Average auditory thresholds for each participant for each condition (Before, After) were obtained by computing means for the two series of 11 frequencies. The difference between these two variables is the mean threshold change. In view of the

small sample sizes and large standard deviations in each group, nonparametric Kruskal-Wallis tests were used to examine the average hearing threshold at all frequencies combined. There were no significant differences between Healers, Patients, and Healer Simulators in their mean hearing thresholds in the Before condition, the After condition, or in the mean change between the two
tests.

Hemispheric Laterality and Emotional Status Tests

A set of tests and techniques evaluated the cerebral asymmetry and emotional status of 6 Healers and 7 of their Patients. The tests were designed to reveal left-hemispheric vs. right-hemispheric cognitive style as well as emotional traits. Handedness was evaluated with a hand-preference questionaire that inquired about (1) hand dominance for writing, (2) hand dominance for cutting with scissors and other common tasks, (3) anamnesis of childhood handedness, (4) mirror-writing tendencies, and (5) familial sinistrality. The cognitive-style tests included the Stroop test (color/word interference), Lusher's color preference test (showing hemispheric involvement as well as emotional proclivities), classification of colors, categorization of objects and words, classification of digits (Roman and Arabic), the grouping of words, the grouping of phrases, syllogistic reasoning (to show “logical” versus “archaic” mentality), and understanding metaphors and idioms. The tests were evaluated by T.C., a clinical neuropsychologist, who provided the following summary of her results.

Although not all participants showed the same hemispheric tendency on all tests, both Healers and their Patients were judged to be predominantly “right-hemispheric” types and both groups exhibited primarily a Gestalt style of processing. Questions on handedness showed substantial right handedness, with all Healers and Patients reporting right-hand dominance for writing. Ambidexterous features, such as left-handed preferences for common tasks, were frequently reported by Healers, as were left-handed relatives (often grandmothers or aunts).

In linguistic testing, both Healers and Patients used a right-hemispheric type of classification (they relied upon extra-linguistic features, mostly emotional, and did not pay attention to structures). Understanding metaphors was very easy for them. In classification and categorization tests they relied on personal factors, revealing Gestalt, emotional, right-hemispheric types of answers. The Healers used metaphoric, archaic thinking, and preferred empirics (concrete, gestalt appraisal) to logic in syllogistic reasoning. Their attitude to the tests was very personal. Most of the Patients also were evaluated as very sensitive, empathic, and emotional on the tests.

Individual and sex differences were also apparent in the test profiles. One Healer showed versatile characteristics, both Gestalt and strictly logical. He classified figures according to counting systems (Roman, Arabic) but systematically classified colors according to their wave-lengths. He was rather empiric in his approach to syllogistic reasoning, but showed logic as well. Two Healers exhibited mirror writing and a tendency toward backward counting. One of the Healers liked to construct palindromes (reversing words mentally). Female Healers seemed generally less rigid and more flexible than males, and they were occasionally more analytic than Gestalt. Males would seldom say, "I can do it in several different ways."

On the Stroop (color/word interference) test, the majority of Healers and Patients were influenced by the colors of the ink, preferring to name the colors rather than the written words. On the Lusher color test (which is widely used in Russian neuropsychological evaluations, and considered reliable), Patients and most of the Healers (especially males) showed preferences for red and lilac colors rather than greys. This is interpreted as showing greater than normal emotional activity, poor emotional control, and sensitivity, a pattern indicative of right-hemispheric involvement in cognitive processing.

Discussion

Psychophysical sensory testing provides the best method currently available for quantifying modality-specific sensory variation. In assessing its virtues, Gruener and Dyke (1994) point out that such testing has long been used in neurological examinations, allowing judgments to be made about hypoacuity, hyperacuity, and other characteristics of impaired neurological functioning. Gruener and Dyck conclude that despite the fact that such tests require subject interaction and are therefore necessarily subjective, quantitative sensory testing based in psychophysics has become well established as a valid and practical method of testing normal cutaneous sensory receptors.

Measurement of absolute tactile thresholds falls under the category of "passive touch," involving only "the excitation of receptors in the skin and its underlying tissue, although the patterns may be elaborate" (Gibson, 1962, p. 479). Prior research on tactile perception using a vibratory stimulus has found fingertips to be more sensitive than palms, due to differences in the density of cutaneous touch receptors in these areas (Vallbo & Johansson, 1984). In our tests also, palm thresholds were higher than fingertip thresholds, and in this respect our findings are consistent with previous research on tactile perception.

So far as we are aware, no one has previously looked at the tactile thresholds of healers to see how they are affected by the laying-on of hands. When such thresholds are examined and contrasted with the thresholds of healing recipients and control groups of normals, we see significantly more change in the right-hand thresholds of Healers than we do in any of the other groups. After healing, Healers showed a decrement in tactile sensitivity, a result that is counter-intuitive and was not anticipated by the experimenters.

The significant change in Healers' right-hand sensitivity does not appear to have resulted merely from their physical exertion during the healing task. If the change were due to factors such as general fatigue (caused by the Healers waving their hands about the body contours of their Patients), we would expect a similar loss of sensitivity in the controls who simulated the

Healers'motions. Although Healer Simulators engaged in comparable physical activity while mimicking the motions of the Healers, they showed significantly less change in right-hand sensitivity than Healers did. Yet the lack of any difference between Healers and Healer Simulators on left-hand tactile attenuation suggests that the simulation task was an adequate control for the general physical exertion of the Healers, insofar as fatigue, peripheral blood flow, or other normal factors that might impact on tactile-threshold changes are concerned. If subtle behavioral differences had distinguished the two groups, we can imagine no reason why they would have affected only one hand rather than both.

In short, we are unable to suggest any conventional physiological or behavioral factor that might plausibly account for the significant difference between Healers' and Healer Simulators' right-hand threshold changes. Nor do we attribute the result to any predisposed mental attitude on the part of the Healers or to subtle "demand characteristics" on the part of the experimenters. Although the technician who collected the data was not blind to participants' group membership, neither she nor the healers (or the other experimenters) knew what outcome to anticipate. Cognitive bias, in our judgment, would more likely have disposed Healers to expect enhanced tactile sensitivity after using their hands for healing, but the reverse of that was observed. Moreover, the data collector was avowedly skeptical regarding alternative healing methodologies, and she did not believe that any differences among the groups of participants would be found.

Based on their introspections, many healers have alleged that the laying-on of hands involves a transfer of healing "energy" from healer to recipient. In this context, a reasonable possibility might be that the significant change in Healers' right-hand sensibility accrued from a healing-related loss of energy specific to the Healers' dominant (or "healing") hand. This inference would be consistent with the perception of some healers that one hand is more important for healing than the other. Although few researchers appear to have examined physiological changes in healers, a brief report by Vilenskaya (in Benor, 1993, pp. 28-29) describes thermal differences between the hands of healer Djuna Davitashivili after she made healing passes with her right hand. As measured by a thermographic device, Davitashivili's right hand became cooler during the healing intervention, while thermoproduction in her patient's right arm, which had an arterial blockage, increased.

Healers in our experiment were well matched to their control group of Healer Simulators in innate sensory acuity. When compared to the factory workers, Healers demonstrated significantly greater a priori right-hand sensitivity, and Healer Simulators showed significantly faster reaction time on auditory tests. Healer Simulators also showed significantly greater left-hand tactile sensitivity than Patients. The Patients appeared to resemble their controls (the factory workers) in innate sensory acuity. This could reflect biological similarity, but it should be borne in mind that Patients' physical condition was less than robust (so much so that they had sought the treatment of healers!) Patients' normal sensory acuity could well have been impaired by poor physical health, and their a priori thresholds may not have been good indicators of their inborn sensory faculties. Indeed, the sample of Patients tended to resemble the sample of Healers in cognitive and emotional characteristics. It is possible that both healers and the patients who seek them out belong to a subpopulation of persons with greater than average emotional and physiological sensitivity, who share similar worldviews, cognitive styles, and emotional predispositions.

The factory workers showed gains in sensitivity in both hands after relaxing quietly while waiting to be retested. Relaxation may serve to increase sensory acuity by decreasing sympathetic nervous system arousal. Cohen (1984-85) found stable pre- to mid-session tactile-sensitivity gains in three normals undergoing a series of biofeedback relaxation-training sessions. But although Patients' and Patient Controls' visible behavior was similar (members of both groups sat passively), Patients' right-hand sensitivity change after healing differed significantly from that

of their controls. This suggests that something other than simply resting may have characterized Patients' experience and affected their physiology. Although the Patient and Patient Control groups were not equivalent with respect to gender, a comprehensive review of sex differences did not show gender to be an important variable in tactile perception (McGlone, 1980).

However, to the extent that healing interactions afford the benefits of relaxation, we suspect that the substantial blood pressure reduction seen in the family of healers and their three patients were augmented by the psychological effect of calming (relaxation) on the autonomic nervous system. The single-session treatments resulted in blood pressure reductions that were substantially greater than those accruing from pharmacological regimens (Bevan et al., 1993) or from nonpharmacological behavioral and stress management strategies (Alderman, 1994). The lack of control participants for the family of healers and their patients, however, precludes any precise assessment of the extent to which the blood pressure and arrythmia benefits may be attributed to the laying-on of hands procedure. Beutler et al. (1988) found that the significant blood pressure reductions seen in hypertensives after 15 laying-on of hands treatments did not differ from those in a placebo control group. (Hypertensives in the control group believed that they might be receiving distant healing.)

After healing interactions in the present study, Healers' and Patients' palm sensitivities changed in a way that was opposite but reciprocal, with Healers showing decreases in sensitivity in both palms, while Patients showed sensitivity increases in both palms. Such reciprocity recalls a phenomenon described by Moss, Johnson, Hubacher, and Gray (1975), who observed relatively diminished radiation-field coronas emitted by the right fingertips of healers after healing, along with relatively enhanced coronas emitted by patients' right fingertips after treatment. They report that control subjects who mimicked the healers' protocol showed no comparable diminution in their fingertip coronas; nor did patients who received the mock healing show any noticeable coronal enhancement afterwards. The researchers interpreted the reciprocal effect as demonstrating a "transfer of energy" from healer to patient.

The significant interaction seen in our palm-threshold data appears compatible with a transfer of energy hypothesis. We caution, however, that the reciprocal changes may only reflect the active vs. passive nature of the Healers' and Patients' roles. Palm-sensitivity changes with Healer- and Patient-Simulator pairs need to be examined to determine if the reciprocal effect is related to the healing interaction. Even if so, the reciprocity alone would not demonstrate that "healing" had occurred (as Moss et al. rightly point out with respect to their own finding), but only that reciprocal sensory changes can occur between healers and recipients as a consequence of the laying-on of hands activity. It is also possible that reciprocal physiological changes or even a "regression to the mean" phenomenon can occur as a result of the empathic interaction of two persons, regardless of whether an intent to "heal" is present. The prospect of reciprocal sensory changes during distant healing might profitably be investigated also.

The significant sensory-acuity changes observed in our data were specific to the tactile modality. Auditory tests showed no significant task-related changes among the groups of participants. This difference between sensory modalities lends support to the prevailing assumption that the hands feature prominently in this type of healing intervention. Healers in our experiment used both of their hands in the laying-on of hands procedure, and presumably they regarded both as important. Yet Healers and Patients differed from their controls because of

fingertip changes in only one hand (the right hand), rather than both. This implies to us that the effect observed, as well as its confinement to the tactile modality, cannot be attributed to the residue of psychological expectation.

An exploratory series of tests, such as that reported here, can provide no more than a preliminary indication of the usefulness of a new testing paradigm and suggest methodological refinements for future rigorous tests. We conclude only that a physiological approach to the study of healers provided significant data that were consistent with the introspections of healers, and bore interesting similarities to other reports of physiological changes in healers (although such reports are scant). We believe quantitative sensory testing may have utility in future studies with healers and that the task-dependent changes observed in Healers' and Patients' tactile thresholds warrant further research. If future studies adopt a psychophysical testing regimen, we recommend that experimenters use larger groups of subjects; that Patient Controls participate as active Patient Simulators, and that the samples of Healers, Patients, Healer Simulators, and Patient Simulators be comparable in age, gender, handedness, and, insofar as is possible, innate sensory acuity.

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APPENDIX

This study was conducted during the summer of 1992 in the Laboratory of Comparative Physiology of Sensory Systems at the I. M. Sechenov Institute of Evolutionary Physiology and Biochemistry in St. Petersburg, Russia. The laboratory routinely conducts research with psychophysical, neuropsychological, and electrophysiological (EEG, EKG) testing for a variety of St. Petersburg medical and other institutions.

Because of the limited time that the laboratory facilities could be made available for purposes of this study, it was determined that proof-oriented healing research with humans (requiring documented medical diagnoses and double-blind follow-up evaluations) was not feasible. Therefore, a process approach was utilized, with an intent to examine selected physiological changes that might attend the healing activity. With the exception of three healer-recipient pairs, no attempt was made to evaluate any possible beneficial effects of the healers on the recipients. Our approach required only an implicit assumption that healers who attempted to provide healing for their patients in the laboratory would be doing a reasonable facsimile of what they customarily did in more naturalistic settings.

The Laboratory of Comparative Physiology of Sensory Systems at the Schenov Institute is directed by I. A. Vartanian, M.D. Her laboratory has equipment for the testing of thresholds and reaction time for tactile stimuli; thresholds, reaction time, and hemispheric localization for acoustical stimuli; and cerebral lateralization, emotional states, and electrophysiology (EEG, EKG). The laboratory staff includes six full-time researchers trained in the collection of tactile, auditory, and brain-hemispheric laterality data. The staff researchers and technicians who collected the data reported in this paper were skeptically disposed toward the prospect of finding any healing-related differences among the groups of participants.