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Energy medicine treatments for hand and wrist pain: A pilot study

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ABSTRACT

Introduction: The term "energy medicine" describes healing modalities that manipulate or channel purported subtle energies associated with the body. The objectives of this pilot study were to determine the feasibility of studying energy medicine for people with carpal tunnel pain and gathering relevant preliminary data.
Methods: Following a prospective, within-participant design, participants were recruited to experience a 30 min treatment from one of 17 energy medicine practitioners. Of 374 adults experiencing carpal tunnel pain who were screened for the study, 190 received an energy medicine treatment. Practitioners delivered treatments at close distance, some with and some without light, stationary touch. Outcome measures were collected before, during, and immediately after the treatment, and three weeks later. The primary outcome measure was self-reported pain. Secondary subjective measures included credibility regarding energy medicine and expectancy regarding the efficacy of treatments, pain interference, sleep quality, well-being, mood, and sense of personal transformation. Physiological measures included median nerve conduction velocity, heart rate variability, heart rate synchrony (between the participant and practitioner), and expression levels of neuroinflammation-related genes.
Results: On average, self-reported current pain scores decreased 2.0 points post-session and 1.3 points at three weeks compared to baseline values using a 0–10 point scale with 10 denoting worst pain ($F(2, 565) = 3.82$ $p < 0.000005$). This effect was not influenced by the participants' level of expectancy or credibility regarding the energy medicine modality. Well-being, negative emotion, and sleep quality scores significantly improved at the follow-up visit. Multiple heart rate variability measures significantly changed reflecting increased parasympathetic activity which may indicate decreased stress. No other secondary outcome showed significant change.
Discussion: Studying the administration of energy medicine to people with carpal tunnel pain is feasible, although requiring a documented carpal tunnel syndrome diagnosis proved to be prohibitive for recruitment. Our finding of preliminary evidence for positive effects in pain and pain-related outcomes after a single session of energy medicine warrants further controlled investigation.

Background

Chronic pain

Chronic pain is a serious and costly public health issue. An estimated 20% of U.S. adults (approximately 50 million people) experience chronic pain, with 8% of this group describing their pain as high-impact.[1] High impact pain is persistent pain with substantial restriction of life activities lasting six months or more. Chronic pain is often severe and not easily managed, leading to other health issues such as fatigue, sleep disturbance, mood changes, and functional disability.[2,3] Not only does chronic pain reduce an individual's quality of life, but it results in $61 billion lost annually from worker productivity.[4,5]

Carpal tunnel syndrome

Approximately 3–8% of adults in the general population in the United States have carpal tunnel pain.[6,7] The carpal tunnel is a narrow passageway of ligament and bones at the wrist that encircles the median nerve. Carpal tunnel syndrome typically occurs when the median nerve is compressed as it travels through this passageway, causing pain. It also causes numbness and tingling in the hand and

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arm. Standard treatments include splints to immobilize the wrist, pain and nonsteroidal anti-inflammatory drugs (NSAIDs), and very often surgery to take the pressure off of the median nerve, which in the U.S. costs approximately $2 billion annually.[8] The disruptiveness, unwanted side effects, and significant risks associated with these treatments often prompt people with carpal tunnel syndrome to seek alternative or complementary therapies for relief from their pain.

Pain and alternative or complementary therapies

Supplemental treatments for chronic pain often include mindfulness meditation[9] and energy medicine.[10] Multiple clinical trials, systematic reviews, and meta-analyses demonstrate meditation's benefit for improving pain outcomes,[11] even after as few as one meditation session.[12] The Centers for Disease Control and Prevention has recommended non-pharmacologic therapies like meditation as preferred modalities for pain management.[13,14]

While there is increasing research-based evidence that energy medicine improves pain outcomes, the results are limited. One systematic review of Reiki found significant improvements on pain outcomes in 9 out of the 12 randomized controlled trials included.[15] Unfortunately, 11 of the 12 studies were rated poorly on their methodological quality. Another systematic review of biofield therapy studies found 66 studies that met their inclusion/exclusion criteria, 15 of which included pain outcomes.[16] This review cast a wide net by including study designs other than randomized controlled trials, which are usually the only studies included in such reviews. Biofield therapies for decreasing pain intensity had strong evidence in pain populations, and moderate evidence in hospitalized and cancer patients. Another case series of energy medicine in a community teaching hospital reported that 50 patients showed marked improvement (76%).[17] The most recent systematic review and meta-analysis of Reiki, which included four randomized controlled trials of Reiki on pain (two distant and two close distance), found a significant improvement by one point on the Visual Analog Scale of Pain Symptoms.[18]

Carpal tunnel syndrome and energy medicine

More relevant to our current study is a randomized placebo-controlled, double-blind trial of 30 participants with carpal tunnel syndrome.[19] The participants were randomized to receive a biofield therapy or a placebo condition and the practitioner administered both the treatment and the placebo condition, each consisting of six sessions (20–30 min) over a two-week period. The treatment group showed statistically significant changes in multiple pain and functionality measures, including pain intensity with activity and night pain. At the six-month follow-up, 86% of the treatment participants were pain-free and had no functional limitations.

The objectives of the pilot study reported here were to 1) assess the feasibility of conducting an energy medicine study focused on people with hand and wrist pain, 2) gather preliminary data on psychobiological endpoints that may suggest how energy medicine practitioners improve health outcomes (pain and pain-related outcomes, well-being, and potential predictors) and, 3) gather preliminary data on the manner by which subtle energy could be "transmitted" from the practitioner to the receiver, including both human and inanimate receivers (e.g., water as a proxy for the human body). Due to a large number of outcome measures, the results are presented in 5 separate reports within this issue. This report details the overall experimental design and presents the demographic data and primary psychobiological and physiological outcomes. Accompanying reports present the results of analyses of 1) spectroscopic readings of water samples exposed to energy medicine treatment, 2) output of a quantum noise generator that was present in the room before, during, and after the treatments, 3) the outcome measures in relation to concurrent solar and geomagnetic parameters, and 4) perceptions related to apparent subtle energy movement during the treatments as reported by a witness trained in such perceptions.

Methods

Overview

The current study was an uncontrolled, within-participant design study. Participants visited the Institute of Noetic Sciences (IONS) campus, one at a time, on two occasions. During the first visit, they completed baseline measures before experiencing a 30-minute energy medicine session and, immediately afterward, completing subjective and objective outcome measures. They returned three weeks later to complete follow-up measures.

Participants and recruitment

All study activities were approved by the IONS Institutional Review Board (IRB) [#YOUG2019.02]. Adult participants with chronic hand or wrist pain were recruited from the San Francisco bay area through print and radio advertisements and social media (e.g., Facebook, NextDoor). With a goal of 200 participants, eligible participants were over 18 years of age experiencing carpal tunnel pain (persistent numbness, tingling, or pain in the hand, fingers, or thumb); no eligibility cut-off point for pain was set. Exclusion criteria included pregnancy and the use of pacemakers. These criteria were assessed by self-report through a telephone or email screening interview. Personnel equipoise was maintained during scheduling and all interactions with participants, i.e., study staff had no personal preconceived preferences toward the ability of any of the energy medicine practitioners to have a better outcome than another. Participants were given a $200 gift card after completing all study activities. Fig. 1 presents the flow of participant recruitment.

Energy medicine practitioners

Seventeen energy medicine practitioners from a wide range of healing disciplines were invited to collaborate on the project. Because there is no generally accepted method of testing the efficacy of energy medicine practitioners, we invited experienced practitioners (>5 years in practice) based on anecdotal testimonials from their respective communities regarding their exceptional healing abilities. Testimonials were vetted via phone first to ensure validity and accuracy resulting in a prioritized list of approximately 50–60 practitioners. Each individual was interviewed and asked if they would be willing to work within the constraints necessary for the pilot study. This process identified 20–25 viable candidates. A second more detailed interview was conducted to confirm modalities that would be used, details of the study restrictions, and time availability to

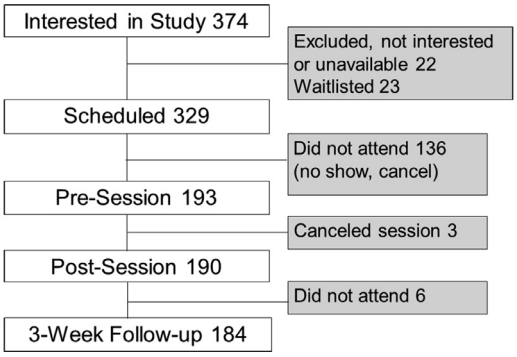

Fig. 1. Participant recruitment flow.

schedule and coordinate travel, meals, and overall logistics. Finally, seventeen practitioners were selected with 2–5 alternates. While the participating practitioners combined multiple modalities throughout the treatment session, the primary modality used by each was: 1) Shaktis, 2) Rosalyn Bruyere method, 3) Reiki, 4) Barbara Brennan method, 5) clairvoyant healing, 6) Bengston Energy Healing method, 7) Healing Touch, 8) Peruvian shamanic healing, 9) psychokinetic healing, 10) channeling healing energy of ascended masters, 11) calling in Holy Spirit, 12) quantum healing, 13) Xponential Intelligence, 14) Pranic Healing, 15) Quantum Touch, 16) Krysantha Healing, and 17) psychic manipulation of auras. Some of the practitioners (10) used light, stationary touch throughout the sessions and the others used exclusively non-physical means. Data analyses considered all of the practitioners collectively and did not compare results obtained between individual practitioners. This was done in accordance with IRB guidance and to increase the generalizability of study results. All practitioners agreed to this aspect of the study during the vetting process. Practitioners resided at the IONS Earthrise Learning Center for approximately one week and were asked to administer their modality to up to 20 participants over the course of that week; the number varied due to participant cancellations and other circumstances. Their travel, lodging, and meals were reimbursed and they were offered a $1000 honorarium for their participation.

Study procedures

Volunteers responded to recruitment material and were contacted by study staff. They underwent a telephone or email interview to determine eligibility and those who met study criteria were scheduled for their first session. Prior to arrival at the IONS Earthrise Learning Center for their first visit, participants received an email with a link to SurveyMonkey.com, which included an informed consent form and questionnaires regarding demographics, personality, well-being, pain, sleep quality, and noetic beliefs and experiences (see Measures section for questionnaire details).

On the day of their session, participants were greeted by study staff and stayed on campus for approximately three hours. When they arrived at the reception area, participants signed a second informed consent and completed the Numeric Pain Rating Scale (NPRS), Modified Brief Pain Inventory, and questionnaires assessing expectancy and credibility regarding the intervention. Next, they were escorted to a laboratory room where a nerve conduction velocity test was performed and where they provided an oral rinse sample for collecting cells for gene expression analysis, which involved vigorously swishing with a salt solution for 30 s. The participants were then guided to a 8′x8’x7.5′ electromagnetically shielded room for the energy medicine session where they were seated in a semi-reclined chair in front of the practitioner’s chair. Electrocardiography (ECG) electrodes were placed on the participants and practitioners. Immediately prior to entering the shielded room, vials of water (1.5 ml each of distilled and mineral water) were suspended over the participant and practitioner's chest on a 10-inch, non-metallic lanyard.

The energy medicine sessions lasted 30 min and were delivered from a close distance (<10 inches). Sessions were conducted between April 4 and August 30, 2019. A staff member trained in techniques to enable perception of purported subtle energies (Academy of Intuition Medicine® in Sausalito, CA), referred to as the *seer*, was also present in the shielded room during all the energy medicine sessions to silently observe and record written descriptions of any energetic movement from or between the participant and practitioner. The *seer* also recorded any energetic changes in the environment (shielded room) during all sessions and performed a ritual of clearing the energy of the room, using a water-based, non-aromatic, aerosolized spray (Clean Sweep, Energy Tools Intl., Eagle Point, OR).

The first and last six minutes of the session were designated for collecting ECG data and required that the practitioner remained seated. The practitioner was permitted to move around during the middle portion of the session. Study staff chimed a bell from outside the shielded room to mark the onset of the session, end of the first six minutes sitting period, beginning of second six minutes sitting period, and the end of a session. Immediately following the energy medicine session, the ECG electrodes and water vials were removed and participants repeated the Numeric Pain Rating Scale and nerve conduction test and again provided oral rinse samples.

Three weeks later, participants returned to campus for their follow-up visit and stayed on campus for approximately one hour to repeat the Numeric Pain Rating Scale, Modified Brief Pain Inventory, and the questionnaires assessing well-being, transformation, pain, and sleep quality. Participants then provided oral rinse samples and repeated the nerve conduction test.

Other measures

The shielded room was equipped with environmental sensors, including a thermometer and a capacitance sensor to measure humidity. A custom-built “quantum noise generator” was also included because previous reports have suggested that focused intention is associated with changes in environmental entropy. Infrared absorbance of the water samples exposed to the energy medicine treatments was measured by a Nicolet iS20 Fourier transform infrared (FTIR) Spectrometer with a zinc selenide multi-bounce hATR (horizontal attenuated total reflection) module and a liquid nitrogen-cooled DTGS (deuterated triglycine sulfate) detector (Thermo Fisher Scientific, San Jose, CA), following previously published methods.[20] The *seer* who observed the sessions used both a quantitative rubric and free response to document energetic movement or exchange between participant and practitioner. Additional methods and results of these other measures are presented in accompanying articles in this issue. Fig. 2 lists which outcome measures were collected at each of the time periods. While there was no questionnaire item eliciting

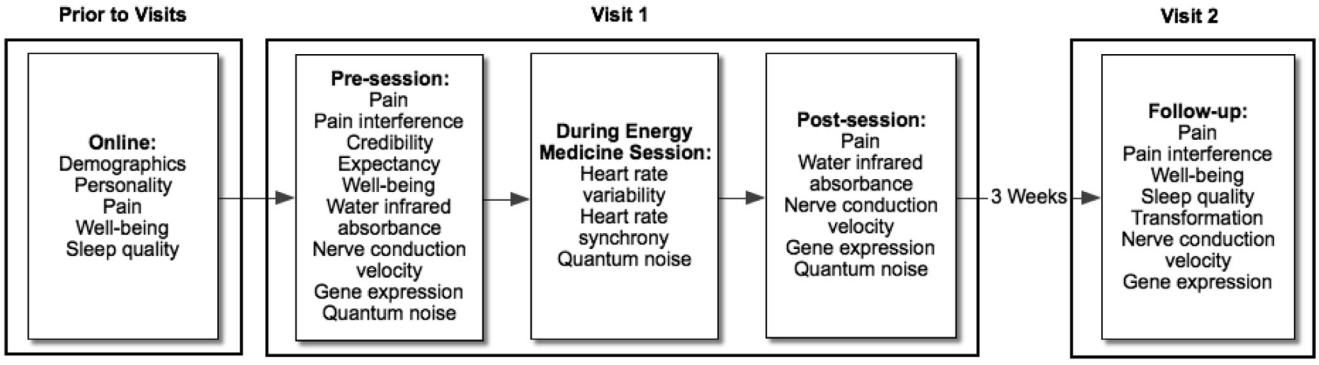

Fig. 2. Collection times for outcome measures.

free-response feedback from participants, many of them voluntarily shared anecdotes regarding their experiences immediately following the energy medicine session and at their follow-up visit.

Questionnaires

The following questionnaires were administered to the participants.

Demographic information was collected, including age, gender, occupation, income, etc.

The *Credibility and Expectancy Scale* measured the participants' level of belief, or credibility, regarding the efficacy of energy medicine and their expectations that energy medicine would work for them.[21] This is especially important to measure in interventions where placebo may play an important role such as in mind-body medicine.[22] The measurement uses a Likert scale ranging from 1 to 9 with higher scores representing higher credibility and expectancy.

The *Numeric Pain Rating Scale (NPRS)* is a segmented numeric version of the visual analog scale where participants select a whole number (0 = "No pain" to 10 = "Worst possible pain") that best reflects the intensity of their pain. This scale was assessed prior to their in-person visit and at their three-week follow-up.[23]

The *Modified Brief Pain Inventory* was adapted for use in this study. Participants rated their pain/numbness for their worst discomfort in the last week, least discomfort in the last week, and current discomfort. They also answered how much this pain interfered with their normal work (both inside and outside of the home), relations with other people, and enjoyment of life.[24]

The *Sleep Quality Scale (SQS)* measured the quality of participants' sleep the night before, rated from 0 to 10 (with 0 representing the best sleep).[25]

The *Positive and negative affective well-being* was measured with six dichotomous indicators (happiness, enjoyment, smiling/laughter, stress, worry, sadness) asking participants whether they had experienced an emotional state for much of the day yesterday. Responses for both positive and negative emotions were averaged for two scores ranging from 0 to 1.[26]

The *Arizona Integrative Outcomes Scale (AIOS)* is a one-item, visual analog self-rating scale that evaluates overall subjective sense of well-being over the past 24 h. Participants were instructed to take into account their physical, mental, emotional, social, and spiritual condition and rate it on a scale of 0–100 with larger values indicating greater well-being.[27]

The *Big Five Inventory-10* is a 10-item scale that evaluates the Big-5 personality constructs of extraversion, openness, conscientiousness, neuroticism, and agreeableness. It has been shown to be correlated with longer scales.[28] Personality results are reported in an accompanying article in this issue.

The *Noetic Belief and Experience Scale* is a 20-item scale that assesses noetic beliefs and experiences. Participants were asked to rate their level of belief in noetic constructs e.g., affecting the physical world with the mind and mind-to-mind communication. They rated the experience of each construct on a sliding scale from 0 to 100 with 100 representing greater belief and more experience.[29] Noetic Belief and Experience Scale results are reported in an accompanying article in this issue.

Electrocardiography

ECG data were collected simultaneously from the participant and practitioner with a Biopac M150 System with Universal Interface (Biopac Systems, Inc., Goleta, CA) in one data file to ensure time-matched data with two EMG100C units. Two small electrode sticker pads (from Biopac, Inc.) were placed just below the clavicles on the participants' right and left side. Although this placement is not typical for recording the heart's electrical activity for clinical applications, our preliminary testing showed that it was sufficient for a clean ECG signal and this placement is regularly used in research applications.[30–33] The Kubios software had no issues extracting the RR intervals with low levels of artifact correction. The same procedure was performed for the practitioners with special cable extension wires to minimize interference with their movements. The amplifiers in the BIOPAC system are insulated specifically to make it safe to link two participants through the same system. Participants and practitioners were asked to rest for at least 20 min prior to the onset of ECG recording. Practitioners were also asked to be still for six minutes at the beginning and end of each 30-minute session to ensure a clean signal. A research assistant alerted the practitioner with a bell for these periods. Four classes of ECG measures were analyzed.

Heart rate variability (HRV)

Raw ECG data were extracted from the Biopac acq software (data sampled at 2000 Hz with channel 1 containing the data for the participant and channel 2 containing the data for the practitioner). The raw ECG data were segmented into six-minute (pre and post) intervals, downsampled at 200 Hz (*resample* function of Matlab Signal Processing Toolbox 2019a, MathWorks, Inc, Natick, MA) and low-pass filtered at 15 Hz (39-point FIR filter with 2 Hz transition bandwidth) using custom Matlab scripts. They were then exported as CSV text files and processed with the Kubios HRV Premium v 3.3.0 software (University of Kuopio, Kuopio, Finland) to extract R markers (ECG peak latency) and generate R-R intervals (ECG peak to ECG peak). Each file was visually examined for errant R markers. Markers were fixed where appropriate and the Kubios' artifact rejection algorithm applied if needed. In general, the percent of data with artifacts was low (first six minutes 2.6% $\pm$ 8.0; second six minutes 3.2% $\pm$ 9.4). Kubios then calculated ECG-derived respiration, heart rate, overview measures, time domain, spectral analysis (VLF: 0–0.04 Hz; LF:0.04–0.15 Hz; HF: 0.15–0.4 Hz), and non-linear analyses. A full description of the default available measures can be found in the Kubios manual.[34] While Kubios calculates both fast Fourier transform and autoregressive modeling, frequency domain measures are presented as absolute power using autoregressive modeling as recommended.[35] HRV analysis parameters included a 100 s window width, 50% window overlap; autoregressive spectrum model order = 16 with no factorization, and interpolation rate of 4 Hz.

Coherence

Physiological coherence, used extensively by HearthMath, Inc. (Boulder Creek, CA), is reflected in more ordered and sine wave-like HRV patterns at a frequency of around 0.1 Hz (10 s rhythm). A coherent rhythm can be defined as a relatively harmonic (sinewave-like) signal with a very narrow, high-amplitude peak in the LF region of the HRV power spectrum, with no major peaks in the VLF or HF regions. Coherence was assessed by identifying the maximum peak in the 0.04–0.26 Hz range of the HRV power spectrum, calculating the integral in a window 0.03 Hz wide centered on the highest peak in that region and then calculating the total power of the entire spectrum. The coherence ratio is formulated as: [PeakPower/(TotalPower-PeakPower)].[36]

Average heart rate synchrony

Heart rate synchrony measured the relationships between the ECG signal of the participant and that of the practitioner for the first six-minute and the last six-minute segments. The first and last six minutes of the session were used because ECG data is sensitive to movement. The practitioners were still during these parts of the session so that clean ECG could be obtained. We computed three measures, correlation synchronization, phase coherence synchronization,

and coherence synchronization. Correlation synchronization measures the correlation of the signal amplitudes. Phase coherence synchronization measures the alignment of the phase of the signals. Coherence synchronization is a mixture of the two previous measures. Specifically, the Kubios R-R time series obtained for each channel (participant: channel 1 and practitioner channel 2) were exported to text files and reimported by Matlab custom scripts.[37] The R-R time series contained the exact latencies of each ECG peak. To be processed together, the ECG data for the practitioner and the ECG data for the participant needed to be realigned to a common time frame. The alignment of the ECG signal between the practitioner and participant was performed by linear interpolation of the R-R time series to a common time frame with a one-second increment (*interp1* function of Matlab 2019a). The data from each channel were then bandpass filtered in both directions (to avoid phase distortion) using a five-order Butterworth filter for each frequency of interest (*butter* and *filtfilt* functions of Matlab 2019a) - (broadband, referring to all frequencies and no filtering; LF which is low-frequency HRV from 0.04 to 0.15 Hz and HF which is high-frequency HRV from 0.15 to 0.40 Hz). Then a Hilbert decomposition was applied to the bandpassed signal (*hilbert* function of Matlab 2019a) to obtain instantaneous amplitude and phase of the signal at 1 Hz resolution. Three relationships, amplitude correlation, phase coherence, and coherence and were assessed at three frequency bands as mentioned previously. Amplitude correlation is the standard Pearson correlation coefficient between the Hilbert signal amplitude of the practitioner and the time-synchronized signal amplitude of the participant. Coherence is the average of the product of the Hilbert spectral decomposition of the participant with the time-synchronized complex conjugate of the Hilbert signal for the practitioner data. Phase coherence is the same as coherence although the amplitude information is first removed from all spectral estimates by normalizing all spectral estimates - thereby providing the average phase difference between the two signals. Correlation, coherence, and phase coherence were calculated for the broadband signal, low-frequency and high-frequency bands.

Time Series Heart Rate Synchrony

Time-varying synchrony analysis (i.e., observing how the synchrony between the practitioner and the participant changed over time) was used to evaluate the relationship between the practitioner and participant during the change in synchrony for the first six minutes of the energy medicine session. This was achieved by computing the synchrony measures described above over sliding non-overlapping windows of 30 s interspaced by 30 s, as opposed to the average heart rate synchrony described above in which measures were calculated over a single six-minute window. The slope of the norm of each synchrony measure was then used as an indicator of change during the first six minutes of the energy medicine session. Although it would also be possible to calculate the change in synchrony for the last six minutes, variation in heart synchrony over the last six minutes would not be easily interpreted so this method was decided against.

Median nerve conduction velocity

In some carpal tunnel syndrome cases, nerve impulses are slowed as they pass through the carpal tunnel due to compression and it may be possible to measure an increase in conduction velocity when the compression is released.[38] To assess this possibility, the conduction velocity of the median sensory nerve was measured on both wrists using an XLTEK Neuromax 1002 nerve conduction stimulator (Excel-Tech Ltd., Oakville, Canada). This particular test for nerve conduction velocity was chosen because it is less invasive compared to tests that rely on needle insertion. A small electric stimulus was applied at the wrist and the signal was recorded from the index finger. The distance between electrodes was measured manually and entered into the Neuromax device which determines the onset latency, peak latency, and amplitude based on processing the recorded waveform through internal algorithms. The amplitude is determined from where the waveform peaks to where it rebounds. Conduction velocity was determined by the ratio of the distance measured divided by the onset latency. A minimum threshold for onset latency was set at 2 milliseconds. Clients reported which wrist was affected via the pain questionnaire.

Gene expression analyses

Because proinflammatory mechanisms have been implicated in the etiology of carpal tunnel syndrome,[39] expression levels for a panel of neuroinflammatory genes were measured before and 3 weeks after the energy medicine treatment. Messenger RNA (mRNA) levels for a panel of 770 genes focused on immunity, inflammation, and stress (nCounter® Human Neuroinflammation Panel, Nanostring, Seattle, WA) were quantified in salivary neutrophils using a multiplex analysis system (nCounter®, Nanostring). Neutrophils were isolated from oral rinses (30 ml saline) by sequential filtration to exclude contaminating buccal cells, following previously published methods.[40] The detection accuracies of both the oral rinse method and the Nanostring analysis system have been shown to be comparable to the gold-standard quantitative real-time RT-PCR.[40,41] The resulting cell pellets (92–98% pure neutrophils) were resuspended in RNAlater (Invitrogen, Waltham, MA) to preserve the integrity of the RNA and stored at 4 °C until transferring to a service laboratory for nCounter® analysis (Core Diagnostics, Inc., Hayward, CA). The binding density threshold applied to the multiplex data for inclusion in the analysis was 0.35. Because of budgetary constraints, only a subset of 96 samples was analyzed. The subset consisted of samples collected before the energy medicine session (baseline) and at the three-week follow-up visit, from the 48 participants whose responses were at the two extreme ends of the response range for the pain scale (NPRS): 24 designated as “Improved” and 24 designated as “Worsened”. The Improved group consisted of the participants who reported the most relief from pain and the Worsened group consisted of the participants who reported no difference, or a slight increase in pain. Samples from the three-week follow-up collection point were chosen to compare with the samples collected at baseline because the targeted genes are late-response genes that typically show altered expression levels in blood cells over periods of days to weeks following interventions.

Statistical analyses

Data cleaning and processing were described above in individual measure sections.

Pain, Questionnaires, and Nerve Conduction Velocity: Means and standard deviations were generated for continuous variables and percentages for categorical variables. Demographic data are qualitatively described. Pain variables and nerve conduction values were analyzed for differences across visits with a repeated-measures analysis of variance (ANOVA) to make the most efficient use of the data since no data is thrown out. To support future research efforts, statistics for paired *t*-tests for subjective pain and well-being are also included. Effect sizes and 95% confidence intervals were calculated for subjective pain and well-being using a Hedges's g repeated measures calculator (https://effect-size-calculator.herokuapp.com/).

ECG Measures: Most of the ECG variables were not normally distributed so a non-parametric paired statistical test (Wilcoxon matched-pairs signed-rank test) was used to evaluate differences in variable values between the first and last six minutes of the energy medicine session. This was done for the HRV parameters, coherence, and average heart rate synchrony. The time series heart rate synchrony was analyzed using paired *t*-test. Slope and *p*-values to assess change of synchrony measure over the first six-minute session was analyzed using linear regression analysis.[42]

Gene Expression: Normalization using the three house-keeping genes was performed and log2 fold-changes (post/pre) calculated. A two-sample Student's *t*-test was performed on these values.

Multiple comparison corrections for all analyses were conducted using the Benjamini-Hochberg procedure for False Discovery Rate. This false discovery rate correction is a preferred method for clinical studies over the more extremely conservative Bonferroni which can lead to a high rate of false negatives.[43,44] Statistical analyses were conducted in Stata/IC 15.1 (StataCorp, LLC, 2020) and R statistical programming language v. 3.6.1 (R Core Team, 2019). Some participants were unable to complete the online survey that included demographics and self-report questionnaires, which resulted in missing data. Participant numbers for each variable are included in results tables.

Table 1
Participant demographics.

Measure	Units/Categories	Values Mean (sd) or%
Age (191)	Years	55.0 (13.9)
Education (145)	Years	15.7 (2.4)
Gender (191)	Male	14.1%
	Female	84.3%
	Other	1.6%
Ethnicity (145)	American Indian	1.4%
	Asian/Pacific Islander	4.1%
	Black or African American	0.7%
	Hispanic	6.9%
	White/Caucasian	85.5%
	Other	1.4%
Relationship (142)	In a relationship	65.5%
	Not in a relationship	34.5%
Overall Health (144)	Poor	0.0%
	Fair	22.2%
	Good	36.8%
	Very good	34.0%
	Excellent	6.9%

Notes: Numbers of participants completing each measure are in parentheses.

Results

Participant demographics

Table 1 presents the demographic characteristics of all participants where the data are available. Most participants were meditators (64.0%). On average, participants' credibility scores were 6.0 ± 1.7 and their expectancy scores were 5.5 ± 2.6 (scale ranging from 1 to 9 with higher scores representing higher credibility and expectancy).

Pain

The average pain over the last month at baseline was 5.6 ± 1.9 (n = 138). Participants reported significant levels of pain upon entering the study (Table 2. Subjective Pain) that significantly improved immediately after the 30-minute session and at the three-week follow-up. A recent systematic review found that the minimum clinically important difference in acute pain can range from 0.8 to 4.0 points and vary by population, although 1–1.5 points are a general average.[45] Our study found, on average, a 2 point drop immediately and a 1.3 reduction at 3 weeks. Pain in the last 24 h also significantly improved, as did multiple dimensions of pain interference (see Fig. 3). Credibility and expectancy did not influence the changes in pain (Credibility $F(1375) = 0.74$, $p = 0.39$; Expectancy $F(1375) = 1.37$, $p = 0.24$).

Well-Being and transformation

Table 3 presents the response to the well-being, positive and negative emotion, and sleep quality measures, comparing participants'

Table 2
Subjective Pain.

Measure	Baseline Mean (sd, se) 193	Post-Session Mean (sd, se) 189	3-Week Mean (sd, se) 184	Change (sd, se)	Paired *t*-test and Repeated Measure ANOVA Statistics	Effect Size Hedges's g repeated measures [95% CI]
Worst pain last week	6.2 (2.1, 0.15)		5.0 (2.5, 0.18)	1.2 (2.3, 0.17)	$F(1, 376) = 3.12$ $p < 0.000005$*	0.52 [0.31–0.73]
	6.2 (2.1, 0.15)		5.0 (2.5, 0.19)		$t(183) = 7.10$ $p < 0.000005$*	
Least pain last week	2.6 (2.4, 0.17)		1.5 (1.9, 0.14)	1.6 (2.0, 0.16)	$F(1, 376) = 3.81$ $p < 0.000005$*	0.51 [0.30–0.72]
	2.6 (2.3, 0.17)		1.5 (1.9, 0.14)		$t(183) = 7.90$ $p < 0.000005$*	
Current pain - at visits[a]	3.7 (2.3, 0.17)	1.7 (1.9, 0.14)	2.4 (2.1, 0.15)	1.3 (2.4, 0.18)	$F(2, 565) = 3.82$ $p < 0.000005$*	0.59 [0.38–0.80]
	3.7 (2.3, 0.17)	1.7 (1.9, 0.14)		2.0 (2.2, 0.16)	$t(188) = 12.5$ $p < 0.000005$*	
		1.7 (1.9, 0.14)	2.4 (2.1, 0.16)	−0.76 (2.3, 0.17)	$t(181) = -4.6$ $p < 0.000005$*	
Normal Work Interference	4.7 (2.6, 0.19)		3.0 (2.7, 0.20)	1.7 (2.4, 0.18)	$F(1, 376) = 4.11$ $p < 0.000005$*	0.64 [0.43–0.86]
	4.7 (2.5, 0.19)		3.0 (2.7, 0.20)		$t(183) = 9.4$ $p < 0.000005$*	
Relationship Interference	2.0 (2.3, 0.17)		1.3 (2.1, 0.15)	0.79 (1.4, 0.19)	$F(1, 376) = 2.72$ $p < 0.000005$*	0.40 [0.19–0.61]
	2.1 (2.4, 0.18)		1.3 (2.1, 0.15)		$t(183) = 4.6$ $p < 0.000005$*	
Enjoyment Interference	3.9 (2.6, 0.19)		2.6 (2.6, 019)	1.2 (2.3, 0.1)	$F(1, 376) = 3.24$ $p < 0.000005$*	0.50 [0.29–0.71]
	4.0 (2.6, 0.19)		2.6 (2.6, 019)		$t(183) = 7.4$ $p < 0.000005$*	

Notes: The *p*-values listed above are unadjusted. Those marked with an * are significant after correction for multiple comparisons using False Discovery Rate. Pain was rated on a scale of 0–10 with 0 anchored by no pain, and 10 by extreme pain. Interference was rated on a scale of 0–10 with 0 anchored by not at all, and 10 by very much.

[a] Primary Outcome

sd = standard deviation; se = standard error.

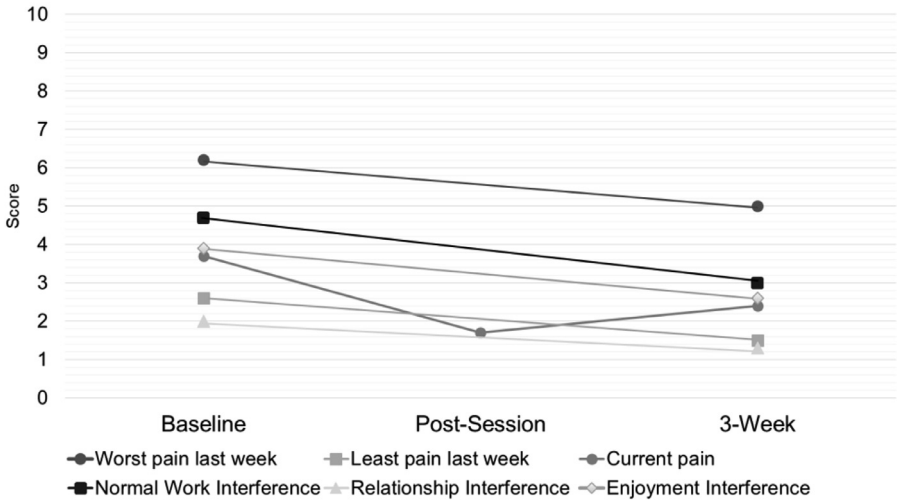

Fig. 3. Pain and pain interference.
Note: Standard error bars are listed in Table 2 and are too small to be seen on the figure.

Table 3
Well-being.

Measure	Baseline Mean (sd) N	3-Week Mean (sd N)	Change (sd, se)	Paired *t*-test and Repeated Measure ANOVA Statistics	Effect Size Hedges's g repeated measures [95% CI]
Overall well-being *(0–10; 10 = best)* Sense of well-being, taking into account your physical, mental, emotional, social, and spiritual condition over the past 24 h	58.1 (19.0) *137* 58.7 (19.2)	62.1 (19.9) *178* 63.1 (17.9)	−4.4 (21.9, 1.9)	$F(1, 314) = 2.20$ $p < 0.000005$* $t(126) = -2.36$ $p = 0.02$*	−0.20 [−0.44–0.03]
Positive emotion (0–1.0; 1.0 is most positive)	0.84 (0.29) *144* 0.84 (0.30)	0.86 (0.30) *182* 0.85 (0.30)	−0.01 (0.37, 0.03)	$F(1, 325) = 1.39$ $p = 0.02$* $t(134) = -0.46$ $p = 0.64$	−0.07 [−0.30–0.16]
Negative emotion (0–1.0; 1.0 is most negative)	0.54 (0.38) *140* 0.54 (0.38)	0.53 (0.39) *179* 0.51 (0.38)	0.04 (0.41, 0.04)	$F(1, 318) = 2.23$ $p < 0.000005$* $t(130) = 1.13$ $p = 0.26$	0.03 [−0.21–0.26]
Sleep quality (0–10; 0 is best sleep) last night	4.33 (2.32) *134* 4.22 (2.32)	3.56 (2.34) *179* 3.54 (2.40)	0.68 (2.6, 0.23)	$F(1, 312) = 2.15$ $p < 0.000005$* $t(124) = 2.60$ $p = 0.004$*	0.33 [0.09–0.57]

Notes: The *p*-values listed above are unadjusted. Those marked with an * are significant after correction for multiple comparisons using False Discovery Rate.

responses before their session and at the three-week follow-up visit (with the number of responses at baseline and at follow-up indicated in the second column). There were significant improvements in overall well-being, negative emotion and sleep quality.

172 participants answered the question, *"I feel like I have positively changed as a result of this session."* on a scale of 0–100 (with 100 representing Definitely True and 0 representing Definitely False) as True (69.5 ± 23.9). 66% of the participants said they experienced a moment of clarity or profound insight during their session ($n = 180$). Those who answered yes to the clarity/insight question were then asked, *"I feel that my behavior and relationships will change as a result of this experience."* and on average most responded that this was true for them (71.3 ± 21.2). These quantitative data were reflected in anecdotal reports from participants, such as "I woke up the day after and felt that my heart was much more open."

Heart rate variability (HRV)

Multiple comparison correction for the 64 measures led to a significance threshold of less than 0.002 for a significant *p*-value. There were seven significantly changed variables, PNS index, SNS index, mean RR interval, mean heart rate, minimum heart rate, HF peak frequency, and pNNxx with multiple comparison correction (Table 4). Nonlinear variables did not show any significant changes. (See Supplemental Data for results of all HRV measures).

Of the heart rate variability measures, six demonstrated significant improvements from the first to last six minutes of the session. Most of these reflect an increase in parasympathetic activation. For example, the HRV measure that is an index of parasympathetic activity (PNS Index) increased, and the HRV measure that is an index of sympathetic activity (SNS Index) decreased. A possible interpretation of such changes is described below. Also, the mean RR interval increased and the mean heart rate decreased as did the minimum heart rate.

Coherence

There was no significant difference in the coherence (First 6 min - 0.0014 ± 0.0025; Second 6 min - 0.0011 ± 0.0022; $z = 1.40$, $p = 0.16$), despite other studies observing changes in this measure resulting from various interventions.[36,46,47]

Table 4
Heart rate variability measures.

Measure	First 6 Min Mean (sd) n = 186	Last 6 Min Mean (sd) n = 186	z	p-value
EDR (Hz)	0.22 (0.06)	0.23 (0.07)	−2.19	0.029
PNS index	−0.11 (1.68)	0.07 (1.74)	−4.26	<0.000005*
SNS index	0.84 (1.75)	0.65 (1.81)	3.61	0.0003*
Stress index	13.8 (7.52)	13.25 (7.6)	1.88	0.060
Mean RR (ms)	937.2 (77.78)	958.9 (185.98)	−5.47	<0.000005*
SDNN (ms)	38.35 (30.91)	39.34 (30.51)	−1.50	0.133
Mean HR (bpm)	66.2 (11.96)	64.83 (12.17)	5.51	<0.000005*
Min HR (bpm)	60.31 (10.96)	58.79 (11.04)	5.92	<0.000005*
Max HR (bpm)	75.6 (16.07)	74.62 (15.13)	2.37	0.018
RMSSD (ms)	37.48 (43.81)	40.03 (44.57)	−2.56	0.010
pNNxx (%)	12.97 (16.96)	14.64 (18.63)	−3.11	0.0019*
VLFpower (ms2)	119.98 (155.92)	135.69 (159.11)	−2.68	0.007
LFpower (ms2)	1072.86 (1714.84)	1006.81 (1565.38)	0.35	0.729
HFpower (ms2)	911.65 (3898.4)	938.26 (3559.51)	−2.50	0.012
HFpeak (Hz)	0.185 (0.056)	0.191 (0.058)	−2.85	0.0044*
LF/HF ratio	3.27 (3.46)	2.94 (3.53)	1.78	0.076

Notes: The p-values listed above are unadjusted. Those marked with an * are significant after correction for multiple comparisons using False Discovery Rate. Variables are not normally distributed so the nonparametric Wilcoxon Sign Rank test was used. EDR = ECG-derived respiration, PNS = parasympathetic nervous system, SNS = sympathetic nervous system, RR = ECG peak to ECG peak interval, SDNN = the standard deviation of normal RR intervals, HR = heart rate, RMSSD = root mean square of successive differences between normal heartbeats, pNNxx = Relative number of successive RR interval pairs that differ more than xx msec, VLF = very low frequency, LF = low frequency, HF = high frequency.

Table 5
Heart rate synchrony between practitioner and participant.

	First 6 Min mean(sd) n = 185	Last 6 min mean(sd) n = 185	z	p-value*
Overall Correlation	0.073 (0.154)	0.084 (0.163)	−0.69	0.49
Overall Coherence	0.001 (0.001)	0.001 (0.001)	−1.93	0.05
Overall Phase Coherence	0.155 (0.098)	0.176 (0.118)	−1.77	0.08
Correlation LF	0.079 (0.282)	0.087 (0.322)	0.01	0.99
Coherence LF	0.0003 (0.0003)	0.0003 (0.0003)	−1.49	0.14
Phase Coherence LF	0.29 (0.139)	0.288 (0.149)	0.25	0.80
Correlation HF	0.046 (0.209)	0.029 (0.201)	0.65	0.52
Coherence HF	0.0002 (0.0003)	0.0002 (0.0002)	1.30	0.20
Phase Coherence HF	0.183 (0.09)	0.173 (0.098)	1.65	0.10

Notes: The p-values listed above are unadjusted. *None of these comparisons were significant using a False Discovery Rate for multiple comparisons. Variables were not normally distributed so the nonparametric Wilcoxon Sign Rank test was used to evaluate similarities between first and last six minutes of the session. There is an inherent assumption in this analysis that the correlation and coherence of the participant's and practitioner's heart rates would increase during the session. LF = Low frequency, HF = High frequency.

Average heart rate synchrony

After multiple comparison corrections, there were no significant differences between the first and last six minutes in ECG synchrony variables (Table 5).

Time series heart rate synchrony

Time-varying synchrony proved significant after correction for multiple comparisons for the high-frequency coherence measure (Table 6).

Median nerve conduction velocity

Median nerve conduction velocity (NCV) test results were analyzed for 145 participants. Results from 39 participants were not included due to technical issues with the NeuroMax device which corrupted these data files. The majority of participants reported pain in both wrists. The breakdown of which wrists were involved is as follows: Left = 25; Right = 52; Both = 68. Baseline data collected before the energy medicine sessions were used in an attempt to validate the outcome measure by comparing NCV values for involved versus uninvolved wrists. A slight difference between them was discernible in the expected direction (slower NCV for the involved wrist) but it was not statistically significant by Student's t-test (p = 0.60): involved wrist = 44.78 ± 10.8 m/s and uninvolved wrist = 45.64 ± 11.50 m/s. There was no change in NCV values from baseline (n = 145, 44.9 ± 10.6 m/s), post-session (n = 141,

Table 6
Time series heart rate synchrony analysis between practitioner and participant for the first six minutes of the energy medicine session.

Parameter	Slope 95% confidence Interval	p-value
correlation (broadband- no filtering)	[−0.00011, 0.00013]	0.84
correlation (low frequency)	[−0.00023, 0.00017])	0.82
correlation (high frequency)	[−0.00021, 0.00014]	0.70
phase coherence (broadband - no filtering)	[−0.000087, 0.000041]	0.50
phase coherence (low frequency)	[−0.000032, 0.0000086]	0.24
phase coherence (high frequency)	[−0.00014, 0.000035]	0.25
coherence (broadband - no filtering)	[−0.0000010, 0.000000069]	0.13
coherence (low frequency)	[−0.00000033, −0.000000016]	0.04
coherence (high frequency)	[−0.00000072, −0.00000021]	0.0091*

Notes: The p-values listed above are unadjusted. Those marked with an * are significant after correction for multiple comparisons using False Discovery Rate.

45.3 ± 10.7 m/s), and three weeks later (n = 141, 43.4 ± 9.7 m/s; F (2426) = 1.0, p = 0.39).

Gene expression analysis

The binding density quality control measure applied to the multiplex expression data resulted in samples from 15 participants being eliminated from inclusion in further analysis: eight of the participants in the Better group, and seven participants in the Worse group. Three house-keeping genes were selected for normalization of target gene expression levels based on their consistent expression levels across all of the mRNA samples: CNOT10, GUSB, and TADA2B. The second level of quality control applied to the multiplex expression data was to require that the normalized expression levels for a target gene to be at least twice background levels in all samples. Genes that met this threshold (236) were carried forward for analysis. Mean fold-changes were modest and none of the p-values remained below 0.05 after adjustment for multiple comparisons.

Discussion

Recruitment and retention

The participants enrolled in the study were mostly well-educated, Caucasian women who were "in relationship", which reflects the demographics of the local area as well as users of complementary and alternative medicine in general. The initial recruitment criteria included a requirement for clinical documentation of carpal tunnel syndrome, which proved to be an impediment to recruitment and was eliminated. The remote location and lack of public transportation to the campus was a major factor that deterred potential participants residing outside the area from joining the study. Another barrier was the requirement that appointments for the two visits occur within standard work hours, which would necessitate taking two days off from work for many participants. Both of these factors likely contributed to the high number of cancellations and missed appointments. Three participants opted to drop out of the study during the first visit: two due to discomfort associated with stimulation of the median nerve for the NCV test, and one due to perceived conflict of energy medicine with religious beliefs.

Pain and pain-related outcomes

Encouragingly, the primary outcome of self-reported pain improved significantly in all the ways that were measured for this study: worst pain in the last week, pain in the last 24 h, and current pain. Not only did the current pain improve immediately post-session but it was sustained at the three-week follow-up. Persistence of the pain relief is especially significant considering that, while the degree of pain relief was less than that reported for daily administration of pain medications such as NSAIDS,[48] the energy medicine modalities were administered only once. Future studies could include pain measures collected a few weeks prior to the session to better evaluate natural improvement trajectory. Another type of analysis that would be interesting to include in future studies is to compare the effects obtained with different types of modalities, such as comparing those that do and do not involve touch. Also important to note, the significant pain improvement observed demonstrates that interference, if any, from protocol requirements that limited practitioner movements, as well as the close proximity of instrumentation, was not sufficient to eliminate the efficacy of the energy medicine treatments.

Participants had marked improvement in pain-related outcomes as well. Reports of pain interference associated with work, relationships, and enjoyment all revealed significant improvements at the three-week follow-up. Sleep quality also improved, which is a known comorbid issue in pain syndromes, and pain severity and sleep quality can exacerbate each other.[49–51] Mood and well-being are well-established to be related to pain syndromes as well.[2] In our study, overall well-being and negative emotion also improved at the 3-week follow-up. Positive emotion also improved although it did not pass correction for multiple comparisons. It is arguable that a placebo effect might have been at play in many of these self-reported improvements. This will only be fully established with further research using a time and attention control arm. However, the fact that the credibility and expectancy scores were not correlated to pain improvement suggest that some outcomes were not mediated by these aspects of the placebo response.

Aside from the pain and pain-related outcome improvements, many participants reported improvement in areas other than their hand and wrist following the energy medicine sessions. During the three-week follow-up visit, for example, one participant stated that his knee pain diminished so dramatically after the energy medicine session that he was able to cancel a scheduled knee surgery. Another participant claimed that a palpable neck tumor shrank during the course of the session. In addition to unrelated physical effects, many participants related that they benefited from the experience emotionally and spiritually. The improvements in areas other than the hand and wrist as well as the positive influences in mood and well-being are predicted by the theoretical frameworks of the practitioners. They uniformly believe that their energy medicine modalities are directed toward the whole person rather than a specific symptom, and attribute the effectiveness of their modalities to mechanisms involving subtle energies or spiritual dimensions.

Physiological outcomes

Our preliminary exploration into physiological changes occurring during the energy sessions revealed several findings of note. Of the heart rate variability measures, six demonstrated significant improvements from the first to last six minutes of the session. Most of these reflect an increase in parasympathetic activation. For example, the HRV measure that is an index of parasympathetic activity (PNS Index) increased and the HRV measure that is an index of sympathetic activity (SNS Index) decreased. A possible interpretation of such changes is described below. Also, the mean RR interval increased and the mean heart rate decreased as did the minimum heart rate.

There were no significant differences in coherence between the first and last six minutes of the energy medicine session, despite other studies observing changes in this measure resulting from various interventions.[36,46,47] However, this result must be considered in light of the fact that there was no significant peak in the signal within the 0.04 to 0.26 Hz range for many participants. Similarly, no difference in heart rate synchronization was detected between the participant and practitioner in the first six minutes of the energy medicine session compared to the last six minutes. Given the negative result of this exploratory measure, researchers considering this measure in future studies would be well-advised to weigh its value against the potential inhibitory effect on the administration of the energy medicine because the requirement that the practitioners remain seated and still during the first and last six minutes of each session was the aspect of the protocol that most interfered with some of the practitioners' natural method of delivery.

In contrast, a significant difference was observed when analyzing at the time series of heart rate synchrony of the practitioner and participant. Over the course of the first six minutes, we observed that the coherence increased in the high-frequency band. The time series analysis is different from the average analysis in that it is comparing the similarity of the heart rate over time between the participant and practitioner rather than averaging the data over the whole six minutes. The time-series coherence measure looks at the relationship of the phase and amplitude of the ECG signal. High-frequencies represent vagal tone and reflect parasympathetic nervous system activity. This result mirrors what we observed in the heart rate variability

measures with increased parasympathetic activation. High-frequency HRV is also linked to respiratory sinus arrhythmia and our interpretation of this result is that participants and practitioners tend to synchronize their breath at the onset of the healing session, and then slowly get back into their own rhythms as both participant and practitioner relax.

The apparent parasympathetic activation, when comparing the participants' heart rate variability during the beginning and end of the energy medicine sessions and increased coherence synchrony during the first six minutes, likely aligns with increased relaxation during the sessions.[32] Future studies would need to carefully control for parameters influencing relaxation such as the amount of time resting in a seated position, which can induce relaxation by itself. Nevertheless, it is unlikely that the parasympathetic activation we observed in this pilot study was due solely to the participants being seated because the initial measurements were taken after the participants had been seated for approximately 20 min.

Considering the vast implications of parasympathetic activation on health, this finding may be an important clue to follow up on regarding possible mechanisms of action for energy medicine. Parasympathetic activation is interesting because the change in the time intervals between adjacent heartbeats has been used to predict future health outcomes.[52–55] Decreased HRV has been correlated with disease onset and mortality as it reflects reduced regulatory capacity of the body to adaptively respond to challenges like exercise or stressors. The data from this study will allow for specific hypotheses to be tested and power calculations conducted for future studies.

The lack of any apparent correlation between pain relief and the NCV results may be due to the high degree of variability in the nerve action potentials that were recorded. One factor that might have contributed to this variability is the likely heterogeneity of neuropathic and orthopedic conditions associated with the participants' pain because of our reliance on self-report of carpal tunnel pain rather than confirmed diagnosis and clinician referral. Another contributing factor to the variability in the sensory nerve action potentials may have been underlying nerve damage that influenced action potential measurements. Given these results, it seems advisable to reserve the NCV measure for use in studies with very narrow entry criteria and thus a more homogeneous population.

The gene expression measure also did not yield any apparent correlation between the degree of pain relief and expression levels of known neuroinflammation-related genes. One likely explanation for this finding is that, while the degree of pain relief was clinically significant, it may not have been sufficient to result in detectable gene expression changes. Indeed, there are no published reports indicating that changes in the experience of pain are associated with detectable transcriptional regulation in blood cells. However, our results do not rule out the possibility due to the limited number of target genes probed and the single time point assessed after the energy medicine sessions.

The results of this study should be considered with the following limitations in mind. The experimental design did not include a time and attention control arm. Another aspect of the design that was not controlled for was whether or not the *seer's* presence influenced the results. To minimize this possibility, the *seer* was asked to maintain an "objective place of neutrality" throughout all of the sessions. A further limitation was the necessity to rely on self-reporting of carpal tunnel pain for inclusion, rather than a documented diagnosis. This relaxed inclusion criterion undoubtedly increased the heterogeneity of the participant population in terms of the underlying etiologies causing pain and subsequently increased the variability in outcomes, especially the NCV data. Future studies may also benefit from tracking the length of time that participants were experiencing carpal tunnel pain prior to entering the study. Additionally, the anecdotes collected in this pilot study indicate that important information may be gained in future studies by including a questionnaire item asking participants to offer comments regarding their experiences. As was done for perceptions related to apparent subtle energy movement during the treatments (reported in an accompanying article), quantitative and qualitative analyses can be applied to such free-response information.

There were missing data for many variables of the self-reported questionnaire data. One reason for this was that the IRB required that participants were permitted to skip any items on the questionnaire that they wanted. Thus, we were unable to include protections to ensure all items of the survey were captured. The other reason there were missing records in the baseline survey data was that participants were given a link and asked to complete the survey online prior to their arrival, yet some failed to do so. Fifty-one records were missing because of this reason (26%). Similarly, participants were not fully compliant with the instructions to refrain from eating anything two hours prior to the oral rinse collections, which is a likely cause for the samples from 15 participants failing the quality control measures for the gene expression analysis.

Conclusions

The finding that participants experienced clinically significant and persistent pain relief confirms the feasibility of studying the effective application of energy medicine within a laboratory setting. In addition to the pain outcomes, the questionnaire results indicate trends for positive effects on well-being and feelings of transformation. These participant reports are consistent with the activation of the parasympathetic nervous system that was apparent during the energy medicine sessions, as this branch of the autonomic nervous system is associated with feelings of calm and relaxation. Future studies are warranted that examine both dose and distance of the energy medicine intervention and incorporate control conditions such as mock treatment. These expansions of our protocol can begin to distinguish effects unique to energy medicine and to explore the underlying mechanisms of these modalities.

Author contributions

Garret Yount - Conceptualization, funding acquisition, methodology, investigation, supervision, writing – original draft preparation, review & editing

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Dean Radin - Conceptualization, funding acquisition, methodology, data curation, formal analysis, writing – original draft preparation, review & editing

Loren Carpenter - Conceptualization, funding acquisition, methodology

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Joyce Anastasia - Project management, investigation

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Meredith Pierson - Investigation

Sue Steele - Investigation

Aimee Chagnon - Conceptualization, writing – review & editing

Helané Wahbeh - Conceptualization, funding acquisition, methodology, data curation, formal analysis, writing - original draft preparation, review & editing

Declaration of Competing Interest

The authors declare no conflict of interest.

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Repository: Open Science Framework

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