

Editorial

Gender Differences in Manual, Electro, and Laser Acupuncture

Yan Yang^{1,2,†}, Gerhard Litscher^{1,2,†,*}

1. Research Unit of Biomedical Engineering in Anesthesia and Intensive Care Medicine, Research Unit for Complementary and Integrative Laser Medicine, and Traditional Chinese Medicine (TCM) Research Center Graz, Medical University of Graz, 8036 Graz, Austria; E-Mails: grace.yang123@outlook.com; gerhard.litscher@medunigraz.at
2. Heilongjiang University of Chinese Medicine, Harbin 150040, China

† Both authors contributed equally to this work.

* **Correspondence:** Gerhard Litscher; E-Mail: gerhard.litscher@medunigraz.at

Academic Editor: Gerhard Litscher

Special Issue: [Modernization of Acupuncture Education and Research](#)

OBM Integrative and Complementary Medicine
2020, volume 5, issue 1
doi:10.21926/obm.icm.2001003

Received: January 08, 2020

Accepted: January 08, 2020

Published: January 14, 2020

Abstract

Acupuncture, being a unique method, is a millennia-old tradition in the field of Chinese medicine. However, it is surprising that there are very few scientific publications on acupuncture and its gender-specific effects. This article summarizes the previous work from the perspective of both Western and Eastern medicine, involving manual acupuncture, electro-acupuncture, and modern innovative laser acupuncture. There is scientific evidence that future gender-specific considerations should be included in the assessment of acupuncture therapy success. Thus this topic is interesting and provides leads for future research to the international research community.

Keywords

Acupuncture; gender; sex; manual acupuncture; electro acupuncture; laser acupuncture



© 2020 by the author. This is an open access article distributed under the conditions of the [Creative Commons by Attribution License](#), which permits unrestricted use, distribution, and reproduction in any medium or format, provided the original work is correctly cited.

1. Introduction

As an integrative part of Traditional Chinese Medicine (TCM), acupuncture therapy has been recognized worldwide and well-developed with the help of new modernized technological methods. There are different methods to stimulate acupoints, which mainly include invasive techniques such as manual acupuncture (MA) and electroacupuncture (EA) and non-invasive techniques like moxibustion and laser acupuncture (LA) [1]. Although there is still debate about optimal kind of stimulation, the non-invasive methods are more acceptable to patients with needle phobia. Acupuncture has a wide range of applications in addition to pain-related conditions. Other nervous system problems and dysfunctional diseases, including but not limited to stroke [2], Alzheimer's disease (AD) [3], insomnia [4], anxiety [5] or depression [6], can also be benefited by acupuncture therapy. Painful diseases [7] are strongly affected by gender; women are more sensitive to pain. Moreover, gender has also been considered when assessing the efficacy of pharmacological and non-pharmacological pain interventions. According to the DSM-V (Diagnostic and statistical manual of mental disorders (5thed.) [8] and ICD-10 (International Statistical Classification-10) [9], AD starts in the middle or old age with a gradual onset, progresses over time and manifests by multiple cognitive deficits. It occurs mainly in females than in males [10]. Parkinson's disease (PD) is diagnosed by the presence of characteristic and progressive motor abnormalities (i.e., bradykinesia, rigidity, and resting tremor) in the absence of dementia. Although in most patients, cognitive problems often occur over time [8,9]. The ratio of men suffering from PD is more than women (2:1) [11]. Major depressive disorder (MDD) is one of the most prevalent psychiatric disorders. Clinical studies have shown that women are more susceptible to depression. Gender susceptibility to depression has been associated with social, cultural, as well as biological factors [12]. Depression is sexually dimorphic with males and females exhibiting differences in incidence, clinical manifestations, and response to antidepressant therapy [13]. The selection of these conditions is not systematic.

With regard to response to acupuncture therapy and its mechanism of action, there is increasing evidence of variation based on gender. Over a decade, several functional magnetic resonance imaging (fMRI) studies have been conducted and significant differences have been observed between men and women in brain activation following acupuncture intervention [14-16]. Lund and Lundeberg from Karolinska Institute in Sweden stated that the mechanisms underlying these differences between women and men in acupuncture are currently unknown but are complex and involve interactions between biological, sociocultural and psychological aspects [17]. Only a few relevant studies related to gender-specific differences in the field of acupuncture are available. Thus one should not neglect the problem [18] but intensify research in this field to develop tailor treatment to meet specific needs for male and female patients, respectively. In this editorial, we reviewed the influence of gender on the efficacy of different acupoint stimulation techniques in the treatment of various diseases and discussed the mechanisms influencing these differences.

2. Search Strategy

The authors conducted a database search in the two most critical scientific databases, PubMed and China National Knowledge Infrastructure (CNKI), the latter is currently the most significant

academic journal database in China. The keywords used for the search were “gender”, “gender difference”, “sex”, “sex difference” and “acupuncture”, “acup*”, “laser acupuncture”, “electroacupuncture”, “electro-acupuncture.”. No restrictions were applied for the year of publication or study design, and English, German, and Chinese articles were retrieved. From the resulting search, the authors carried out the final review that included peer-reviewed publications.

3. Gender Differences in Manual Acupuncture

MA is the earliest and most widely used method. MA is achieved by manipulating the needles to elicit the de-qi sensation, which is often described as *suan* (aching or soreness), *ma* (numbness or tingling), *zhang* (fullness, distention, or pressure), and *zhong* (heaviness) [19]. Differences in response to manual acupuncture based on gender have been reported in both Western and Eastern countries. Recently acupuncture and spinal manipulation therapy (SMT) have been used for treating low-back pain (LBP) in a randomized controlled trial conducted in California by Kizhakkeveettil et al. [20]. The outcomes demonstrated gender-specific differences in response to the treatment. Women showed more possibility to reduce pain and disability rates with acupuncture treatment alone, while in men, SMT alone gave better outcomes than acupuncture [20].

Two fascinating articles have been published on the effect of acupuncture on brain function. The goal of one study in the USA reported by Qiu et al. [15] was to compare the sex differences of the brain regions responsible for emotion and cognition in response to acupuncture stimulation. The researchers retrieved the data of 38 subjects (19 male, 19 female) from previous studies, who had brain fMRI during acupuncture and reanalyzed them based on sex status. The result observed significant gender differences at both the networks related to cognition and emotion and the sensation network in the brain, i.e., the limbic-paralimbic-neocortical network (LPNN) and the default mode network (DMN). A few years later, another study performed by researchers from Korea and the Netherlands in 2016 [14] examined gender differences and similarities in the psychophysical and brain responses to acupuncture in 19 healthy participants (9 male, 10 female). During needle manipulation of acupuncture, women reported a higher intensity of aching than men. Moreover, the neural results showed greater brain activation in numerous brain areas in women than men [14]. Gender-specific differences in response to manual acupuncture have the necessary implications for the acupuncture treatment of patients with psychiatric disorders, such as depression [21] and schizophrenia [22]. Gender differences should also be taken into account for depression, especially in TCM diagnosis. A recent study by Bosch et al. [21] concerning depression was published in the German language in 2019. Thirty patients (20 females and 10 males) with depression were recruited from a German psychiatric clinic. The TCM diagnostics showed that females have more emptiness and deficiency, while males show more full patterns with heat.

Gender differences in manual acupuncture have also been reported in the eastern part of the world. In a study performed in Beijing by Dong et al. [23], obese rats were treated by acupuncture. The results indicated that acupuncture works equally on obesity in rats of both gender; however, the effect of acupuncture was better on males than that on females in terms of the body contours of rats. In addition, Fan et al. [24] reported gender differences when treating depression. Patients were treated with acupuncture and moxibustion for 12 weeks (twice a week). About 143 patients

completed the study, including 61 males and 82 females. The combined treatment showed non-statistically significant differences between men and women; however, for the method of shallow puncturing on acupoint, women showed less sensitivity than men. Recently, a study from the point of view of Western and Eastern medicine has been published by researchers from Heilongjiang University of Chinese Medicine, China in collaboration with researchers from the United States [16]. They investigated gender differences and similarities in cerebral activity response to the acupuncture at local acupoints around the knee. The cerebral activity response to acupuncture was measured using fMRI in healthy 15 male and 15 female adults. Acupuncture activated the postcentral gyrus, precuneus, temporal, posterior lobe, and occipital lobe in both males and females. Males showed brain activation in the right middle frontal gyrus, inferior frontal gyrus, right precuneus, right superior parietal lobule, left cerebellum anterior lobe, and brain deactivation in the right frontal. Females showed brain activation in the right frontal lobe, right parietal lobe, and right middle temporal gyrus, and brain deactivation in the left and right medial frontal gyrus. The results of this study demonstrated that the neural effects of local acupoints around the knee are different between male and female subjects [17]. However, they failed to explain the reason for the differences in detail. Besides, the number of participants was not very high to make any firm conclusion.

4. Gender Differences in Electroacupuncture

EA is a form of acupuncture using electrical impulses passing through the needles to stimulate acupoints. Currently, EA is widely used in clinical trials and laboratory research because of its continuity of stimulation and repeatability of operation. Besides, the therapeutic efficacy of EA can be modulated by varying the frequency, intensity, and duration. The evidence of gender differences in response to EA treatment has been mainly reported in China with the first report published in 1986. Du et al. [25] found that the inhibitory effect of EA on the endotoxin-induced thermophilic outcome differs between genders. EA can reduce the body temperature in a female rabbit more than the male, which might be related to the estrogen secretion level. Several studies about gender differences in EA efficacy in the treatment of various diseases have been reported. Li et al. [26] studied the effect of EA on Systolic Time Intervals (STI) which is an index system for evaluating the cardiac function and found that the changes in the differential value of STI indicators are not entirely consistent between male and female. Shi et al. [27] also discussed the effects of the different genders on pain perception and inhibition [28, 29]. A study on the analgesic effect of 100 Hz EA on rats on gender difference indicated that the female rats were stronger than males and this difference was most significant at 20 min of treatment. This difference may be related to the gender difference of morphine analgesia at the spinal cord level. Interpretation of the results, however, has to be done with caution taking into account that these are results from different species. The effect of gender differences in EA on the nervous system is also reflected in the impact of acupuncture on the vagus nerve. By observing the effects of acupuncture at Tongli (HT5) on the heart rate variability of young people (20 female, 20 male), Wang and Shao [30] found that acupuncture at the HT5 can enhance vagal nerve function. Interestingly, the change in females is more significant than that in males. In recent years, gender differences in EA treatment on obesity have become the focus of research. Liu [31] investigated the effect of EA on central obesity and indicated that male patients are more effective than female

patients. However, this result is the opposite of another animal experiment conducted by Huang et al. [32] which confirmed that the effect of EA on female obesity model rats is better than that of males. This contradiction in results may be related to the acupuncture points selected for the treatment. A research team [33, 34] from Hebei Medical University also concluded that there are gender differences in EA treatment on obesity. They performed further studies on body weight, blood lipids, and other obesity-related indicators and found that the effect of low-frequency EA treatment on reducing body mass index and serum content of adiponectin (ADPN) was more evident in male than female, whereas a decrease in the waist circumference, hip circumference, subcutaneous fat content and serum content of leptin was more pronounced in female than in the males.

From a western perspective, a study conducted by Smeester et al. [35] focused on gender differences in EA treatment for rodent models on persistent pain. They applied EA at the ST-36 acupoint twice weekly for reducing hyperalgesia pain and revealed that the analgesic effect of EA began earlier in males, but lasted longer in females.

5. Gender Differences in Laser Acupuncture

LA is defined as “Photonic stimulation of acupuncture points and areas to initiate therapeutic effects similar to that of needle acupuncture and related therapies together with the benefits of PhotoBioModulation (PBM)” [36]. LA has been used clinically since the 1970s; it is not only a branch of acupuncture therapy but also a form of photobiomodulation therapy that uses (nonthermal) visible and infrared light to promote therapeutic benefits. Painless LA has become a trend in acupuncture, but few studies have focused on gender differences in LA. One report from the research group at the Medical University of Graz in Austria was found in scientific databases. Litscher et al. [18] performed quantitative thermal sensory and pain threshold testing on 29 adult healthy volunteers (20 females, 9 males) before and after laser needle acupuncture and placebo stimulation, respectively [18]. Significant gender-specific differences were observed in cold pain threshold analysis. A changing trend in the median value of cold pain sensation after laser needle stimulation was seen within a group of healthy females [18]. Acupuncture treatment has a curative effect on inhibiting pain; however, quantitative as well as qualitative differences in the endogenous pain inhibitory systems have been implicated, as well as an influence of gonadal hormones. Thus, treatment recommendations should be based on studies using both genders as the norm [17]. In 2018, another study [37] from the same group of the Medical University of Graz reported gender-specific differences in the effects of auricular LA. Within a crossover study, the ear acupuncture point, Shenmen, was stimulated with two different kinds of laser (green, 532 nm, and yellow, 589 nm) in 22 healthy volunteers (13 female, 9 male). Both green and yellow lasers were used in the same volunteers for 15 min in two different sessions. In general, more pronounced effects were found in females than in males. Systolic blood pressure and heart rate decreased significantly after yellow laser stimulation, whereas heart rate variability ratio, i.e., low frequency/high frequency, increased [37]. This is in accordance with an EA study mentioned previously [30].

The mechanisms of LA, however, seem to differ from MA and EA since the light stimulus affects chromophores in the skin, hair follicles, and superficial fat cells [38, 39]. Although gender differences in LA are under-reported, research on photobiomodulation therapy suggests gender

differences [40]. In one study, it was reported that sex affects the penetration of red-light (660 nm) through sites susceptible to a sports injury in lean tissues regardless of tissue thickness. Therefore, precise identification of the gender differences in response to LA therapy is crucial to tailor treatment, especially regarding the application of appropriate dose and specific needs in women and men with various diseases.

Acknowledgments

The editorial has been written during a 6-month research stay of Mrs. Yan Yang, MA at Medical University of Graz which was supported by a scholarship from Eurasia-Pacific Uninet. Professor Gerhard Litscher is also Visiting Professor at the Heilongjiang University of Chinese Medicine in Harbin, China. The authors are thankful to Prof. Maurits van den Noort, Dr. Peggy Bosch and Prof. Ann Liebert for their contributions (collecting some references) to this editorial.

Author Contributions

Both authors contributed equally to this editorial.

Funding

Eurasia Pacific Uninet, Austria and TCM Research Center Graz, Medical University of Graz.

Competing Interests

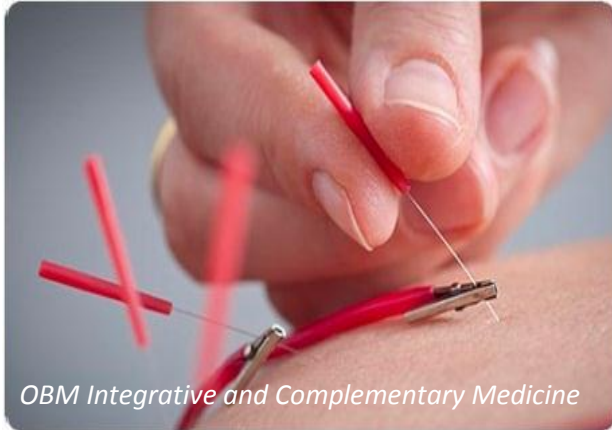
The authors have declared that no competing interests exist.

References

1. Jun MH, Kim YM, Kim JU. Modern acupuncture-like stimulation methods: A literature review. *Integr Med Res.* 2015; 4: 195-219. doi:10.1016/j.imr.2015.09.005
2. Chavez LM, Huang SS, MacDonald I, et al. Mechanisms of acupuncture therapy in ischemic stroke rehabilitation: A literature review of basic studies. *Int J Mol Sci.* 2017, 18. pii: E2270.
3. Zhou J, Peng W, Xu M, et al. The effectiveness and safety of acupuncture for patients with Alzheimer disease: A systematic review and meta-analysis of randomized controlled trials. *Medicine (Baltimore).* 2015, 94: e933.
4. Shergis JL, Ni X, Jackson ML, et al. A systematic review of acupuncture for sleep quality in people with insomnia. *Complement Ther Med.* 2016, 26: 11-20.
5. Amorim D, Amado J, Brito I, et al. Acupuncture and electroacupuncture for anxiety disorders: A systematic review of the clinical research. *Complement Ther Clin Pract.* 2018; 31: 31-37.
6. Smith CA, Armour M, Lee MS, et al. Acupuncture for depression. *Cochrane Database Syst Rev.* 2018; 3: CD004046.
7. Pieretti S, Di Giannuario A, Di Giovannandrea R, et al. Gender differences in pain and its relief. *Ann Ist Super Sanita.* 2016; 52: 184-189.
8. American Psychiatric Association. *Diagnostic and statistical manual of mental disorders.* 5th ed. Washington, DC: American Psychiatric Association; 2013.

9. World Health Organization. The ICD-10 classification of mental and behavioural disorders: Clinical descriptions and diagnostic guidelines. Geneva: World Health Organization; 1992.
10. Vina J, Lloret A. Why women have more Alzheimer's disease than men: Gender and mitochondrial toxicity of amyloid-beta peptide. *J Alzheimers Dis.* 2010; 20 Suppl 2: S527-533.
11. Van Den Eeden S K, Tanner C M, Bernstein A L, et al. Incidence of Parkinson's disease: Variation by age, gender, and race/ethnicity. *Am J Epidemiol.* 2003; 157: 1015-1022.
12. Ma L, Xu Y, Wang G, et al. What do we know about sex differences in depression: A review of animal models and potential mechanisms. *Prog Neuropsychopharmacol Biol Psychiatry.* 2019; 89: 48-56.
13. Gorman JM. Gender differences in depression and response to psychotropic medication. *Gen Med.* 2006; 3: 93-109.
14. Yeo S, Rosen B, Bosch P, et al. Gender differences in the neural response to acupuncture: Clinical implications. *Acupunct Med.* 2016; 34: 364-372.
15. Qiu WQ, Claunch J, Kong J, et al. The effects of acupuncture on the brain networks for emotion and cognition: An observation of gender differences. *Brain Res.* 2010; 1362: 56-67.
16. Li A, Wang YH, Zhang F, et al. Acupuncture for gender differences and similarities in cerebral activity of health volunteers: A pilot fMRI study. *Medicine (Baltimore).* 2018; 97: e13655.
17. Lund I, Lundeberg T. Is it all about sex? Acupuncture for the treatment of pain from a biological and gender perspective. *Acupunct Med.* 2008; 26: 33-45.
18. Litscher G, Wang L, Huber E, et al. Quantification of gender specific thermal sensory and pain threshold before and after laser needle stimulation. *Biomed Tech (Berl).* 2004; 49: 106-110.
19. Yang XY, Shi GX, Li QQ, et al. Characterization of deqi sensation and acupuncture effect. *Evid Based Complement Alternat Med.* 2013; 2013: 319734.
20. Kizhakkeveetil A, Rose KA, Kadar GE, et al. An exploratory analysis of gender as a potential modifier of treatment effect among patients in a randomized controlled trial of integrative acupuncture and spinal manipulation for low back pain. *J Manipulative Physiol Ther.* 2019; 42: 177-186.
21. Bosch P, Lim S, Staudte H, et al. Gender differences in the acupuncture treatment of patients with depression. *Dtsch Z Akupunkt.* 2019; 62: 160-165.
22. van den Noort M, Yeo S, Lim S, et al. Acupuncture as add-on treatment of the positive, negative, and cognitive symptoms of patients with schizophrenia: A systematic review. *Medicines (Basel).* 2018; 5. pii: E29
23. Dong NX, Zhang SY, Liang YL, Xu XK, Xiao HL, Sun YH, Sun LH. Effect of lose weight on the different gender rats with simple obesity by acupuncture. *China J Chinese Med.* 2015; 30: 846-848.
24. Fan L, Gong J, Fu W, et al. Gender-related differences in outcomes on acupuncture and moxibustion treatment among depression patients. *J Altern Complement Med.* 2015; 21: 673-680.
25. Du KQ, Guo ZH, Zhu SG, et al. Study on acupuncture antipyretic: (I) inhibitory effect of intermittent acupuncture on endotoxin-induced fever and its gender relation. *J Bethune Med Univ.* 1986; 5: 379-381.
26. Li L, Chen HP, Gu J. The impact of electroacupuncture on the contraction time interval of different genders. *Shanghai J Acupunct Moxibustion.* 1995; 1: 21-23.

27. Shi H, Wan Y, Han J. Sex differences of analgesia induced by 100 Hz electroacupuncture and intrathecal injection of dynorphina in rats. *Chinese J Pain Med.* 1999; 2: 35-39.
28. Jamner LD, Girdler SS, Shapiro D, et al. Pain inhibition, nicotine, and gender. *Exp Clin Psychopharmacol.* 1998; 6: 96-106.
29. Keogh E, Hatton K, Ellery D. Avoidance versus focused attention and the perception of pain: Differential effects for men and women. *Pain.* 2000; 85: 225-230.
30. Wang XB, Shao Y. Study on the effect of acupuncture at Tongli point on vagus nerve in young people of different gender. *J Chinese Med.* 2014; 42: 105-106.
31. Liu KZ. Therapeutic effect of electro-acupuncture on central obesity in adults and its relationship with gender. *Chinese Tradit Chinese Med Technol.* 2010; 17: 542.
32. Huang NH, Hu L, Cai RL, et al. Comparison of therapeutic effects of electro-acupuncture "Sanyinjiao" and "Tianshu" on obesity rats of different sexes. *J Chengdu Univ Tradit Chinese Med.* 2007; 3: 48-51.
33. Gao F. Comparative research on the effects of low frequency electroacupuncture for treatment of simple obesity of different gender. Shijiazhuang: Hebei Medical University; 2016.
34. Xu XK, Gao F, Wang LL, et al. A comparative study of the effect of low-frequency electroacupuncture on blood lipids between men and women with simple obesity. *J Acupunct Tuina Sci.* 2017; 15: 415-419.
35. Smeester B A, Al-Gizawiy M, Beitz A J. Effects of different electroacupuncture scheduling regimens on murine bone tumor-induced hyperalgesia: Sex differences and role of inflammation. *Evid Based Complement Alternat Med.* 2012; 2012: 671386.
36. Litscher G. Definition of laser acupuncture and all kinds of photo acupuncture. *Medicines.* 2018; 5: 117. <https://doi.org/10.3390/medicines5040117>
37. Litscher D, Wang J, Litscher G, et al. Gender differences in laser acupuncture - results of a crossover study with green and yellow laser at the ear point Shenmen. *Medicines (Basel).* 2018; 5: 24.
38. Hamblin MR, Huang YY, Heiskanen V. Non-mammalian hosts and photobiomodulation: Do all life-forms respond to light? *Photochem Photobiol.* 2019; 95: 126-139. doi:10.1111/php.12951
39. Ondrusova K, Fatehi M, Barr A, et al. Subcutaneous white adipocytes express a light sensitive signaling pathway mediated via a melanopsin/TRPC channel axis. *Sci Rep.* 2017; 7: 16332. doi:10.1038/s41598-017-16689-4
40. Hu D, van Zeyl M, Valter K, et al. Sex, but not skin tone affects penetration of red-light (660 nm) through sites susceptible to sports injury in lean live and cadaveric tissues. *J Biophotonics.* 2019; 12: e201900010.



Enjoy *OBM Integrative and Complementary Medicine* by:

1. [Submitting a manuscript](#)
2. [Joining in volunteer reviewer bank](#)
3. [Joining Editorial Board](#)
4. [Guest editing a special issue](#)

For more details, please visit:

<http://www.lidsen.com/journals/icm>