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Distant Healing Of Surgical Wounds: An Exploratory Study

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Abstract

Distant healing intention (DHI) is one of the most common complementary and alternative medicine (CAM) healing modalities, but clinical trials to date have provided ambivalent support for its efficacy. One possible reason is that DHI effects may involve variables that are sensitive to unknown, uncontrolled, or uncontrollable factors. To examine two of those potential variables – expectation and belief – the effects of DHI were explored on objective and psychosocial measures associated with surgical wounds in 72 women undergoing plastic surgery. Participants were randomly assigned to one of three groups: blinded and receiving DHI (DH), blinded and not receiving DHI (Control), and knowing that they were receiving DHI (Expectancy). Outcome measures included collagen deposition in a surrogate wound and several self-report measures. DHI was provided by experienced distant healers. No differences in the main measures were observed across the three groups.

Participants' prior belief in the efficacy of DHI was negatively correlated with the status of their mental health at the end of the study ($p = 0.04$, two-tailed), and healers' perceptions of the quality of their subjective "contact" with the participants were negatively correlated both with change in mood ($p = 0.001$) and with collagen deposition ($p = 0.04$). A post-hoc analysis found that among participants assigned to receive DHI under blinded conditions, those undergoing reconstructive surgery after breast cancer treatment reported significantly better change in mood than those who were undergoing purely elective cosmetic surgery ($p = 0.004$). If future DHI experiments confirm the post-hoc observations, then some of the ambiguity observed in earlier DHI studies may be attributable to interactions among participants' and healers' beliefs, their expectations, and their motivations.

INTRODUCTION

Distant healing intention (DHI) may be defined as "a compassionate mental act intended to improve the health and well-being of another person at a distance."[1] Terms used to describe

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DHI interventions include intercessory prayer, spiritual healing, non-directed prayer, intentionality, energy healing, shamanic healing, non-local healing, non-contact Therapeutic Touch, and Reiki. Each of these methods involves a distinct theoretical, theological, cultural, or pragmatic approach toward healing through the application of one person's intention towards another.

DHI, especially in the form of prayer, is one of the most commonly used complementary and alternative medicine (CAM) healing modalities. A government survey of adult Americans by the US National Center for Health Statistics showed that of the top ten CAM practices, the first was prayer for oneself and the second was prayer for others.[2] Among social workers, a survey found that 28% of over 2,000 respondents had engaged in verbal prayer with their clients, while 57% privately prayed for their clients.[3] In a survey among 1,900 cancer survivors, 62% reportedly prayed for their own health, 39% had others pray for their health, and 15% participated in group prayer.[4] And based on general population surveys from 2002 to 2008, the use of prayer for health concerns has continually increased in the United States after taking into account demographic, socioeconomic status, health status, and lifestyle behaviors.[5]

While the popularity of DHI is well established, its efficacy is uncertain. A meta-analysis by Hodge reviewed 17 randomized controlled studies of DHI and concluded that the outcomes produced small but significant effects for intercessory prayer under both random and fixed effect models, and with and without inclusion of one controversial study. [6,7] Masters et al focused on 14 studies involving only intercessory prayer and found a positive but non-significant outcome.[8] In an updated meta-analysis with one additional study, Masters et al again found a positive, non-significant outcome.[9] That data also showed that the DHI effect size, while small, was nearly 15 times larger for unhealthy subjects than for healthy controls, suggesting that need or motivation may play a role in DHI efficacy. Nevertheless, because the overall results were not robust, Masters et al recommended that further resources not be allocated for this type of research. The most recent meta-analysis, a Cochrane systematic review by Roberts et al,[10] found fewer deaths in an intercessory prayer condition as compared to standard care control, results that were again significant for high risk and thus highly motivated subjects ($p < 0.00001$). Their conclusion was similar to that of Masters et al: "The evidence presented so far is interesting enough to support further study. However, if resources were available for such a trial, we would probably use them elsewhere."(p. 24).

Laboratory evidence for the possibility of DHI efficacy specifically on the healing of wounds was first published by Grad,[11] who studied the effects of a noted healer, Oskar Estebany, on surgical wounds in 48 mice as compared to a non-healed control group. In a study that was later successfully replicated, mice exposed to the healer showed significantly enhanced wound healing, suggesting a DHI effect not attributable to placebo effects. More recent studies by Bengston,[12] also involving mice but with DHI directed towards healing of injected mammary cancer rather than surgical wounds, also showed significantly enhanced healing.

Overall, clinical trials and laboratory studies suggest that there might be some efficacy for DHI, but lack of a clear consensus and uncertainty about the key underlying variables has led most analysts to recommend that research funding be directed towards more tractable problems. For pragmatic reasons, such advice is not unreasonable. However, if DHI effects are genuine to any extent, even if they manifest only as a small magnitude, high variance phenomenon, then the scientific and medical consequences are profound and additional research is justified. In particular, exploring the extent to which effects of DHI may be attributable to or modulated by patient expectations and resulting placebo effects, or how

patient beliefs or motivations might interact with DHI, offers the potential to shed light on the mind-body healing process in general.

In this study, we chose to explore the effectiveness of DHI on the healing of surgical wounds. For an objective outcome measure we used the rate of subcutaneous collagen deposition. To address other possible outcomes of DHI, we also administered a set of self-report measures of mental and physical health.

In the real world, people often know that they are being treated with DHI, so it can be difficult to determine what proportion of the reported benefit may be due to DHI and what may be attributed to expectancy or placebo. To explore the role of expectation in DHI, we designed a three-arm study: a blinded group receiving DHI, a blinded group not receiving DHI, and an unblinded, placebo-enhanced group receiving DHI. This allowed us to study the effects of subjects' expectations by varying whether the subject knew that DHI efforts were being made on their behalf. The primary research questions were: 1) Do participants' expectations about whether or not they are the target of DHI influence collagen deposition, and is this correlated with their subjective measures of well being? And 2) Do participants' beliefs about DHI affect collagen deposition or subjective measures of well being?

METHODS

Procedure

The Institutional Review Boards of the California Pacific Medical Center and St. Mary's Medical Center, both in San Francisco, approved this study and informed consent was obtained from all participants. The study involved women undergoing elective surgery, some for reconstruction after breast cancer surgery and some for cosmetic reasons. They were randomized into three groups:

1. A *Control* group knew that they were being randomly assigned to receive DHI or not, and in this condition they did not receive it.
2. A *Distant Healing* (DH) group knew that they were being randomly assigned to receive DHI or not, and in this condition they did receive a 20-minute or more DHI session per day for 8 days.
3. An *Expectancy* group knew that they were receiving DHI in a 20-minute or more DHI session each day for 8 days, and they were reminded of this daily by a telephone call.

All participants, clinical staff, and data analysts were blinded to group assignments and for the Expectancy group the research staff and data analysts were blinded to group assignment.

During the study period, all women entering the Plastic Surgery Associates facility (San Francisco, CA) who were eligible for the study were contacted by mail prior to their pre-operative visit. A recruitment letter described the study and provided contact information if they had questions about the study before they arrived at the office. The recruitment letter specified that this study concerned "distant healing, or someone holding the intention for your healing in a remote location." Participants who expressed interest had an enrollment interview on site at Plastic Surgery Associates approximately two weeks before surgery. Study participants also filled out initial questionnaires and were photographed. After surgery, participants engaged in their daily activities with no special requirements from the study. They were contacted for a three-month follow-up interview administered via mail. Contacts between participants and study personnel were kept to a minimum.

Assessments

An investigator-developed *Personal Data Questionnaire (PDQ)* collected demographic information, baseline health behaviors including nutritional intake and exercise, use of alternative therapy interventions including other forms of DHI, and degree of social support. It also contained a 5-point Likert scale assessing the subject's degree of belief in the effectiveness of DHI as a healing modality.

IMPRA implants—Hydroxyproline (collagen) deposition was measured at the 8-day post-surgical assessment point using two expanded polytetrafluoroethylene implants (International Polymer Engineering, Inc., Tempe, AZ, trade name "IMPRA"), positioned subcutaneously following a standard method described in the wound healing literature.[13] IMPRA samples were stored at −70° F until the time of assay. Quantification of collagen deposition was made through chromatographic analysis for hydroxyproline, using micrograms per centimeter units. The assay was performed according to the methods of Lindblad and Diegelmann.[14]

The *Short Form Health Survey (SF-36®)* is a 36-item questionnaire that generates a health-related quality of life profile consisting of 8 scales and 2 summary measures: a Physical Composite Score (PCS) and a Mental Composite Score (MCS).[15] Used in more than a thousand published studies, the original SF-36 has proven to be useful in monitoring general and specific populations, comparing the burden of different diseases, differentiating health benefits produced by different treatments, and screening individual participants.

The *Profile of Mood States (POMS*) is a 65-item measure of level of mood disturbance; it takes about 3–5 minutes to complete.[16] The scale provides a total score and 6 dimensions of mood, including tension, depression, anger, vitality, fatigue, and confusion. It was first assembled and tested for validity and reliability in 1955. Internal consistency reliabilities based on a sample of female outpatients range from 0.84 (confusion-bewilderment) to 0.95 (depression-dejection).

The *Rosenberg Self-Esteem Scale* is a brief, single-scale validated measure of self-esteem.[17]

The *Impact of Surgery Scale* is a 5-point Likert investigator-developed instrument designed to capture the subject's overall perception of the impact of plastic surgery on their lives in retrospect. It was administered via mail three months after the surgery.

Surgical Procedure

All surgical procedures were performed by one of the authors (LE), a licensed plastic surgeon, at California Pacific Medical Center or at St. Mary's Hospital (San Francisco, CA). At the end of the surgery, while the subject was still under anesthesia, a small wound was made with a number 11 blade at the planned entry and exit sites of the IMPRA collagen collection tube. Two 1 mm × 7 cm sections of IMPRA tubing were implanted. Two tubes were implanted to increase sample volume because 7 cm is the limit of tube length that can be easily implanted subcutaneously. The same entry site was used for both implants, and the ends of each implant protruded from a separate exit site. All IMPRA implants were placed in a standardized location in the lower portion of the abdomen, just above the pubis.[18] This standardized surrogate site was chosen because it represents the same tissue compartment as the actual wound, but is far enough from the wound to alleviate concerns for contamination. Participants were informed that placement of the tubes may leave a small (1–2 mm) scar. Because many of the women in the study were having cosmetic and /or reconstructive surgery, and would thus likely be concerned about such a scar near their surgical wound, we chose a site where a scar would not be an issue. Using a surgical needle, the surgeon pulled

the IMPRA through, just under the skin, until the distal tip disappeared under the skin and only a few mm protruded proximally. They then dressed the wound with a thin, semi-permeable, transparent film dressing (Tegaderm, 3M, St. Paul, MN).

On the eighth day after surgery, the subject returned to the Plastic Surgery Associates office to have the surgical sutures removed. The surgeon also removed the IMPRA tubes from the implant site. A topical anesthetic (EMLA cream, AstraZeneca LP, Wilmington, DE) was used on the exit site to minimize the pain of removal. The dry, exposed end of the IMPRA implant was cut off and the remainder placed in separate test tubes, then placed on ice, coded to match the subject code, and stored in a −70° F freezer within 2 hours of removal. Samples were then delivered on ice to an analytical laboratory at the Wound Healing Laboratory at the University of California, San Francisco, where they were stored in a −20° F freezer until analysis. To reduce assay variability, analysis was performed simultaneously on all samples after subject enrollment was complete. The hydroxyproline content for the two implants removed from each subject was measured separately. Values were then averaged and the single average value used for analysis, as in previous studies.[18] Ingrowth into the implants is somewhat heterogeneous and this method provides the most accurate representation of the healing capacity of the subject.[19,20]

If the subject did not have a follow-up appointment scheduled on the eighth day after surgery, and did not wish to come in to the Plastic Surgery Associates office for an additional appointment (some participants lived far enough away that this constituted a hardship, particularly during recovery from surgery), a nurse trained in IMPRA implant removal removed the implants at the subject's home.

DHI Intervention

The study was designed to explore the use of DHI as it is commonly practiced by professional healers, i.e. without providing precise prescriptions instructing the healers what to do. Participants in the treatment conditions received healing effort from DHI practitioners who were asked to "Direct an intention for the health and well-being of the subject, for at least 20 minutes per day for eight days." When a new subject entered the study, the DHI practitioner assigned to work on the subject was provided (by overnight mail delivery) with a subject information sheet including a 4 by 6-inch (10.2 cm by 15.2 cm) color photograph, the subject's first name, and the date and approximate time of surgery. Each sheet was placed in a sealed envelope with instructions not to open it until the date the DHI practitioner was to begin treatment (i.e., the day of surgery). The DHI practitioner's location and distance from the subject was unrestricted. Each subject received DHI by one practitioner, and each practitioner was randomized to direct DHI to two participants (one at a time, separated by at least one month). This design was intended to help distribute possible variations in DHI practitioners' healing abilities as uniformly as possible across the subject pool, and also to give DHI practitioners adequate respite.

Each DHI practitioner was asked to commit 20 minutes of their time per day per patient, plus time to complete the healer daily log. DHI practitioners were asked to treat their subject for 8 days in a row and to fill out a 2-page, 8-question log to record time, location and duration of each day's healing effort, as well as any comments, images or impressions that they wished to report. The log also contained a checklist that documented the use of any of 25 different DHI strategies, such as "sending light," "praying to a higher power," "visualizing the subject well," etc., as well as any intuitive diagnostic efforts made. They were also asked to report to what degree they felt "affinity for, resonance with, or connection to" the subject, and how effective they felt the healing session was. DHI practitioners received a reminder phone call the day before they were scheduled to begin

their 8 days of DHI, a thank you phone call and letter at the close of each 8 days of DHI, and a small gift, but they were not paid for their participation.

Data Analysis

Participants were compared on baseline demographics to assess similarity across groups. Baseline variables showing significant between-group differences were controlled in subsequent analyses via analysis of covariance (ANCOVA). Spearman rank-order correlations were used to examine relationships between expectancy ratings and healing outcomes. All reported p-values are two-tailed. This study was explicitly exploratory. It was intended to examine possible trends and to establish effect sizes for future confirmatory studies.

Four outcome measures were used: Natural log (to adjust for a positively skewed distribution) of collagen deposition, change in POMS normalized mood scores from baseline to end of the 8-day DHI period, SF-36 Mental Composite Score at the end of the DHI period, and SF-36 Physical Composite Score at the end of the DHI period.

Participant Selection

Inclusion criteria—1) Women undergoing plastic surger y; 2) American Society of Anesthesiologists (ASA) Physical Status Criteria I or II (i.e. ASA I = health excellent with no systemic disease; no limitations on activity; no danger of death; excluded: persons at extremes of age; ASA II = health: disease of one body system; status of underlying disease is well-controlled; no limitations on activity). Participants were compensated $100 in the form of a check upon completion of all study requirements.

Exclusion criteria—1) non-English speaking; 2) inability or unwillingness to fill out questionnaires; 3) smoking; 4) morbid obesity; 5) circulatory inadequacies; 6) nutritional deficits as evidenced by neutropenia or hypoalbuminemia; 7) history of radiation to the site of IMPRA implant, or any radiation therapy within the past three months, 8) current Stage 3 or 4 breast cancer; 9) duration of surgery anticipated to be less than 2 hours.

Healer inclusion criteria—Healers identified for this study had: 1) a minimum of 5 years of experience as a professional DHI practitioner, meaning that they regularly used DHI for treatment of participants or clients not otherwise known to the DHI practitioner; 2) had practiced healing at a distance on at least 30 previous patients; and 3) had experience working with wound healing. Healers were recruited from a database of more than 100 healers maintained by California Pacific Medical Center Research Institute, all of whom had been previously evaluated and met or exceeded these criteria. Applicants filled out a Healer Information Form which provided verification of inclusion criteria and additional descriptive information. DHI practitioners were located in North America within a range of 3 to 3000 miles away. Practitioners were experienced in a variety of DHI modalities including visualization, prayer, energy work, and shamanic healing.

RESULTS

The study involved 40 healers who collectively directed DHI towards 72 women, aged 28 – 63. Table 1 lists subject demographics and the reason for surgery. After receiving surgery, no participants dropped out of the study because they had to visit the surgeon’s office or see a nurse to have the IMPRA implant removed, and at that time they were all available to fill out the 8-day post-surgery questionnaires. However, 17 participants failed to return the mailed 3-month follow-up questionnaire (24%). The drop-outs were spread approximately evenly among the three groups (Control: 29%; Distant Healing (DH): 17%; Expectancy:

24%). Of 48 participants who were assigned a healer (23 in the DH group, 25 in the Expectancy group) there were two instances in which the assigned healer did not complete the daily logs (one in the DH group, one in the Expectancy group). For the remaining 46 sessions, all daily logs were completed, and many healers provided extensive notes on the sessions.

Aim 1

Did expectations about DHI influence collagen deposition or subjective measures of well being?

Examination of demographic and other variables revealed one significant difference among the groups: hours of surgery (see Figure 1). Surgeries in the Expectancy group participants lasted nearly an hour longer on average than the Control group, and about 50 minutes longer than the DH group ($F(2, 64) = 5.22$, $p = 0.008$). Participants were randomly assigned and the surgical staff and research team were blinded to assignment at the time of surgery, so it appears that randomization failed to equally distribute surgical times in this study. As a result, this factor was controlled for by being entered as a covariate in all subsequent analyses.

Collagen deposition—There was no significant difference in mean collagen deposition among the three groups ($F(2, 62)=0.79$, $p=0.46$, see Figure 2).

Subjective measures—There were no mean changes in mood among the three groups ($F(2, 48) = 2.54$, $p = 0.09$, Figure 3). There were also no significant mean differences in the SF-36 PCS (physical composite) scores ($F(2, 56) = 2.08$, $p = 0.13$, see Figure 4) or the SF-36 MCS (mental composite) scores ($F(2, 56) = 2.41$, $p = 0.10$). However, a Fisher LSD (least significant difference) post-hoc pairwise comparison did suggest that mood change in the DHI group was more positive than in the Control group ($p = 0.02$, two-tailed).

Aim 2

Did participants' beliefs about DHI affect collagen deposition or subjective measures of well being?

To assess this aim, we evaluated Spearman rank order correlations across all participants (i.e., without regard to group assignment) for the subjective measures (change in mood, and SF-36 PCS and SF-36 MCS on the last day of DHI) and objective measures (natural log of collagen deposition) versus their (1) prior belief in the efficacy of DHI, (2) belief that they were assigned to a group that would receive DHI, (3) belief that DHI was actually taking place, and (4) the degree to which the healers felt "connected" to the participants.

Participants' prior belief in DHI was significantly negatively associated with their mental state at the end of the study period (SF-36 MCS, Spearman rho = −0.27, $p = 0.04$). Similarly, the degree to which participants' felt that DHI was taking place was weakly and negatively associated with collagen deposition (Spearman rho = −0.31, $p = 0.06$).

To examine these results in more detail, we partitioned the data into the three groups. The Expectancy group's results were consistent with the combined analysis, i.e. the more that participants believed that they were receiving DHI, the worse their mental state was at the end of the study period (SF-36 MCS, Spearman rho = −0.50, $p = 0.02$). Also, the more that they believed that DHI was actually taking place, somewhat less collagen was deposited (Spearman rho = −0.38, $p = 0.06$). Further, the more that healers reported a sense of connectedness with their patients, the more negative was the participants' change in mood

(Spearman rho = −0.56, p = 0.03) and the less collagen was deposited (Spearman rho = −0.44, p = 0.07). In the DH group, the healers' sense of connection with the participants, and the participants' change in mood, were again negative (Spearman rho = −.62, p = 0.01). The Control group showed no significant relationships or trends.

Post-hoc analysis

In a series of post-hoc analyses, we examined other variables that may have affected the results. To further explore the correlations observed in the Expectancy and DH groups, we investigated whether those outcomes may have been influenced by the participants' motivation for electing surgery. Participants who underwent surgery for cosmetic purposes accounted for the majority of study drop-outs (e.g. more cosmetic surgery vs. reconstruction patients failed to complete follow-up measures). Furthermore, the Expectancy group contained a greater proportion of cosmetic surgery patients than the Control or DH groups. To explore whether differences in the purpose of surgery might have differently affected the two group's receptiveness to DHI[21], we partitioned participants into those receiving reconstructive surgery following treatment for breast cancer (N = 28) versus those who had surgery for cosmetic purposes (N = 44).

There was a significant interaction between change in mood and motivation for surgery (ANCOVA group × diagnosis × change in POMS: F(2, 45) = 3.56, p = 0.04, Figure 5). A post-hoc Fisher LSD pair-wise comparison showed that the reconstructive surgery participants in the DH group experienced significant improvements in mood as compared to the cosmetic surgery participants in any other condition: Cosmetic Control (p = 0.002), Cosmetic DH (p = 0.004), Cosmetic Expectancy (p = 0.01), Reconstructive Control (p = 0.001) or Reconstructive Expectancy (p = 0.06). No significant interactions were observed between the purpose of surgery vs. PCS or MCS scores, or for collagen deposition.

Finally, healers' self-rated sense of "connectedness" with their participants, based on their subjective impressions recorded on their daily healing logs, was negatively associated with both participants' change in mood (Spearman rho = −0.57, p = 0.001) and with the amount of collagen deposition measured (Spearman rho = −0.30, p = 0.04).

Discussion

DHI is one of the most widely used CAM practices and undoubtedly one of the most controversial. The practice is common because in cases of incurable illness it is often the only course of "treatment" that is available, and for many loved ones it may be the only thing they feel they can offer. It is controversial because, as in the present study, the results of clinical trials are rarely clear-cut, and also because some assume that DHI effects are impossible in principle due to a lack of widely accepted theoretical mechanisms specifying how influences could extend from one person's mind to a distant person's body.[22]

Some theologians further consider DHI to be controversial because they assume science is either inadequate or inappropriate for testing DHI interpreted as divine intervention,[9] or worse, that if some prayers were answered and others were not, it would imply that God is immoral.[23] Moreover, some bioethicists are concerned that DHI experiments may be unethical because many assume that such interventions are benign and risk-free.[24] It was in part for this reason that our study did not include a deceptive condition where people receiving DHI were unaware of that possibility.

Concern about possible harm is not without anecdotal support (albeit at the level of folklore).[25] For example, some fundamentalist preachers have been known to openly evoke "imprecatory prayer" to pray for the death of government officials with whom they

disagree.[26] There is also some empirical support for negative effects. A study of intercessory prayer by Benson et al found that participants who were told that they were receiving prayer were 14% more likely to experience complications than individuals who were also receiving prayer but uncertain of it, or if they were not receiving prayer.[27] In addition, in an earlier prayer study Walker et al found that participants' participation in the prayer study (whether being prayed for or not) delayed drinking reduction, and reports that a friend or family member was praying for them at baseline resulted in increased alcohol consumption at 6 months as compared to those reporting they were unaware of anyone praying for them[28] This suggests that complex interactions may occur between actually receiving prayer or other DHI modalities, and one's knowledge, beliefs and expectancies about whether one is receiving DHI.

The present study was intended to explore these issues. The results suggested no main effects of DHI on the primary outcome measure of collagen deposition, or on secondary measures of self-reported emotional and physical health after surgery. The only significant difference between the conditions was that length of surgery in the Expectancy group was significantly longer than in the DH or Control groups. Because the DHI intervention did not begin until the day following surgery, barring a retrocausal explanation it seems likely that this difference was due to chance, thus to equalize this variable between the three groups it was used as a covariate in subsequent analyses. The most parsimonious interpretation of the main results is that neither DHI nor expectancy affected the outcome measures. It is possible that other limitations in the study design, including a lack of statistical power, may account for the lack of difference between the three conditions.

Post-hoc analyses suggested that concerns about possible negative effects of DHI may deserve a closer look. That is, this study did not provide support for the efficacy of DHI on wound healing *unless* participants' and healers' beliefs and expectations are taken into account. When those factors are included, a more complex picture emerges: The more that participants believed in distant healing, and the more they thought that distant healing was actually focused on them, the *worse* they did on both objective and subjective measures. In addition, the better the healers thought that they were doing, again the *worse* the participants' outcomes. Similar effects were not observed in the control group, suggesting that DHI played a role in these outcomes. These findings are reminiscent of the results of the Benson et al study.[27]

Additional post-hoc findings suggested that the motivation for having surgery may play an important role in modulating DHI effects. Participants' change in mood was substantially improved in the DH condition in women receiving reconstructive surgery after breast cancer treatment, but not in women receiving cosmetic surgery. Limitations of this finding include different proportions of cosmetic vs. reconstructive surgeries in each condition and differences in drop-out rates between cosmetic vs. reconstructive surgery participants. However, this finding does suggest that motivation for surgery may be a worthwhile variable for further study.

What might account for the generally negative trend associated with belief in DHI? It is conceivable that high belief in DHI may be associated with less psychological resilience to surgery. It is also possible that high-belief patients expect that other people or forces outside of themselves can exert healing effects, and thus they might feel a lower sense of responsibility for their own healing. Another possibility, based on laboratory studies of the effects of distant intention on the human nervous system,[21,29,30] is that distant intention effects are often correlated with activation of the sympathetic nervous system, i.e., a stress response. Increased stress is known to have negative effects on wound healing rates,[31] suggesting that participants who are the target of DHI, especially those who do not have

strong motivations to heal, may experience a rise in stress, and as a result a decrease in wound healing rates.

In conclusion, one explanation why meta-analyses are providing ambivalent conclusions about the efficacy of DHI is that distant healing effects do not exist. From that perspective, the occasional positive report of a properly conducted DHI study is best attributed to a statistical false positive or to selective reporting. An alternative explanation is that DHI effects do exist, but the relevant variables that modulate these effects are not well understood and interact in complex ways. Ultimately, future empirical studies or development of new theories will be required to help decide which of these explanations is closer to the truth.

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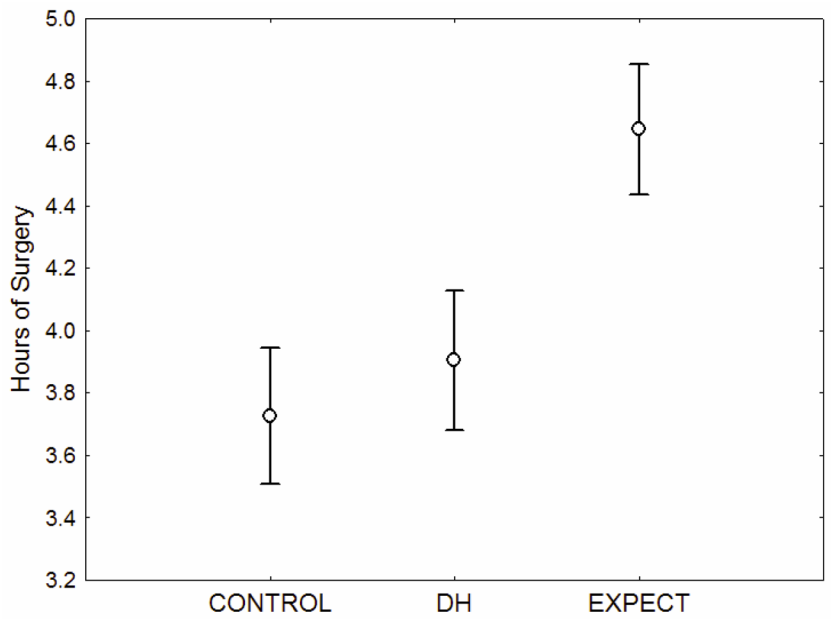

Figure 1.
Means and one standard error of the mean error bars for hours of surgery in the control, distant healing and expectation groups.

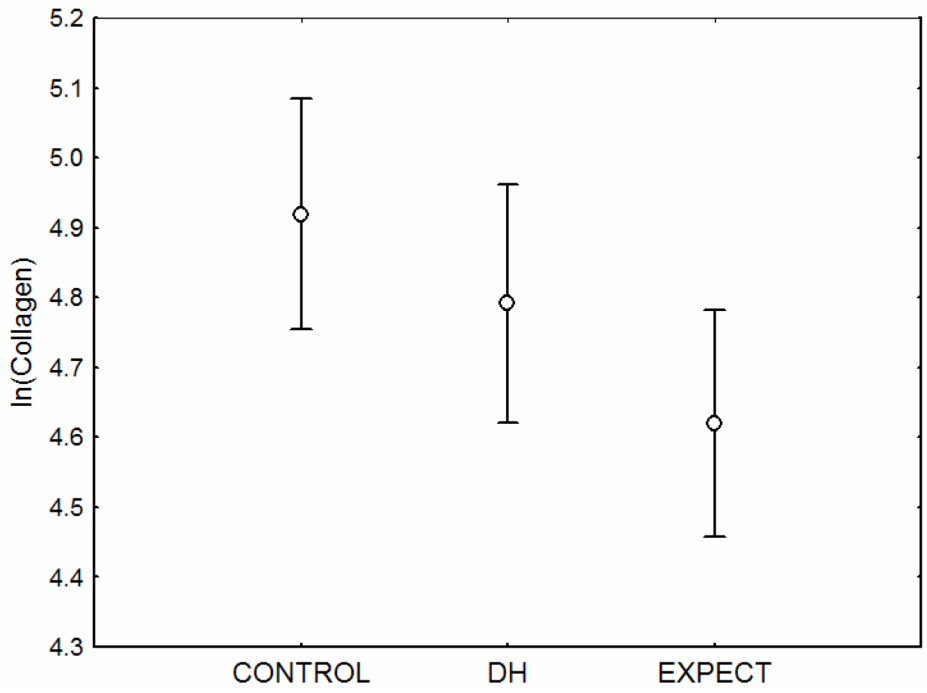

Figure 2.
Means and one standard error of the mean error bars for natural log of collagen deposition for the control group (blinded, not receiving DHI), the distant healing group (blinded, receiving DHI), and the expectation group (unblinded, receiving DHI).

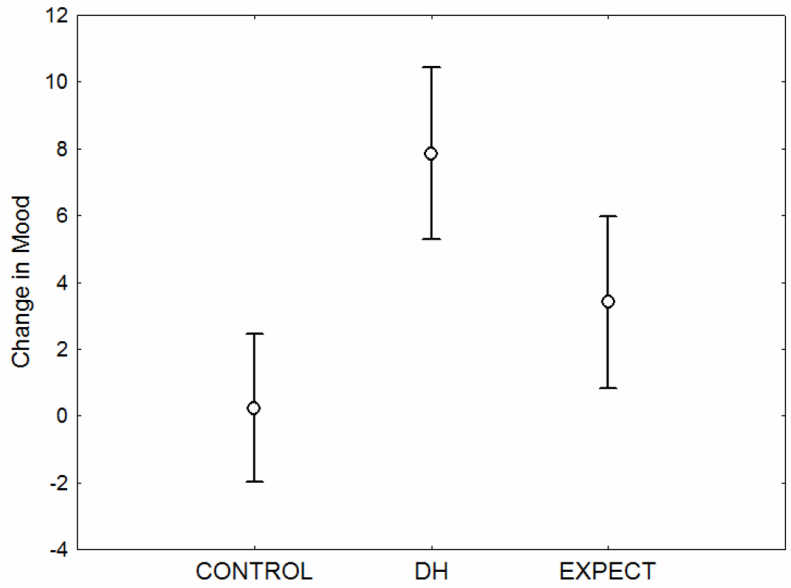

Figure 3.
Means and one standard error of the mean error bars for change in mood (POMS) scores from day of surgery to end of DHI period 8 days later.

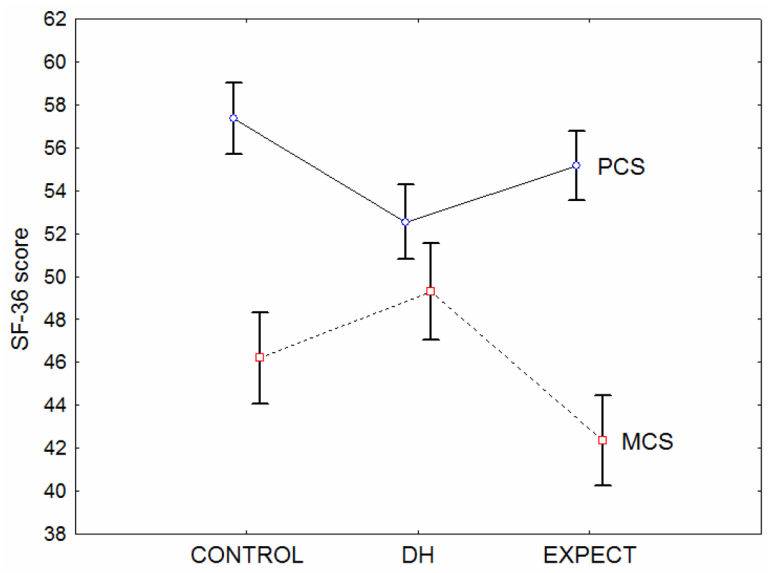

Figure 4.
Means and one standard error bars for SF-36 PCS (physical composite score) and MCS (mental composite score) on the last day of the 8-day DHI period.

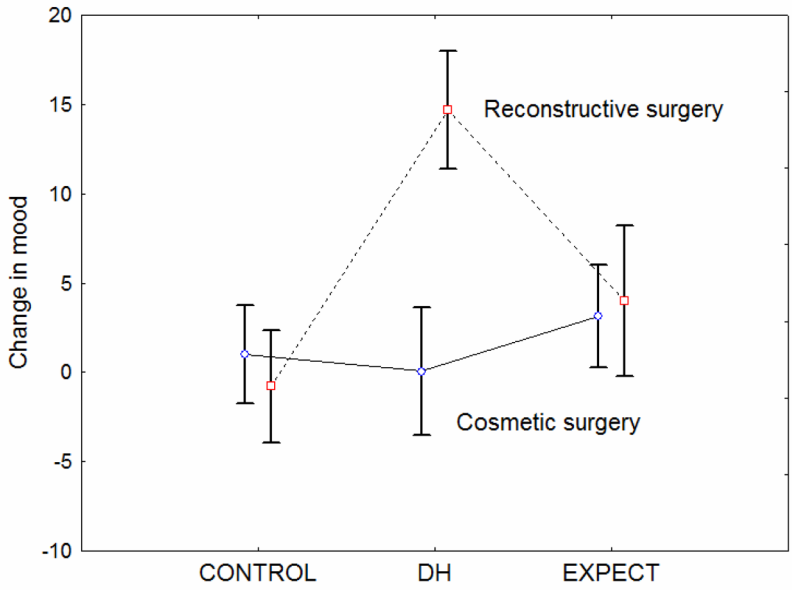

Figure 5.
Interaction between mean change in mood scores and purpose of the surgery, with one standard error of the mean error bars.

Table 1

Participant demographics.

		Ethnicity		Education		Reason for Surgery	
Control Group		European-American	19	High School Diploma	2	Cancer	10
Participants	24	Other	4	Technical School	1	Cosmetic	14
Average Age	44	Non-reporting	1	Some College	1		
Age Range	28 – 63			College Degree	13		
				Graduate Degree	7		
						Total	24
Distant Healing Group		European-American	21	High School Diploma	1	Cancer	11
Participants	23	Other	0	Technical School	0	Cosmetic	12
Average Age	49	Non-reporting	2	Some College	5		
Age Range	28 – 63			College Degree	8		
				Graduate Degree	7		
				Non-reporting	2		
						Total	23
Expectancy Group		European-American	20	High School Diploma	2	Cancer	7
Participants	25	Other	3	Technical School	1	Cosmetic	17
Average Age	48	Non-reporting	2	Some College	7	Both	1
Age Range	32 – 67			College Degree	10		
				Graduate Degree	3		
				Non-Reporting	2		
						Total	25