Effects of Acupuncture versus Non-Acupuncture Treatment on Pain

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Abstract
This study examines the impact of acupuncture treatment in comparison to non-acupuncture treatment on multiple facets of pain. All studies included met inclusion criteria in which patients were to have experienced some sort of pain before treatment. After being informed of the procedure, each study’s participants were assigned to a control group or a treatment group in order to test the true effect on pain. After gathering data from each of the studies, it was necessary to standardize the data for comparison. It was found that the overall effect of acupuncture reduced pain in the participants. However, Hegu acupuncture compared to other types of treatment seemed to have the greatest reducing effect in pain.

Keywords
Acupuncture, pain Hegu Acupuncture
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Abstract
This study examines the impact of acupuncture treatment in comparison to non-acupuncture treatment on multiple facets of pain. All studies included met inclusion criteria in which patients were to have experienced some sort of pain before treatment. After being informed of the procedure, each study’s participants were assigned to a control group or a treatment group in order to test the true effect on pain. After gathering data from each of the studies, it was necessary to standardize the data for comparison. It was found that the overall effect of acupuncture reduced pain in the participants. However, Hegu acupuncture compared to other types of treatment seemed to have the greatest reducing effect in pain.

Acupuncture originated in China over 5,000 years ago. Today, it has spread into Western practices, and is used for pleasure, as well as for its medicinal effects. Natural Standard (2013) explains Chinese theory suggesting that the human body contains a network of energy pathways, through which energy called “chi” circulates. These pathways, otherwise known as “meridians,” contain specific points that function like gates in which chi flows throughout the body (Natural Standard, 2013). Acupuncture needles are placed in these points to regulate the flow of chi through the meridians, as problems in the circulation of chi are believed to cause illness. Western science has determined that the meridians and points identified by Chinese medicine actually overlap with anatomical features that can be observed with scientific technology (Natural Standard, 2013). Based on acupuncture’s history of use and other research, both the World Health Organization and the National Institutes of Health have identified many conditions for which acupuncture is effective, including pain, nausea, and vomiting. It is important to note however, that acupuncture’s physiological and psychological impact may have varying degrees of effectiveness on the treatment of pain. With these factors in mind, acupuncture may have a greater effect on pain than techniques not using acupuncture therapy.

Throughout years of research, scientists have debated over the use of acupuncture as a physiological analgesia, or pain alleviator. According to many modern theories, endogenous opiates, the body’s natural pain inhibitors, such as serotonin, are said to be important mechanisms of acupuncture analgesic (Lin & Chen, 2008). In studies by Lin & Chen (2008), there is a great deal of evidence suggesting such a relationship, by focusing on electro-acupuncture. Studies have concluded that some regions of the upper brain stem and hypothalamus are stimulated to release opiates and serotonin (Lin & Chen, 2008). Acupuncturists are able to achieve this release of opiates by placing the needles at various points, along 12 of the major meridians and eight minor ones. Each meridian is associated with a particular organ, and each organ is considered responsible for different symptoms, which acupuncture can treat at specific points.

Lee et al. (2009) hypothesized a similar theory, stating that electro-acupuncture, compared with no electro-acupuncture would decrease pain in cancer patients. This study, a convenience sample, was tested on rats from a laboratory where acupuncture therapy was controlled for
against no therapy, and a pain outcome was measured. The mice were placed into three different groups and were observed for signs of mechanical allodynia (i.e., pain on the skin, usually caused by irritants) as spontaneous pain after being induced with cancer cells. Electro-acupuncture (EA) was applied to only one group. The mice were then evoked with a hand-held force transducer to induce hind paw flexion. The study’s findings supported the hypothesis that the therapy could be used as an alternative therapeutic method for cancer pain due to an increase in β-endorphin levels since the EA treatment reduced cumulative lifting duration, compared to the untreated tumor control group. This suggests that the mice did not feel as much pain in the EA group compared to the untreated tumor control group.

Dhond, Kettner & Napadow (2007) hypothesized that “it is highly likely that acupuncture elicits a common, distributed network of brain regions” to reduce pain. In a convenience sample taken from animal research, the effects of acupuncture versus non-acupuncture therapy were controlled and the outcome of pain was measured. Their findings support the hypothesis by indicating that areas including SI, SII, ACC, PFC, insula, thalamus, hypothalamus, amygdala, and hippocampus are involved in endogenous anti-nociceptive, or anti-pain, signaling, which furthermore indicates that acupuncture has some effect on reducing pain.

In addition to acupuncture’s physiological effects on pain, scientists believe it may have some psychological effects as well. According to Shi, Yang, Liu & Wang (2012), a major component of acupuncture’s psychological effect is patient expectancy. Clinical experience in acupuncture suggests that patients must be aware of the fact that they are being treated in order to have some effect on pain. The insertion of needles for investigative reasons rarely produces good effect however, one possible basis for acupuncture effect may result from the change in the patient’s attention. Positive expectation may also amplify the effect since patients may often assume that pain will be alleviated by the treatment. The mind can often will itself to believe that something may be working and thus promote true change within the body.

In their study, Bäcker, Schaefer, Siegler, Balzer, Michalsen, Langhorst, & Dobos (2012) hypothesized that effect of acupuncture on pain would depend on the personality of the subjects. A convenience sample was taken from the Universities of Witten-Herdecke and Duisburg-Essen, in total consisting of 52 participants. The experiment was also a randomized clinical trial, in which one group received the acupuncture therapy while the other group did not, and pain was the measureable outcome. In order to assess the personality of the subjects, a reducer-augmenter-scale was used to differentiate pain tolerate from pain intolerant subjects. As a result, the strongly stimulated augmenters perceived the treatment as most painful, followed by weakly stimulated augmenters. This evidence, suggesting that personality truly does play a role in the effectiveness of acupuncture, therefore supported their hypothesis.

In another study conducted by Smith, Ussher, Perz, Carmady & de Lacey (2011), acupuncture compared to non-acupuncture therapy was suggested to improve psychological factors, specifically anxiety and infertility related-stress. The study design was a randomized clinical trial and a random sample was taken from participants who were found through local advertisements and online forums. The subjects chosen were 32 women aged 20-45 years with a diagnosis of infertility, or a history of unsuccessfully trying to conceive.
for 12 months or longer. The women received six sessions of acupuncture over eight weeks. After they received treatment, women in the acupuncture group reported changes in two domains on the fertility problem inventory test, with less social concern. There were also trends toward a reduction of infertility stress on other domains, and less anxiety compared to the non-acupuncture group. Each theoretical approach provides evidence suggesting that acupuncture may have some effect on pain. Research support for each of these theories however, is conflicting. Physiological research and support seems to be more abundant than support for psychological effects of acupuncture on pain.

Emerging data indicating that acupuncture may have a role in improving pain requires more research and support. According to ancient Chinese medicine, as well as new modern medicine theories, we can assume that acupuncture will have some effect on subjects, otherwise acupuncture would have been rendered useless many years ago. Although there is a lack of sufficient evidence of a true medicinal effect, we can still assume that either the physiological theory or the psychological theory will be stronger than the other. The abundance of data collected on acupuncture’s effect on pain supports making a reasonable hypothesis, therefore based on the number of studies that have been carried out, we can hypothesize that acupuncture will have some effect (either positive or negative) on pain as compared to a treatment with no acupuncture.

Method

Meta-analysis

In science, an experiment must be conducted several times in order for a hypothesis to be proven or considered statistically significant. When multiple studies are conducted, they are usually not performed the exact same way every time, which causes differences in numerical data. For example, in experiments that test if acupuncture has an effect on pain, different pain measures may be used. Meta-analysis is the combining of numerical results from a few or many studies, to standardize results for comparison (Rosenthal & DiMatteo, 2001). More specifically, Gregson, Meal & Avis (2002) suggested that, “meta-analysis is a genuinely epistemological concept that practitioners use to synthesize evidence from many sources, supported by open discussion and the development of theories that can explain best practice.” It also allows researchers to arrive at conclusions that are more accurate and more credible than any one study.

Search and Retrieval

In identifying articles for use in meta-analysis, it was necessary to limit the number of studies in order to produce a relevant sample. Criteria for inclusion required that the study examine how acupuncture has some effect in treating pain. With that criterion set, articles were searched in the CINAHL database using a key phrase: ‘effects of acupuncture on pain,’ which yielded 477 results. To reduce the amount of amount of articles for review, full text only and RCT limiters were added which yielded 26 results. After the initial selection, these 26 articles’ abstracts were read to reveal only relevant studies. Studies were excluded if they did not include: a valid description of the participants (some studies did not include how many participants or how they were chosen), include a description of the measurement of pain, or if they were animal studies. Based on these exclusion criteria, 13 studies were chosen to be included for analysis.
Data-analytic Procedure

In order to compare data among multiple studies, it is crucial to convert the variables to get a common Cohen’s d, and also weigh each Cohen’s d for each effect size. The larger samples produce estimates of true effects that are more reliable, so larger sample sizes received more weight in analysis while small sample sizes receive lesser weight. After calculating this data, I was able to calculate the average weighted mean, d, which gives us a better understanding of acupuncture’s true effect on pain. I was also able to calculate a 95% confidence interval, which describes an interval in which the measure of pain falls within. This is important to determine whether or not the null hypothesis should be included in analysis. The type of treatment, Chinese, Hegu, Western, or electro-acupuncture, is used as a moderating variable to determine the possibility that the type of treatment may have an effect on the variables.

Results

Characteristics of the included studies:
Chinese Acupuncture

Five of the 13 studies were similar. The studies typically included around 40 people and the inclusion criteria consisted of people who had previously experienced some type of pain. All studies used a Visual Analog Scale to record pain measure except one study that used a Numeric Rating Scale (Silva, 2007). Most studies also had a short duration of treatment (3-6 weeks) except two studies that lasted for 6 and 8 months (Hsieh, Liou, Lee; Chen & Yen, 2010; Silva, 2007). All studies in this sample used Chinese Acupuncture.

Hegu Acupuncture

Three of the 13 studies were similar. They all included Hegu acupuncture as the treatment means. They all used a Visual Analog Scale to measure a pain variable except for one that used a short-form of the McGill Pain Questionaire (Wu, Su & Liu, 2012).

Electro-acupuncture

Two studies of the 13 were similar in that they included electro-acupuncture as the treatment means. Both studies used a Visual Analog scale as a pain measure and lasted for a short duration of time. The inclusion criteria for electro-acupuncture included healthy recruits that have never undergone acupuncture treatment.

Western Acupuncture

Three of the 13 studies were similar. They all used western acupuncture as a treatment means. All studies used the Visual Analog Scale as a pain measure except one that used the Oxford Need Score (Soni, Joshi, Mudge, Wyatt & Williamson, 2012).

Meta-analytic analyses

The Cohen’s d variable describes the effect that acupuncture has on pain. In conjunction with that statistic, a weighted variable was found which produced mean effect size of d=0.270652 (CI=0.148441, 0.392863) was found for overall acupuncture treatments. Acupuncture yields an effect in reducing overall pain in patients. However, acupuncture treatment type may reveal that certain types have a larger effect on pain than others. The analysis of the standardized effect size data from the sample studies (k=13) showed that Hegu Acupuncture had more of an effect on pain, with an average weighted d=0.754882 and a CI=0.462173, 1.047592 (see table 2). In this case we may rule out the possibility that the null hypothesis is true since the confidence interval does not include 0. Thus we can rule that acupuncture does have an effect on
We can also rule that Western acupuncture treatment has the least effect on pain, producing the smallest effect size of \( d = 0.04178 \).

<table>
<thead>
<tr>
<th>Study</th>
<th>N</th>
<th>Clinical Population</th>
<th>Comorbid Condition</th>
<th>Sample type</th>
<th>mean age or range (yrs)</th>
<th>Treatment Type</th>
<th>Treatment Duration</th>
<th>Pain Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Park and Hopkins (2012)</td>
<td>36</td>
<td>yes</td>
<td>anterior knee pain</td>
<td>random</td>
<td>22.7</td>
<td>Chinese</td>
<td>6 weeks</td>
<td>VAS</td>
</tr>
<tr>
<td>Sun et al. (2010)</td>
<td>35</td>
<td>yes</td>
<td>chronic neck myofasial pain syndrome</td>
<td>random</td>
<td>27-52</td>
<td>Chinese</td>
<td>3 weeks</td>
<td>VAS</td>
</tr>
<tr>
<td>Mingdong Yun et al. (2012)</td>
<td>187</td>
<td>yes</td>
<td>chronic low back pain</td>
<td>convenience</td>
<td>22-45</td>
<td>Hegu</td>
<td>7 weeks</td>
<td>VAS</td>
</tr>
<tr>
<td>Wu et al. (2012)</td>
<td>66</td>
<td>yes</td>
<td>dysmenorrheal (menstrual pain)</td>
<td>random</td>
<td>27.2</td>
<td>Hegu</td>
<td>8 weeks</td>
<td>SF-MPQ</td>
</tr>
<tr>
<td>Sahmeddini et al. (2010)</td>
<td>90</td>
<td>yes</td>
<td>nasal septoplasty</td>
<td>convenience</td>
<td>28-35</td>
<td>electro-acupuncture</td>
<td>1 day</td>
<td>VAS</td>
</tr>
<tr>
<td>Soni et al. (2012)</td>
<td>56</td>
<td>yes</td>
<td>total knee replacements</td>
<td>random</td>
<td>35-58</td>
<td>western</td>
<td>18 weeks</td>
<td>OKS</td>
</tr>
<tr>
<td>Borrup et al. (2009)</td>
<td>607</td>
<td>yes</td>
<td>healthy women in labor</td>
<td>random</td>
<td>25-35</td>
<td>electro-acupuncture</td>
<td>2 months</td>
<td>VAS</td>
</tr>
<tr>
<td>Harkin and Parker (2007)</td>
<td>45</td>
<td>yes</td>
<td>emergency care patients</td>
<td>random</td>
<td>32.1</td>
<td>western</td>
<td>6 weeks</td>
<td>VAS</td>
</tr>
<tr>
<td>White et al. (2004)</td>
<td>135</td>
<td>yes</td>
<td>neck pain</td>
<td>convenience</td>
<td>18-80</td>
<td>western</td>
<td>4 weeks</td>
<td>VAS</td>
</tr>
<tr>
<td>Tukmachi (2004)</td>
<td>30</td>
<td>yes</td>
<td>osteoarthritis pain</td>
<td>random</td>
<td>38.3</td>
<td>Chinese</td>
<td>5 weeks</td>
<td>VAS</td>
</tr>
<tr>
<td>Pfab et al. (2010)</td>
<td>10</td>
<td>yes</td>
<td>atopic eczema</td>
<td>random</td>
<td>25.2</td>
<td>Hegu</td>
<td>33 days</td>
<td>VAS</td>
</tr>
<tr>
<td>Hsieh et al. (2010)</td>
<td>28</td>
<td>yes</td>
<td>chronic headache</td>
<td>convenience</td>
<td>24-83</td>
<td>Chinese</td>
<td>6 months</td>
<td>VAS</td>
</tr>
<tr>
<td>Silva (2007)</td>
<td>51</td>
<td>yes</td>
<td>pregnant women</td>
<td>convenience</td>
<td>15-39</td>
<td>Chinese</td>
<td>8 months</td>
<td>NRS</td>
</tr>
</tbody>
</table>

Notes: VAS= Visual Analog Scale  
SF-MPQ= Short-form of the McGill Pain Questionnaire
OKS= Oxford need score  
NRS= Numeric Rating Scale

Table 2. Results of meta-analysis and moderator analysis

<table>
<thead>
<tr>
<th></th>
<th>k</th>
<th>n</th>
<th>Avg wtd d</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>13</td>
<td>1130</td>
<td>0.27</td>
<td>0.15, 0.39</td>
</tr>
<tr>
<td>Chinese</td>
<td>5</td>
<td>142</td>
<td>0.40</td>
<td>0.06, 0.73</td>
</tr>
<tr>
<td>Hegu</td>
<td>3</td>
<td>199</td>
<td>0.75</td>
<td>0.46, 1.05</td>
</tr>
<tr>
<td>Electro-acupuncture</td>
<td>2</td>
<td>553</td>
<td>0.16</td>
<td>-0.01, 0.34</td>
</tr>
<tr>
<td>Western</td>
<td>3</td>
<td>236</td>
<td>0.04</td>
<td>-0.22, 0.30</td>
</tr>
</tbody>
</table>

Discussion

After computing and analyzing data, it is proven that acupuncture will have some effect on pain, either positive or negative. Acupuncture therapy more specifically, however, has a positive effect on pain, meaning that it reduces the amount of pain. When Hegu acupuncture treatment is utilized, the effect is even greater compared to Western acupuncture whose effect is the smallest. Many types of acupuncture therapy alter pain, although Hegu acupuncture seems to have produced the greatest reductive effect.

Based on the findings in this study, the data may indicate that acupuncture treatment has a physiological effect on pain. As Lin & Chen (2008) theorized, acupuncture may cause a release of serotonin and opiates from the hypothalamus. This can most clearly be seen in electro-acupuncture treatments since it stimulates the brain and furthermore, the hypothalamus. Serotonin and opiates are “feel good” hormones that may enable one to feel less pain (Lin & Chen, 2008). Since electro-acupuncture treatments produce reductive effects on pain, this theory could very possibly be verified. Also according to Shi et al. (2012), acupuncture’s reductive effect may have something to do with the expectancy effect in which patients often times may feel positive effects of acupuncture simply because they expect it to work. This can most likely be seen in Sham acupuncture treatments, in which the needles are not placed in correlation to the circulation of chi. This should not produce the same effects as true acupuncture treatments however, it can often produce the same results because of the patient’s expectancy that acupuncture treatment will have an effect on pain.

Some practical implications of this study may result in doctors and other medical professionals to utilize acupuncture treatment. Since Hegu acupuncture remains the treatment with the highest effect on pain, professionals may suggest this treatment over Western acupuncture or other types. Both Hegu and Chinese acupuncture seem to reduce pain the most over electro-acupuncture and Western, so much so that electro-acupuncture and Western may be advised against since it has such little effect on reducing pain. In this study’s samples however, electro-acupuncture and Western acupuncture therapy treated more severe cases of pain in patients, such as nasal septoplasty, total knee replacements, emergency care, and neck pain. The effects these treatments may have some implications in that they may not have a significant effect on major types of pain. Perhaps doctors and scientists may test these two types of treatments on smaller instances of pain to yield similar effects as Chinese and Hegu acupuncture treatment therapies.

Although acupuncture seems to have an effect on pain, there are some limitations of this study. Some of which may be
inclusion and exclusion criteria that were used to limit the number of studies included in this sample. There may have been other studies that were overlooked, simply due to the fact that their results were not clear. Also, more studies could be found on other databases to include in this sample. More studies will produce a more accurate analysis. With only 13 studies included in this sample, there is room for error in analysis of the data.

New issues and questions are naturally prompted by the results of this study. Future research should design studies that specifically examine the physiological effect of acupuncture on the treatment of pain. Psychological factors seem to be easily skewed by factors outside the realm of science, whereas physiological factors can be proven and tested by measuring direct hormone release. This will tell us whether certain treatments work better than others in a more diplomatic approach to acupuncture.

References


