

## Sham acupuncture is not a placebo treatment – implications and problems in research

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### Abstract

To date no ‘sham acupuncture’ has been inert. This non-inertness always results in problems for studies that attempt ‘placebo-control’ in acupuncture trials, usually introducing bias against acupuncture. Despite almost 30 years of discussion of this topic, multiple publications about it, detailed descriptions of the problems, researchers still attempt sham acupuncture trials as though they can be placebo-control trials and/or researchers are required to use sham acupuncture controls by funding agencies and other institutions. Reviewers and readers of these trials routinely misinterpret results of sham acupuncture trials. Additionally knowledge of the practice of acupuncture and what methods are to be used to test it is often confused or inadequate, leading to selection of completely wrong study design using sham acupuncture to test the question which the study attempted to investigate. The lecturer will outline and illustrate these issues and discuss alternative approaches for researching acupuncture that have been proposed in Europe and the US.

### Introduction

There is considerable confusion and disagreement about what the placebo treatments and placebo effects are [16, 20, 49]. Placebo treatments are supposed to be biologically inert [46], but some define placebos as a therapy thought not to include the active ingredients, thereby including components or aspects of a therapy that are not inert [43] while some paradoxically go so far as to define any untested therapy as a placebo [52]. Some authors claim placebo effects are small [21] some claim they are large [24], and some claim placebo does not exist [28]. Some make claims of placebo effects [43] citing studies that state the effects may not be [34] or cannot be placebo related [42]. Such opposing interpretations of the same evidence are not uncommon with regards understanding placebo effects. Placebo effects vary with different treatments [24, 29, 44]; placebo effects of a drug are said to be different than a device for the same condition [25], though evidence now contradicts that [11]; different-colored placebo pills can change the placebo effect [12, 24, 44]; how treatment and placebo are explained (informed consent) in the study changes the placebo effect [24, 29, 33] and can trigger its opposite, the nocebo effect [15]. Placebo effects are assumed to be additive [24], but evidence exists showing that they are not [14]. When placebo effects are not additive but interact with other treatment effects [10, 29, 30], it makes it difficult if not impossible to control

for them [24]. Some argue that placebo controlled trials may not be possible in complex interventions because they cannot separate placebo from other treatment effects [41, 48]. How should this bewildering array of opinions, claims, counterclaims, and contradictory findings be understood? When something supposedly so ubiquitous as the placebo effect is not really understood, what does it mean for clinical research?

### Placebo and Sham studies

In pharmaceutical trials, the placebo pill is supposed to be inert, but trials have sometimes used substances that were not inert and had specific effects for the condition for which the drug was being tested thereby resulting in false negative trials and creating bias against the tested therapy [13]. Surgical trials that have attempted to use sham surgical comparisons have made the same mistakes since the sham surgical procedures are, by definition, not inert and appear to produce many clinically active effects, creating false negative studies of surgical procedures [5, 47].

Sham acupuncture is used in clinical trials of acupuncture as a common tool for testing the efficacy of acupuncture. In principle it is used in order to control for placebo effects. However, it has been known for almost thirty years that ‘sham acupuncture’ is not inert like a placebo pill in a drug trial, thereby creating the need for

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**Table 1 Variations of sham acupuncture**

	Technique	Acupoints	Potential Uses*
'Real' acupuncture	Real (RT)	Real (RP)	The test treatment
Sham acupuncture -1	Sham (ST)	Sham (non) (SP)	The sham treatment
Sham acupuncture -2	Same as real (RT)	Sham (SP)	Tests relative effects of point location **
Sham acupuncture -3	Sham (ST)	Same as real (RP)	Tests relative effects of needle techniques **

\* I say 'potential' since there have also been serious problems with choice of the 'real' acupuncture [2, 55] and serious misunderstanding about the nature of what is tested in the so-called sham interventions.

\*\* These two sham models are NOT tests of acupuncture per se, rather tests of the relative effects of the places of needling or the techniques of needling. Yet they are routinely used as though they were sham acupuncture -1 type studies, as valid tests of acupuncture and then confused further when said to be placebo treatments. These studies by their nature cannot control for placebo effects, they are similar to studies of acupuncture compared to another therapy, except here the other therapy is a variant form of acupuncture.

large sample sizes when sham acupuncture trials are used, and thus many false negative studies due to inadequate sample size [32]. Since the identification of this problem, many publications have appeared on this problem [3, 4, 5, 6, 7, 8, 17, 37, 39, 56, 58] and some have attempted to design studies that in principle could lead to control of these non-placebo effects so that the study can be said to have controlled for placebo effects [4, 9, 39, 40]. The primary problem is that there are no sham acupuncture techniques that are inert [8, 35, 36, 57, 58, 59]. For the most part researchers have simply ignored this, some either accidentally or intentionally have treated the additional non-placebo effects of the sham as attenuated placebo effects [26, 27, 43] thereby creating bias against acupuncture.

Various forms of sham acupuncture have been tried mostly based on an understanding of modern Chinese needling methods, where the needles are inserted into specific acupoints to the required depth and then manipulated until sensations called 'deqi' are obtained. Sham acupuncture has varied two primary factors: the location of the stimulation and the nature of the stimulation. Unfortunately poorly informed research teams have routinely used sham acupuncture methods inappropriately. Shallow needling cannot be considered to be inert, and is in fact routinely used in countries like Japan instead of the typical modern Chinese needling methods. But because it is not typically used in China and the many countries that follow the Chinese deeper needling methods, superficial needling has been and continues to be used as a sham needling technique by many Western researchers<sup>1</sup> [34, 42, 51, 60]. Many still continue to interpret shallow needling as producing only placebo effects [43]. Curiously a recent Japanese trial that tested a shallow needling technique with 0.6mm depth press-tack needles compared to a non-penetrating sham on athletes demonstrated a clear difference between treatments in favor of the 0.6mm depth needles [23]. For those that interpret shallow needling as a placebo acupuncture treatment, this study is very difficult to interpret – how can a placebo treatment outperform an identical looking placebo treatment? This study reveals flaws in the interpretation of what constitutes a placebo treatment.

### Sham testing in acupuncture trials

Since two primary variables are tested in sham acupuncture studies, we should look more carefully at this. In the 'real' or 'test' acupuncture the 'real' technique (RT) is applied to the 'real' acupoints (RP). Thus three variations of sham acupuncture are possible (see table1):

The following is an example of wrong methods used as 'sham acupuncture' and confused with placebo effects. So and colleagues in Hong Kong attempted to test the use of acupuncture as an adjunctive therapy with IVF procedure [53]. Unfortunately they applied a non-penetrating sham acupuncture treatment to the same acupoints as needed in the test treatment. Which means that this study makes a comparison of the relative effects of two treatment techniques, it is not and could never be an 'explanatory trial' nor is it able to control for placebo effects. When the sham treatment, which they call placebo treatment was significantly more effective than their test treatment, they concluded that placebo is more effective than real acupuncture and that the treatment does not help women become pregnant while undergoing IVF procedures.<sup>ii</sup> This study cannot draw such conclusions, nor is such a conclusion correct. The study demonstrated, contrary to the expectation of the researchers, that gentle stimulation (using the non-penetrating sham needle) is significantly more effective than the heavier stimulation needling for women undergoing IVF procedures. This study is important also because the sham intervention that was used was the Streitberger non-penetrating needle [54]. Given the accidental design of this study as a comparison of the relative effectiveness of two techniques, the study thus shows that the non-penetrating sham is a highly active treatment that cannot be reduced to or labelled as placebo effects. Not only did the researchers misunderstand what they had done but readers and recently reviewers have also misunderstood the study [50], creating false negative conclusions and through the systematic review, bias against the use of acupuncture.

### Unknown mechanisms

Researchers recently figured out that despite decades of research on the mechanisms of acupuncture, it is still

unclear how it works. At best we have established correlations between the needling and measured effects, but we don't know what the mechanisms are inside the body [18, 19]. This has led leading researchers to call for a moratorium on sham acupuncture studies since if we don't know what the mechanisms of acupuncture are, we don't know how to choose an appropriate sham acupuncture therapy to test acupuncture in the 'explanatory trial' model of the placebo controlled clinical trial [31 see also 1]. The position paper of Langevin et al. advocates the use of pragmatic trials to test acupuncture clinically with renewed efforts in the laboratory to test its mechanisms. This is similar to the recommendations of UK professor, Hyland [22].

### Conclusions

Sham acupuncture is still demanded in many trials of acupuncture despite the developing evidence base that it is a much misused and misunderstood technique. Its misuse is compounded by its incorrect association with placebo. As more researchers realize the difficult if not impossible challenges that sham acupuncture trials create, it should gradually become less utilized. It may be helpful to use sham acupuncture type controls in physiological studies rather than clinical studies [45], but these should not be confused with placebo. It makes more sense to concentrate on investigating the mechanisms of acupuncture in laboratory studies and testing its effectiveness in pragmatic clinical trials.

### References

- 1 - Alraek T, Birch S. Acupuncture research strategies – a commentary on the Society for Acupuncture Research white paper. *Forsch Komplementmed* 2012; 19: 43-48, DOI: 10. 1159/ 000336801.
- 2 - Birch S. Issues to consider in determining an adequate treatment in a clinical trial of acupuncture. *Complement Ther Med*, 1997; 5: 8-12.
- 3 - Birch S. Overview of models used in controlled acupuncture studies and thoughts about questions answerable by each. *Clin Acup Orient Med* 2003; 3, 4: 207-17.
- 4 - Birch S. Clinical research of acupuncture: part two – controlled clinical trials an overview of their methods. *J Alt Complement Med*. 2004; 10, 3: 481-98.
- 5 - Birch S. A review and analysis of placebo treatments, placebo effects and placebo controls in trials of medical procedures when sham is not inert. *J Alt Complement Med*, 2006; 12(3): 303-10.
- 6 - Birch S. Comment on 'sham device v inert pill: randomised controlled trial of two placebo treatments. February 9, 2006a & Yes let's get real: what placebo isn't. March 10, 2006b. <http://www.bmj.com/cgi/eletters/332/7538/391#129658>
- 7 - Birch S, Bovey M. Which are the placebo effects: comments on Kaptchuk et al's IBS placebo study. June 30, 2008. <http://www.bmj.com/cgi/eletters/336/7651/999>.
- 8 - Birch S, Hammerschlag R, Trinh K, Zaslawski C. The non-specific effects of acupuncture treatment: When and how to control for them. *Clin Acupunct Orient Med* 2002; 3: 20-5.
- 9 - Birch S, Jamison RN. A controlled trial of Japanese acupuncture for chronic myofascial neck pain: Assessment of specific and nonspecific effects of treatment. *Clin J Pain* 1998; 14: 248-55.
- 10 - Bootzin RR, Bailey ET. Understanding placebo, nocebo and iatrogenic treatment effects. *J Clin Psychol* 2005;61: 871-880.
- 11 - Brunoni AR, Lopes M, Kaptchuk TJ, Fregni F. Placebo response on non-pharmacological and pharmacological trials in major depression: a systematic review and meta-analysis. *PLoS One*; 2009; 4(3): e4824.
- 12 - De Craen AJM, Lampe-Schoenmaeckers AJEM, Kleijnen J. Non-specific factors in randomized clinical trials: Some methodological considerations. In: D. Peters, ed. *Understanding the Placebo Effect in Complementary Medicine*. Edinburgh: Churchill Livingstone, 2001: 179-87.
- 13 - De Craen AJM, Tijssen JGM, Kleijnen J. Is there a need to control the placebo in placebo controlled trials? *Heart* 1997; 77: 95-6.
- 14 - van Die MD, Bone KM, Burger HG, Teede HJ. Are we drawing the right conclusions from randomised placebo-controlled trials? A post-hoc analysis of data from a randomised controlled trial. *BMC Medical Research Methodology* 2009, 9: 41 doi: 10.1186/1471-2288-9-41.
- 15 - Flaten MA, Simonsen T, Olsen H. Drug-related information generates placebo and nocebo responses that modify the drug response. *Psychosom Med* 1999; 61(2): 250-5.
- 16 - Guess HA, Kleinman A, Kusek JW, Engel LW, eds. *The Science of the Placebo*, London: BMJ Books, 2002.
- 17 - Hammerschlag R. Methodological and ethical issues in clinical trials of acupuncture. *J Altern Complement Med* 1998; 4: 159-71.
- 18 - Hammerschlag R, Langevin HE, Lao LX, Lewith G: Physiological dynamics of acupuncture: correlations and mechanisms; in MacPherson H, Hammerschlag R, Lewith G, Schnyer R (eds): *Acupuncture Research: Strategies for Building an Evidence Base*. London, Elsevier, 2007, pp 181-197.
- 19 - Hammerschlag R, Zwickey H: Evidence based complementary and alternative medicine: back to basics. *J Altern Complement Med* 2006; 12: 349-50.
- 20 - Harrington A, ed. *The Placebo Effect*. Cambridge, MA: Harvard University Press, 1997.
- 21 - Hrobjartsson A, Gotzsche P. Is the placebo powerless? An analysis of clinical trials comparing placebo with no treatment. *NEJM*, 2001; 344: 1594-602.
- 22 - Hyland ME: Methodology for the scientific evaluation of complementary and alternative medicine. *Complement Ther Med* 2003; 11: 146-53.

- 23 - Kaneko Y, Furuya E, Sakamoto A. The effects of press-tack needle treatment on muscle soreness after triathlon race – sham controlled study. *JAM*, 2009; 1: 22-30.
- 24 - Kaptchuk TJ, Edwards RA, Eisenberg DM. Complementary medicine: Efficacy beyond the placebo effect. In: Ernst E, ed. *Complementary Medicine: An Objective Appraisal*. Oxford, UK: Butterworth Heinmann, 1996: 42-70.
- 25 - Kaptchuk TJ, Goldman P, Stone DA, Stason WB. Do medical devices have enhanced placebo effects? *J Clin Epidemiol* 2000; 53: 786-92.
- 26 - Kaptchuk TJ, Kelley JM, Conboy LA, Davis RB, Kerr CE, Jacobson EE, Kirsch I, Schnyer RN, Nam BH, Nguyen LT, Park M, Rivers AL, McManus C, Kokkotou E, Drossman DA, Goldman P, Lembo AJ. Components of placebo effect: randomized controlled trial in patients with irritable bowel syndrome. *BMJ*, 2008; 336(7651): 999-1003.
- 27 - Kaptchuk TJ, Stason WB, Davis RB, Legedza ART, Schnyer RN, Kerr CE, Stone DA, Nam BH, Kirsch I, Goldman RH. Sham device v inert pill: randomized controlled trial of two placebo treatments. *BMJ* 2006; 332: 391-7.
- 28 - Kienle GS, Kiene H. Placebo effect and placebo concept: A critical methodological and conceptual analysis of reports on the magnitude of the placebo effect. *Altern Ther Health Med* 1996; 2: 39-54.
- 29 - Kleijnen J, de Craen AJM. The importance of the placebo effect: A proposal for further research. In: Ernst E, ed. *Complementary Medicine: An objective appraisal*. Oxford, UK: Butterworth Heinmann, 1996: 31-41.
- 30 - Kleijnen J, de Craen AJM, van Everdingen J, Krol L. Placebo effect in double blind clinical trials: A review of interactions with medications. *Lancet* 1994; ii: 1347-9.
- 31 - Langevin HM, Wayne PM, Macpherson H, Schnyer R, Milley RM, Napadow V, Lao L, Park J, Harris RE, Cohen M, Sherman KJ, Haramati A, Hammerschlag R: Paradoxes in acupuncture research: strategies for moving forward. *Evid Based Complement Alternat Med* 2011; 2011: 180805.
- 32 - Lewith GT, Machin D. On the evaluation of the clinical effects of acupuncture. *Pain* 1983; 16: 111-27.
- 33 - Linde K, Dincer F. How informed is consent in sham-controlled trials of acupuncture? *J Altern Complement Med* 2004; 10(2): 379-85.
- 34 - Linde K, Streng A, Jurgens S, Hoppe A, Brinkhaus B, et al. Acupuncture for patients with migraine: a randomized controlled trial. *JAMA* 2005; 293: 2118-125.
- 35 - Lund I, Naslund J, Lundeberg T: Minimal acupuncture is not a valid placebo control in randomised controlled trials of acupuncture: a physiologist's perspective. *Chin Med* 2009; 4: 1.
- 36 - Lund I, Lundeberg T: Are minimal, superficial or sham acupuncture procedures acceptable as inert placebo controls? *Acupunct Med* 2006; 24: 13-5.
- 37 - Lundeberg T, Lund I, Naslund J, Thomas M: The Emperor's sham – wrong assumption that sham needling is sham. *Acupunct Med* 2008; 26: 239-42.
- 38 - MacDonald AJR, Macrae KD, Master BR, Rubin AP Superficial acupuncture in the relief of chronic low back pain. *Annals of the Royal Colleges of Surgeons of England*; 1983; 65: 44-6.
- 39 - Margolin A, Avants SK, Kleber HD. Rationale and design of the cocaine alternative treatments study (CATS): A randomized, controlled trial of acupuncture. *J Altern Complement Med* 1998; 4: 405-18.
- 40 - Margolin A, Kleber HD, Avants SK, Konefal J, Gawin F, Stark E, Sorenson J, Midkiff E, Wells E, Jackson TR, Bullock M, Culliton PD, Boles S, Vaughan R. Acupuncture for the treatment of cocaine addiction. A randomized controlled trial. *JAMA* 2002; 287: 55-63.
- 41 - Medical Research Council. A framework for development and evaluation of RCTs for complex interventions to improve health. Online document at: [http://www.mrc.ac.uk/pru/pdfmrc\\_cpr.pdf](http://www.mrc.ac.uk/pru/pdfmrc_cpr.pdf) Posted in 2000. Accessed October 5, 2005.
- 42 - Melchart D, Streng A, Hoppe A, Brinkhaus B, Becker-Witt C, Hammes M, Irnich D, Hummelsberger J, Willich SN, Linde K. The acupuncture randomised trial (ART) for tension-type headache - details of treatment. *Acup in Med* 2005; 23; (4): 157-65.
- 43 - Miller FG, Colloca L, Kaptchuk TE: The placebo effect: illness and interpersonal healing. *Perspect Biol Med*. 2009; 52: 518.
- 44 - Moerman DE, Jonas WB. Deconstructing the placebo effect and finding the meaning response. *Ann Int Med* 2002; 136: 471-6.
- 45 - O'Brien KA, Birch S, Abbas E, Movsessian P, Hook M, Komesaroff PA. Traditional East Asian Medical pulse diagnosis - a preliminary physiological investigation. In press, *J Altern Comp Med*.
- 46 - Oken BS. Placebo effects: clinical aspects and neurobiology. *Brain*, 2008; 131: 2812-23.
- 47 - O'Toole JE, Traynelis VC. Vertebral compression fractures. *J Neurosurg: Spine*, March 4, 2011; DOI: 10.3171/2010.12.SPINE10286.
- 48 - Paterson C, Dieppe P. Characteristic and incidental (placebo) effects in complex interventions such as acupuncture. *BMJ* 2005; 330: 1202-5.
- 49 - Peters D, ed. *Understanding the Placebo Effect in Complementary Medicine*. Edinburgh: Churchill Livingstone, 2001.
- 50 - Qu F, Zhou J, Ren RX. Effects of acupuncture on the outcomes of in vitro fertilization: a systematic review and meta-analysis. *J Alt Complement Med*, 2012; 18(5): 429-39.
- 51 - Scharf HP, Mansmann U, Streitberger K, Witte S, Kramer J, Maier C, Trampisch HJ, Victor N. Acu-

- puncture and knee osteoarthritis: a three-armed randomized trial. *Ann Intern Med.* 2006; 145: 12-20.
- 52 - Shapiro AK, Shapiro E. The placebo: Much ado about nothing? In: Harrington A, ed. *The Placebo Effect.* Cambridge MA: Harvard University Press, 1997: 12-36.
- 53 - So EW, Ng EH, Wong YY, Lau EY, Yeung WS, Ho PC. A randomized double blind comparison of real and placebo acupuncture in IVF treatment. *Hum Reprod.* 2009 Feb; 24(2): 341-8.
- 54 - Streitberger K, Kleinhenz J. Introducing a placebo needle into acupuncture research. *Lancet* 1998; 352: 364-5.
- 55 - Stux G, Birch S. Proposed standards of acupuncture treatments for clinical studies. In Stux G, Hammerschlag R, eds. *Clinical Acupuncture: Scientific Basis.* Berlin: Springer Verlag, 2001: 171-85.
- 56 - Vincent C, Lewith G. Placebo controls for acupuncture studies. *J R Soc Med* 1995; 88: 199-202.
- 57 - Wayne PM, Hammerschlag R, Langevin HM, Napadow V, Park JJ, Schnyer RN. Resolving paradoxes in acupuncture research: a roundtable discussion. *J Alt Complem Med.* 2009; 15(9): 1039-44.
- 58 - White AR: Acupuncture research methodology; in Lewith G, Jonas WB, Walach H (eds): *Clinical Research in Complementary Therapies.* Edinburgh, Churchill Livingstone, 2002, pp 307-23.
- 59 - White A: Research shorts: a new sham acupuncture needle. *Acupunct Med* 2008; 26: 57-60.
- 60 - Witt C, Brinkhaus B, Jena S, Linde K, Streng A, Wagenpfeil S, Hummelsberger J, Walther HU, Melchart D, Willich SN. Acupuncture in patients with osteoarthritis of the knee: a randomized trial. *Lancet*, 2005; 366(9480): 136-43.

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<sup>i</sup> Despite evidence of effectiveness from one of the first trials to use this method as a control treatment in an acupuncture trial [38].

<sup>ii</sup> Although they did acknowledge that their sham treatment may not have been inert [53].