

## Acupuncture Is Theatrical Placebo

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**P**ain is a big problem. If you read about pain management centers, you might think it had been solved. It has not. And when no effective treatment exists for a medical problem, it leads to a tendency to clutch at straws. Research has shown that acupuncture is little more than such a straw.

Although it is commonly claimed that acupuncture has been around for thousands of years, it has not always been popular, even in China. For almost 1000 years, it was in decline, and in 1822, Emperor Dao Guang issued an imperial edict stating that acupuncture and moxibustion should be banned forever from the Imperial Medical Academy.<sup>1</sup>

Acupuncture continued as a minor fringe activity in the 1950s. After the Chinese Civil War, the Chinese Communist Party ridiculed Traditional Chinese Medicine, including acupuncture, as superstitious. Chairman Mao Zedong later revived Traditional Chinese Medicine as part of the Great Proletarian Cultural Revolution of 1966.<sup>2</sup> The revival was a convenient response to the dearth of medically trained people in postwar China and a useful way to increase Chinese nationalism. It is said that Chairman Mao himself preferred Western medicine. His personal physician quotes him as saying "Even though I believe we should promote Chinese medicine, I personally do not believe in it. I do not take Chinese medicine."<sup>3</sup>

The political, or perhaps commercial, bias seems to still exist. It has been reported (by authors who are sympathetic to alternative medicine) that "all trials [of acupuncture] originating in China, Japan, Hong Kong, and Taiwan were positive."<sup>4</sup>

Acupuncture was essentially defunct in the West until President Nixon visited China in 1972. Its revival in the West was largely a result of a single anecdote promulgated by journalist James Reston in the *New York Times*<sup>5</sup> after he had acupuncture in Beijing for postoperative pain in 1971. Despite his eminence as a political journalist, Reston had no scientific background and evidently did not appreciate the

post hoc ergo propter hoc fallacy, or the idea of regression to the mean.

After Reston's report, acupuncture quickly became popular in the West. Stories circulated that patients in China had open heart surgery using only acupuncture.<sup>6</sup> The Medical Research Council (UK) sent a delegation, which included Alan Hodgkin, to China in 1972 to investigate these claims, about which they were skeptical. The claims were repeated in 2006 in a British Broadcasting Corporation TV program, but Simon Singh (author of *Fermat's Last Theorem*) discovered that the patient had been given a combination of 3 very powerful sedatives (midazolam, droperidol, fentanyl) and large volumes of local anesthetic injected into the chest. The acupuncture needles were purely cosmetic.

Curiously, given that its alleged principles are as bizarre as those on any other sort of prescientific medicine, acupuncture seemed to gain somewhat more plausibility than other forms of alternative medicine. As a result, more research has been done on acupuncture than on just about any other fringe practice.

The outcome of this research, we propose, is that the benefits of acupuncture are likely nonexistent, or at best are too small and too transient to be of any clinical significance. It seems that acupuncture is little or no more than a theatrical placebo. The evidence for this conclusion will now be discussed.

### THREE THINGS THAT ARE NOT RELEVANT TO THE ARGUMENT

We see no point in discussing surrogate outcomes, such as functional magnetic resonance imaging studies or endorphin release studies, until such time as it has been shown that patients get a useful degree of relief. It is now clear that they do not.

We also see little point in invoking individual studies. Inconsistency is a prominent characteristic of acupuncture research: the heterogeneity of results poses a problem for meta-analysis. Consequently, it is very easy to pick trials that show any outcome whatsoever. Therefore, we shall consider only meta-analyses.

The argument that acupuncture is somehow more holistic, or more patient-centered, than medicine seems to us to be a red herring. All good doctors are empathetic and patient-centered. The idea that empathy is restricted to those who practice unscientific medicine seems both condescending to doctors, and it verges on an admission that empathy is all that alternative treatments have to offer.

There is now unanimity that the benefits, if any, of acupuncture for analgesia, are too small to be helpful to patients.

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Large multicenter clinical trials conducted in Germany<sup>7-10</sup> and the United States<sup>11</sup> consistently revealed that verum (or true) acupuncture and sham acupuncture treatments are no different in decreasing pain levels across multiple chronic pain disorders: migraine, tension headache, low back pain, and osteoarthritis of the knee.

If, indeed, sham acupuncture is no different from real acupuncture, the apparent improvement that may be seen after acupuncture is merely a placebo effect. Furthermore, it shows that the idea of meridians is purely imaginary. All that remains to be discussed is whether or not the placebo effect is big enough to be useful, and whether it is ethical to prescribe placebos.

Some meta-analyses have found that there may be a small difference between sham and real acupuncture. Madsen et al.<sup>12</sup> looked at 13 trials with 3025 patients, in which acupuncture was used to treat a variety of painful conditions. There was a small difference between "real" and sham acupuncture (it did not matter which sort of sham was used), and a somewhat bigger difference between the acupuncture group and the no-acupuncture group. The crucial result was that even this bigger difference corresponded to only a 10-point improvement on a 100-point pain scale. A consensus report<sup>13</sup> concluded that a change of this sort should be described as a "minimal" change or "little change." It is not big enough for the patient to notice much effect.

The acupuncture and no-acupuncture groups were, of course, neither blind to the patients nor blind to the practitioner giving the treatment. It is not possible to say whether the observed difference is a real physiological action or whether it is a placebo effect of a rather dramatic intervention. Though it would be interesting to know this, it matters not a jot, because the effect just is not big enough to produce any tangible benefit.

Publication bias is likely to be an even greater problem for alternative medicine than it is for real medicine, so it is particularly interesting that the result just described has been confirmed by authors who practice, or sympathize with, acupuncture. Vickers et al.<sup>14</sup> did a meta-analysis for 29 randomized controlled trials, with 17,922 patients. The patients were being treated for a variety of chronic pain conditions. The results were very similar to those of Madsen et al.<sup>12</sup> Real acupuncture was better than sham but by a tiny amount that lacked any clinical significance. Again there was a somewhat larger difference in the nonblind comparison of acupuncture and no-acupuncture, but again it was so small that patients would barely notice it.

Comparison of these 2 meta-analyses shows how important it is to read the results, not just the summaries. Although the outcomes were similar for both, the spin on the results in the abstracts (and consequently the tone of media reports) was very different.

An even more extreme example occurred in the CACTUS trial of acupuncture for "frequent attenders" with medically unexplained symptoms.<sup>15</sup> In this case, the results showed very little difference even between acupuncture and no-acupuncture groups, despite the lack of blinding and lack of proper controls. But, by ignoring the problems of multiple comparisons, the authors were able to pick out a few results that were

statistically significant, though trivial in size. Despite this unusually negative outcome, the result was trumpeted as a success for acupuncture. Not only the authors, but also their university's public relations department and even the journal editor issued highly misleading statements. This gave rise to a flood of letters to the *British Journal of General Practice*<sup>16</sup> and much criticism on the Internet.<sup>17</sup>

From the intellectual point of view, it would be interesting to know whether the small difference between real and sham acupuncture found in some recent studies is a genuine effect of acupuncture or whether it is a result of the fact that the practitioners are never blinded, or of publication bias. However, that knowledge is irrelevant for patients. All that matters for them is whether or not they get a useful degree of relief. It seems that they do not.

There is now unanimity between acupuncturists and nonacupuncturists that any benefits that may exist are too small to provide any noticeable benefit to patients. That being the case, it is hard to see why acupuncture is still used. Certainly, such an accumulation of negative results would result in the withdrawal of any conventional treatment.

### SPECIFIC CONDITIONS

Acupuncture should, ideally, be tested separately for effectiveness for each individual condition for which it has been proposed (like so many other forms of alternative medicine, that is a very large number). Good quality trials have not been done for all of them, but results suggest strongly that it is unlikely that acupuncture works for rheumatoid arthritis, stopping smoking, irritable bowel syndrome, or for losing weight. There is also no good reason to think it works for addictions, asthma, chronic pain, depression, insomnia, neck pain, shoulder pain or frozen shoulder, osteoarthritis of the knee, sciatica, stroke or tinnitus, and many other conditions.<sup>18</sup>

In 2009, the United Kingdom's National Institute for Clinical Excellence did recommend acupuncture for back pain.<sup>19</sup> This exercise in clutching at straws caused something of a furore.<sup>20</sup> In the light of National Institute for Clinical Excellence's judgment, the Oxford Centre for Evidence-Based Medicine updated its analysis of acupuncture for back pain. Their verdict<sup>21</sup> was

**"Clinical bottom line.** Acupuncture is no better than a toothpick for treating back pain."

The article by Artus et al.<sup>22</sup> is of particular interest for the problem of back pain. Their Figure 2 shows that there is a modest improvement in pain scores after treatment, but much the same effect, with the same time course is found regardless of what treatment is given, and even with no treatment at all. They say

"we found evidence that these responses seem to follow a common trend of early rapid improvement in symptoms that slows down and reaches a plateau 6 months after the start of treatment, although the size of response varied widely. We found a similar pattern of improvement in symptoms following any treatment, regardless of whether it was index, active comparator, usual care, or placebo treatment."

It seems that most of what is being seen is regression to the mean, which is very likely to be the main reason why acupuncture sometimes appears to work when it does not.

Although the article by Wang et al.<sup>23</sup> is written to defend the continued use of acupuncture, the only condition for which they claim that there is any reasonably strong evidence is for postoperative nausea and vomiting (PONV). It would certainly be odd if a treatment that had been advocated for such a wide variety of conditions turned out to work only for PONV. Nevertheless, let us look at the evidence.

The main papers that are cited to support the efficacy of acupuncture in alleviation of PONV are all from the same author: Lee and Done (1999)<sup>24</sup> and 2 Cochrane reviews, Lee and Done (2004),<sup>25</sup> updated in Lee and Fan (2009).<sup>26</sup> We need to deal only with the latest updated meta-analysis<sup>26</sup>.

Although the authors conclude "P6 acupoint stimulation prevented PONV," closer examination shows that this conclusion is very far from certain. Even taken at face value, a relative risk of 0.7 cannot be described as "prevention." The trials that were included were not all tests of acupuncture but included several other more or less bizarre treatments ("acupuncture, electroacupuncture, transcutaneous nerve stimulation, laser stimulation, capsicum plaster, an acupoint stimulation device, and acupressure"). The number needed to treat varied from a disastrous 34 to 5 for patients with control rates of PONV of 10% and 70%, respectively.

The meta-analysis showed, on average, similar effectiveness for acupuncture and antiemetic drugs. The problem is that the effectiveness of drugs is itself in doubt because an update to the Cochrane review has been delayed<sup>27</sup> by the discovery of major fraud by a Japanese anesthetist, Yoshitaka Fujii.<sup>28</sup> It has been suggested that metoclopramide barely works at all.<sup>29,30</sup>

Of the 40 trials (4858 participants) that were included in Lee and Fan,<sup>26</sup> only 4 trials reported adequate allocation concealment. Ninety percent of trials were open to bias from this source. Twelve trials did not report all outcomes. The opportunities for bias are obvious. The authors themselves describe all estimates as being of "moderate quality" which is defined thus: "Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate." That being the case, perhaps the conclusion should have been "more research needed." The conclusions of Lee and Fan<sup>26</sup> are nowhere near as secure as the abstract implies. In fact, almost all trials of alternative medicines seem to end up with the conclusion that more research is needed. After more than 3000 trials, that is dubious.

## CONCLUSIONS

It is clear from meta-analyses that results of acupuncture trials are variable and inconsistent, even for single conditions. After thousands of trials of acupuncture and hundreds of systematic reviews,<sup>18</sup> arguments continue unabated. In 2011, *Pain* published an editorial<sup>31</sup> that summed up the present situation well.

"Is there really any need for more studies? Ernst *et al.*<sup>18</sup> point out that the positive studies conclude that acupuncture relieves pain in some conditions but not

in other very similar conditions. What would you think if a new pain pill was shown to relieve musculoskeletal pain in the arms but not in the legs? The most parsimonious explanation is that the positive studies are false positives. In his seminal article on why most published research findings are false, Ioannidis<sup>32</sup> points out that when a popular but ineffective treatment is studied, false positive results are common for multiple reasons, including bias and low prior probability."

Since it has proved impossible to find consistent evidence after more than 3000 trials, it is time to give up. It seems very unlikely that the money that it would cost to do another 3000 trials would be well-spent.

A small excess of positive results after thousands of trials is most consistent with an inactive intervention. The small excess is predicted by poor study design and publication bias. Furthermore, Simmons et al.<sup>33</sup> demonstrated that exploitation of "undisclosed flexibility in data collection and analysis" can produce statistically positive results even from a completely nonexistent effect. They say this is "... not driven by a willingness to deceive but by the self-serving interpretation of ambiguity, which enables us to convince ourselves that whichever decisions produced the most publishable outcome must have also been the most appropriate."

With acupuncture, in particular, there is documented profound bias among proponents.<sup>4</sup> Existing studies are also contaminated by variables other than acupuncture, such as the frequent inclusion of "electroacupuncture" which is essentially transdermal electrical nerve stimulation masquerading as acupuncture.

The best controlled studies show a clear pattern, with acupuncture the outcome does not depend on needle location or even needle insertion. Since these variables are those that define acupuncture, the only sensible conclusion is that acupuncture does not work. Everything else is the expected noise of clinical trials, and this noise seems particularly high with acupuncture research. The most parsimonious conclusion is that with acupuncture there is no signal, only noise.

The interests of medicine would be best-served if we emulated the Chinese Emperor Dao Guang and issued an edict stating that acupuncture and moxibustion should no longer be used in clinical practice.

No doubt acupuncture will continue to exist on the "High Streets" where they can be tolerated as a voluntary self-imposed tax or the gullible (as long as they do not make unjustified claims). ■■■

## DISCLOSURES

**Name:** David Colquhoun, PhD.

**Contribution:** Professor Colquhoun coauthored the manuscript.

**Attestation:** Professor Colquhoun approved the final manuscript.

**Conflicts of Interest:** Professor Colquhoun has no financial conflicts of interest. Professor Colquhoun writes the "DC's Improbable Science" blog (<http://dcsience.net/>), devoted to scientific fraud and medical quackery and education policy. Many postings to Dr. Colquhoun's blog address the lack of scientific evidence for alternative medicine.