

# Auricular Acupuncture: A Potential Treatment for Anxiety

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Acupuncture can be an effective treatment for chronic anxiety disorders. The purpose of this study was to assess the effectiveness of acupuncture in reducing anxiety in a volunteer population. If found effective, this modality could be introduced as a treatment of anxiety before surgery. Adult volunteers ( $n = 55$ ), were randomized to three treatment groups: a) Shenmen group—bilateral auricular acupuncture at the “shenmen” point; b) Relaxation group—bilateral auricular acupuncture at a “relaxation” point; and c) Sham group—bilateral auricular acupuncture at a “sham” point. Press-acupuncture needles were inserted at the respective auricular areas for 48 h. State anxiety, blood pressure, heart rate, and electrodermal activity were assessed at 30 min, 24 h, and 48 h after insertion. Analyzing anxiety levels using repeated-measures

analysis of variance has demonstrated a significant difference [ $F(2,51) = 8.8, P = 0.001$ ] between the three treatment groups. *Post hoc* analysis demonstrated that patients in the Relaxation group were significantly less anxious at 30 min ( $P = 0.007$ ) and 24 h ( $P = 0.035$ ) as compared with patients in both the Shenmen group and the Sham group, and less anxious at 48 h ( $P = 0.042$ ) as compared with patients in Shenmen group. Repeated-measures analysis of variance performed for electrodermal activity, blood pressure, and heart rate demonstrated no group differences ( $P = ns$ ). We conclude that auricular acupuncture at the “relaxation” point can decrease the anxiety level in a population of healthy volunteers.

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**A**dult patients undergoing surgery frequently experience intense levels of anxiety before surgery (1). In fact, the reported incidence of preoperative anxiety in adults can be as frequent as 80% in certain surgical procedures (1–2). Because preoperative anxiety has a negative impact on postoperative outcomes (3), sedative medications and preparation programs are used to treat preoperative anxiety (4,5). Both these interventions, however, are associated with increased operational costs for the health care system. Alternative low-cost interventions such as acupuncture and related techniques are therefore worth considering as treatment for preoperative anxiety.

Acupuncture originated in China between the years 2000 and 100 BC (6). This modality involves puncturing the skin with short hair-thin needles at particular locations called acupuncture points (7–9). Despite

slow progression of scientific evidence, acupuncture and related techniques have become increasingly popular in western medical culture over the last few decades (10). In fact, in 1997 the National Institutes of Health (NIH) issued a position statement promoting acupuncture for the treatment of various medical conditions such as pain, nausea, and vomiting (11). The NIH panel of scientists also encouraged further research to uncover additional areas where acupuncture may be useful (11).

Previous reports have suggested that acupuncture can be used for the treatment of chronic anxiety disorders (12–16). Ulett et al. (13) reported that electrical stimulation at traditional (body) acupuncture points can result in calming effects in patients with chronic anxiety disorders. Eich et al. (14) recently demonstrated that body acupuncture can lead to a significant reduction in anxiety symptoms in patients with minor depression and in patients with generalized anxiety disorders. Finally, Rocca and Rogora (15) showed that the combination of body and auricular acupuncture could produce relaxation in patients with chronic anxiety disorders. Two issues, however, are important to note. First, no previous study has ever assessed the acute anxiolytic effects of auricular acupuncture. This is important as acute situational anxiety (state-anxiety) has a different biopsychological basis from chronic anxiety disorders. Second, although most previous

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studies that have addressed this issue used body acupuncture, Chinese and French acupuncture textbooks indicate that auricular acupuncture points can produce a calming effect as well (7,16). This is important because auricular acupuncture requires less technical expertise and may be more acceptable to patients, as compared with body acupuncture.

Therefore, we designed a study to determine whether auricular acupuncture can decrease acute anxiety. Because there is no previous scientific evidence for the effectiveness of acupuncture as a treatment for acute anxiety, we have decided that before research with clinical patients we should examine this issue with healthy volunteers.

## Material and Methods

The study population of this blinded, randomized controlled trial consisted of 55 operating room staff members, age 27-64 yr, ASA I-II physical status with no history of a major medical or psychiatric illness and with no prior experience with acupuncture. To avoid potential confounding variables, subjects who were taking anxiolytic herbs (e.g., Kava) or psychotropic medications were not invited to participate in this study. All subjects participating in this study were informed that they may receive "sham" acupuncture and were instructed not to discuss the study with one another. The protocol for this study was approved by the Yale University IRB. Subjects were randomized to the following three intervention groups:

1. Shenmen Group. Subjects in this group received bilateral auricular acupuncture at the "shenmen" point. This point is a master acupuncture point of relaxation that is documented in the Chinese and French acupuncture textbooks (7,16). The shenmen point is located near the inferior lateral wall of the triangular fossa (Fig. 1).
2. Relaxation Group. Subjects in this group received bilateral auricular acupuncture at a "relaxation" point that is documented in a French auricular acupuncture textbook (16). This acupuncture point is located at the superior lateral wall of the triangular fossa (Fig. 1).
3. Sham Group. Subjects in this group received bilateral auricular acupuncture at a "sham" point, defined as an acupuncture point that is not documented to have any relaxation or anxiolytic effect. The sham acupuncture point of this study is located at the tip of the concha and is reported to achieve homeostasis of the stomach meridian (Fig. 1).

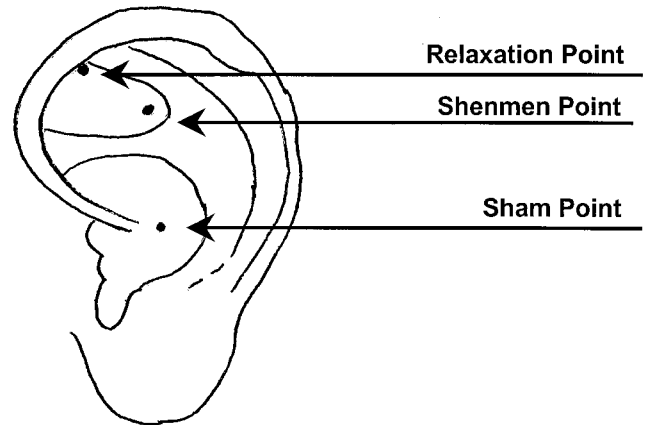


Figure 1. The anatomical locations of the various intervention points.

## Measures

**State-Trait Anxiety Inventory.** This self-report anxiety instrument is widely used for anxiety measurement (17). It contains two separate 20-item subscales that measure trait (baseline) and state (situational) anxiety. The State-Trait Anxiety Inventory (STAI)-state scale (STAI-S) is designed to measure transitory anxiety states, that is, subjective feelings of apprehension, tension, and worry that vary in intensity and fluctuate over time. The STAI-trait scale (STAI-T) measures relatively stable individual differences in anxiety proneness, that is, differences in the tendency to experience anxiety states. High trait-anxiety subjects are more prone to respond to situations perceived as threatening with significant increases of anxiety (17).

**Life Experiences Survey.** This is a measure of the number and severity of both positive and negative life events over the preceding 1 yr. The survey lists 47 specific life events that are frequently experienced by individuals in the general population. For each marked event, subjects use a seven-point scale to indicate how big an impact the event had on them at the time it occurred. The Life Experiences Survey is moderately correlated with depression and locus of control as measured by the Beck inventories (18).

**Arterial Blood Pressure and Heart Rate.** The cardiovascular system is highly responsive to a variety of psychological and behavioral states (19). Both heart rate (HR) and blood pressure (BP) have been widely used as dependent variables in behavioral studies designed to alter level of anxiety, and are frequently cited as physiological indices of stress in psychology, aviation medicine, and anesthesia (19,20). This is hardly surprising given the involvement of the cardiovascular system in the process of emotion and arousal.

**Electrodermal Activity.** Electrodermal activity (EDA) was recorded as a measure of autonomic arousal in response to stress. EDA is a measure of change in skin conductance resulting from eccrine

**Table 1.** Baseline Characteristics and Demographic Data

	Group I (n = 22)	Group II (n = 15)	Group III (n = 18)
Age (yr), median (range)	39 (27-63)	45 (29-64)	34 (29-56)
Gender, (M/F %)	50/50	35/65	39/61
Education (yr, mean $\pm$ SD)	17 $\pm$ 3	17 $\pm$ 2	16 $\pm$ 4
Smoke (% yes)	5	17	0
Caffeine (cups, mean $\pm$ SD)	1.6 $\pm$ 1	1.5 $\pm$ 1	1.3 $\pm$ 1
Liquor (% yes)	50	50	39
ASA Status (%)			
I	77	59	89
II	23	41	11
Trait Anxiety (mean $\pm$ SD)	40 $\pm$ 6	39 $\pm$ 7	42 $\pm$ 10
Life Experience			
Positive (mean $\pm$ SD)	6.3 $\pm$ 3	6.6 $\pm$ 8	9.2 $\pm$ 7
Negative (mean $\pm$ SD)	8.1 $\pm$ 8	8.7 $\pm$ 11	8.6 $\pm$ 7

*P* = not significant.

sweat gland activity, which is modulated by states of emotional stress (21). EDA was recorded using a model 3992/2 Biolog ambulatory recording system (UFI, Palo Alto, CA). This device measures EDA using a constant voltage (0.5 volts) excitation SCL signal conditioner, sampling at 10 Hz, and recording EDA levels of 0-40.95  $\mu$ mho. Recording was done using two Ag-AgCl electrodes filled with BioGel electropotential medium and connected to the volar surface of the second and third finger of the nondominant hand.

On recruitment, subjects were asked to complete a demographic questionnaire, baseline STAI, and the Life Experiences Survey. Next, baseline HR, BP, and EDA were recorded. Auricular acupuncture was performed by a trained licensed acupuncturist (SMW) with occlusive press needles (Pyonex-small; Seirin, Japan) using a sterile technique. These press needles were kept in placed for 48 h. The subjects returned to their working environment immediately after the press needles were inserted and continued to work daily during the entire testing period. Subjects were asked to note any unusual changes in their life or working condition during the study period. State anxiety (STAI), HR, BP, and EDA were reassessed at 30 min, 24 h, and 48 h after the intervention. This was done at the same time of day as the original intervention. The acupuncture press needles were removed after 48 h.

Data were analyzed with the use of SPSS version 6.1.1 (SPSS Inc., Chicago, IL). Normally distributed data are presented as mean  $\pm$  SD, and skewed data as median and interquartile range (25%-75%). Baseline characteristics were analyzed using Student's *t*-test for continuous data and  $\chi^2$  for categorical analysis. BP, HR, GSR, and STAI data were normalized by considering baseline measurement as 100%. Two-way analysis of variance (ANOVA) with repeated measures was used to analyze the changes in behavioral (STAI) and physiological (EDA, HR, systolic BP, diastolic BP) anxiety levels of patients along the various time

points. One-way ANOVA with Scheffé test for multiple comparisons was used to localize the difference between the intervention groups. Comparisons were considered significant if *P* < 0.05.

## Results

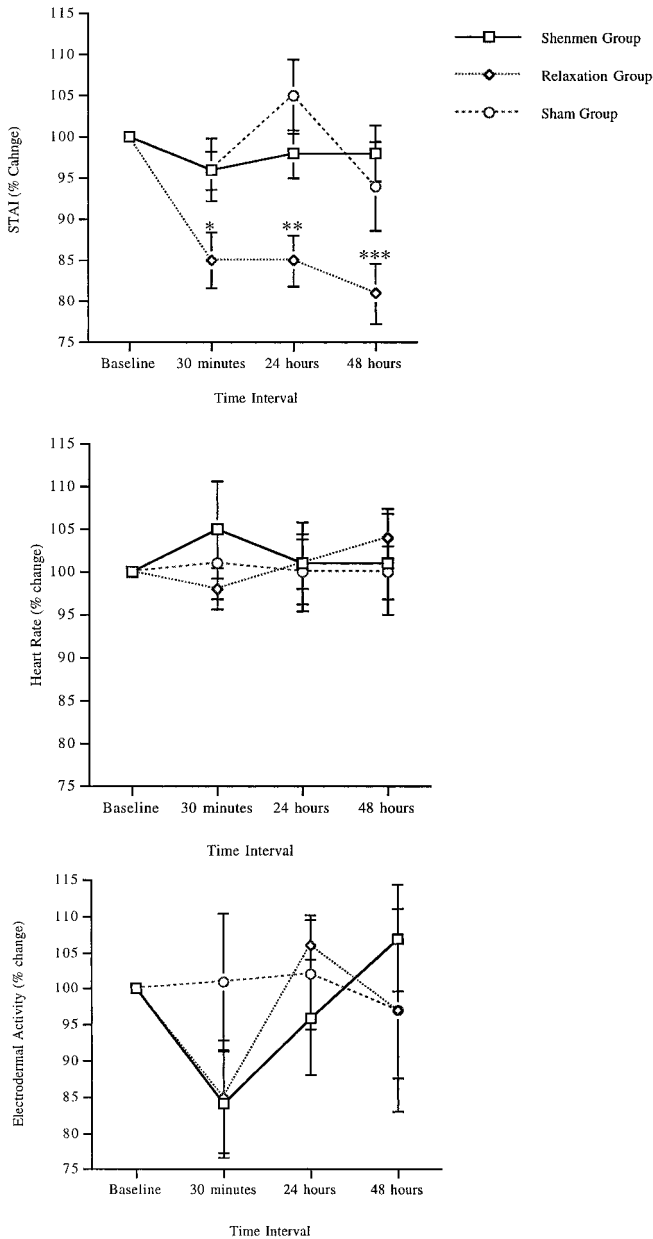
A total of 55 healthcare volunteers were recruited for this study. There are no significant baseline differences among the three study groups (Table 1). Baseline trait anxiety and life experience were not different among the groups. Thus, the three groups had similar baseline anxiety levels and were exposed to similar environmental stress.

Analyzing anxiety levels (STAI) using repeated-measures ANOVA has demonstrated a significant group difference [F (2,51) = 8.8, *P* = 0.001] but no time by group interaction [F (4,88) = 0.9, *P* = 0.46]. *Post hoc* analysis using one-way ANOVA has demonstrated that patients in the Relaxation group were significantly less anxious at 30 min (*P* = 0.007) and 24 h (*P* = 0.035) as compared with patients in Shenmen group and Sham group, and less anxious at 48 h (*P* = 0.042) as compared with patients in Shenmen group (Fig. 2).

Repeated-measures ANOVA performed for EDA data has demonstrated no group difference [F (2,46) = 0.24, *P* = 0.78] and no time by group interaction [F (4,92) = 0.75, *P* = 0.56] (Fig. 2). Similarly, no group differences were found in HR data [F (2,49) = 0.07, *P* = 0.93] and no time by group interaction was found [F (4,98) = 0.89, *P* = 0.47] (Fig. 2). Also, as can be seen in Table 2, there were no significant differences in systolic BP and diastolic BP among groups.

## Discussion

This is the first study that used objective measurements to assess the anxiolytic effect of auricular acupuncture. We found that healthy volunteers who were



**Figure 2.** Changes in anxiety, heart rate, and electrodermal activity are displayed. All changes are compared with baseline (100%). STAI = State Trait Anxiety Inventory, measure of anxiety. STAI analysis showed a significant group difference [F (2,51) = 8.8, P = 0.001]; \*: P = 0.007, \*\*: P = 0.035, \*\*\*: P = 0.042.

given acupuncture press needles for 48 hours reported decreased levels of state anxiety during that time period. This effect started as early as 30 minutes after the insertion of the acupuncture needles. We appreciate that the psychobiological model that underlies anticipatory anxiety (i.e., preoperative anxiety) may not be identical to the model that underlies routine daily anxiety, but we believe that the results of the study are strong enough to precede with a randomized controlled study involving surgical patients.

**Table 2.** Arterial Blood Pressure Responses to Interventions

	30 Minutes	24 Hours	48 Hours
Diastolic Blood Pressure (%) <sup>a</sup>			
Shenmen Group	100 ± 5	100 ± 9	98 ± 8
Relaxation Group	97 ± 9	97 ± 11	92 ± 11
Sham Group	99 ± 11	100 ± 13	100 ± 11
Systolic Blood Pressure (%) <sup>b</sup>			
Shenmen Group	100 ± 8	101 ± 10	98 ± 9
Relaxation Group	100 ± 35	99 ± 11	92 ± 24
Sham Group	95 ± 14	98 ± 14	88 ± 28

All values are % change of baseline that was obtained before intervention. <sup>a</sup>F (2,49) = 0.86, P = 0.43; <sup>b</sup>F (2,49) = 1.39, P = 0.25.

Approximately 60%–70% of adult patients experience intense levels of anxiety before undergoing surgery (1,2). This translates into many millions of people around the world who suffer from high levels of anxiety before surgery. Currently, both psychological and pharmacological interventions have been developed for the treatment of preoperative anxiety (4,5). The commonly prescribed sedatives, however, are expensive (one midazolam vial, 5 mg/mL, costs approximately \$15) and may have unwanted lingering effects. Similarly, psychological preparation programs are expensive, time consuming, and have questionable efficacy. In this study we have demonstrated that auricular acupuncture is an effective intervention for the reduction of anxiety in healthy volunteers. Although preoperative anxiety and the anxiety of healthy volunteers may be different, it can be hypothesized that auricular acupuncture may be equally effective for the reduction of anxiety experienced by patients undergoing surgery. This is of particular importance as auricular acupuncture is technically easy, reliable, inexpensive (a box of 100 needles costs \$16), and is associated with minimal adverse affects.

Because we have documented an effect as early as 30 minutes after the intervention, onset of therapeutic effects may be appropriate for the time constraints of perioperative settings. Interestingly, because the therapeutic effect can last for 48 hours while the press needles are in place, it can be hypothesized that postoperative anxiety levels may be affected by this intervention as well. This is of importance as it was previously suggested that anxiety may potentiate pain because patients become more attentive to pain (22,23). Thus, it may be that preoperative auricular acupuncture may decrease postoperative anxiety and pain levels. The mechanism behind the observation made in our study is unclear. Body acupuncture, however, was previously suggested to alter brain neurochemistry by affecting the release of neurotransmitters such as serotonin (11). This is of importance as multiple studies have indicated that serotonin may play a key role in determining emotional state in humans (24–27).

We also found that the physiological outcomes i.e., HR, BP, and EDA in the Relaxation group, did not differ from the Sham and Shenmen groups. This is of no surprise because the volunteer population did not have an increased baseline physiological response level. That is, although it is well documented that increased anxiety is associated with an increased physiological stress response (19), the correlation between routine daily levels of anxiety and variables such as HR, BP, and EDA is not clear. As subjects in this study were not exposed to acute "experimental" anxiety but rather experienced "routine levels" of daily anxiety, the lack of correlation between physiological measurements and behavior assessment is not surprising.

We found that the anxiolytic effect at the "shenmen" point was not as profound as stimulation at the "relaxation" point. We are not aware of any previous studies directly comparing the anxiolytic effects of these two acupuncture points. In general acupuncture practice, there is always more than one acupuncture point selected for the treatment of anxiety. We can only speculate that the function of "shenmen" is not as specific as the relaxation point in decreasing anxiety. For example, shenmen point is also used to support other acupuncture points for effects such as decreasing fever, BP, cough, and inflammation (16).

Several methodological issues related to this investigation should be noted. First, we appreciated *a priori* that various individuals are exposed to various levels of stress and thus may respond differently to acupuncture. We tried to control for this issue by recruiting volunteers from the same environment (health care), and by making sure that the volunteers' baseline anxiety and life stress were similar. We also avoided recruiting individuals before the weekend, and we made sure that the volunteers were present in their working environment for the 48 hours of the intervention. Throughout the testing period, the volunteers were asked daily about any unexpected changes occurring in their personal lives and their working environment. The results of the study suggest that acupuncture may be an effective treatment for individuals experiencing intense levels of daily stress and anxiety. It is important to note that because of the nature of this study, the sample size of each group was relatively small. This resulted in an uneven sample size among the three groups, and in an uneven distribution with regard to variables such as gender and age. Future studies involving this issue should have a larger sample size.

In conclusion, we found that auricular acupuncture has an anxiolytic effect when applied to healthy volunteers. We suggest a randomized controlled trial be performed to evaluate the effectiveness of this technique for the treatment of preoperative anxiety. Although we appreciate that the psychobiological model

that underlies preoperative anxiety is different from the psychobiological model that underlies daily anxiety, we believe that the data presented above warrant such a randomized controlled trial.

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