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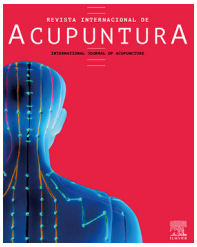

CONTINUING EDUCATION

# Acupuncture for erectile dysfunction: Insights and future research directions

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**Abstract** Erectile dysfunction is a condition in which men have difficulty in obtaining or maintaining a satisfactory penile erection, affecting their sexual life and quality of life. It is a common condition and its prevalence is increasing due to lifestyle changes and psychosocial factors. There are various approaches to treat erectile dysfunction, however many patients are not satisfied with conventional treatments and seek alternatives. Acupuncture is a technique that involves the insertion of needles into specific points of the body to promote the regulation of several systems and improve well-being. Regarding erectile dysfunction, acupuncture seems to positively influence the regulation of the hypothalamus, hormonal function, and local nervous function. Acupuncture is a promising therapeutic option, especially when combined with conventional therapies and by directly addressing mental health. However, the scientific evidence on the effectiveness of acupuncture for erectile dysfunction is still limited.


**PALABRAS CLAVE**
Medicina tradicional china;
Acupuntura;
Salud mental;
Disfunción eréctil

**Acupuntura para la Disfunción Eréctil: Perspectivas y Futuras Direcciones de Investigación**

**Resumen** La disfunción eréctil es una condición en la que los hombres tienen dificultades para lograr o mantener una erección peniana satisfactoria, lo que afecta su vida sexual y calidad de vida. Es una condición común y su prevalencia está en aumento debido a los cambios en el estilo de vida y factores psicosociales. Existen diversos enfoques para tratar la disfunción eréctil, pero muchos pacientes no están satisfechos con los tratamientos convencionales y buscan alternativas. La acupuntura es una técnica que implica la inserción de agujas en puntos específicos del cuerpo para promover la regulación de varios sistemas y mejorar el bienestar. En lo que respecta a la disfunción eréctil, la acupuntura parece influir positivamente en la regulación del hipotálamo, la función hormonal y la función nerviosa local. La acupuntura es una opción terapéutica prometedora, especialmente cuando se combina con tratamientos

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convencionales y se aborda directamente la salud mental. Sin embargo, la evidencia científica sobre la efectividad de la acupuntura para la disfunción eréctil sigue siendo limitada.


## Introduction

Erectile dysfunction is defined as the inability to achieve or maintain a penile erection, resulting in an unsatisfactory sexual relationship.[1,2] It is a common clinical condition that affects men of all ages, with a higher incidence in the elderly, accounting for up to 79% of men between the ages of 40 and 80.[3]

According to statistics, there are at least 150 million men affected by this condition, comprising approximately 20% of adult men worldwide.[4] However, due to the accelerated pace of daily life, increased pressures, changes in diet, lifestyle, and other factors, the prevalence of this condition is trending upwards.[5,6]

Many types of factors such as psychological factors, surgery, trauma, vascular diseases, neurological factors, amongst others can lead to erectile dysfunction.[7,8]

Erectile dysfunction profoundly impacts the quality of life of patients, affecting their family and social stability, causing suffering and distress.[9,10] In some cases, erectile dysfunction demonstrates a negative cycle in which poor sexual relationships, sexual dissatisfaction, decreased confidence, low self-esteem, and symptoms of depression can lead to erectile dysfunction and be a consequence of it.[11] These multidimensional interactions reflect the complexity of erectile dysfunction cases, as represented in Fig. 1.

In addition, due to the complexity of the disease, the diagnosis of erectile dysfunction is multi-dimensional. The "gold standard" for diagnosis is the International Index of Erectile Function,[12] providing scores for five domains (erectile function, orgasmic function, sexual desire, intercourse satisfaction, and overall satisfaction).[13]

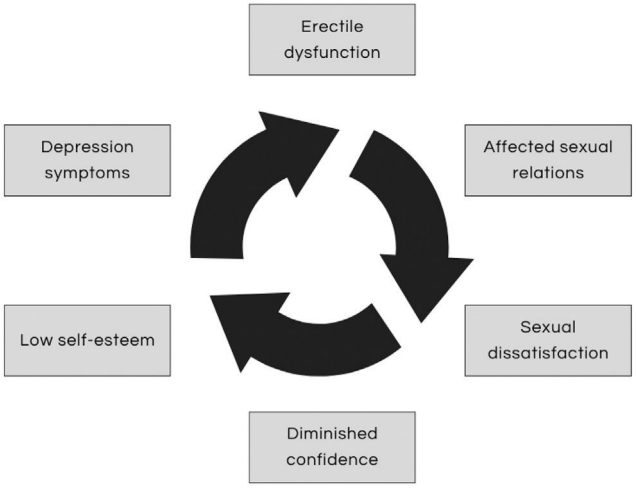


**Fig. 1** Negative cycle in erectile dysfunction.

There are various forms of treatment for erectile dysfunction, which can be divided into invasive and non-invasive approaches.[14]

Non-invasive therapies are based on the oral intake of phosphodiesterase type 5 inhibitors (sildenafil, vardenafil, tadalafil, and avanafil) as the primary form of treatment, characterized by short-term efficacy.[15] These drugs are associated with common side effects such as dizziness and facial congestion, but possibly also resulting in headaches, myalgia and other pains, hearing loss, and severe hypotension.[16,17]

In contrast, invasive therapies include intracavernous injection of vasodilatory medication, vacuum suction devices, and penile prostheses, all of which have associated adverse reactions.[18,19]

Due to the impact and increasing prevalence of this condition, along with dissatisfaction with conventional treatment methods, the demand for new prevention and treatment strategies for erectile dysfunction has been on the rise.[20–24]

Traditional Chinese Medicine is a holistic medical system that views health as a cooperative state of functioning biological systems that can mutually affect each other when disturbed.[25] There has been an ongoing study in the West to understand the specific philosophy and theory of traditional Chinese medicine.[26–30] However, many authors and organizations believe that this medicine can be included under the term "integrative medicine" and is a promising complement to Western conventional medicine methods.[31–37] Regarding erectile dysfunction, traditional Chinese medicine seems to provide promising results in improving the International Index of Erectile Function scores, clinical recovery rates, and testosterone levels, with no increased side effects.[38,39]

Acupuncture, as part of Traditional Chinese Medicine, is defined as the insertion of small needles into specific points on the body, typically located along pathways commonly referred to as channels or meridians, where it is believed that *Qi* (vital energy) circulates.[25,36,40]

Electro-acupuncture, on the other hand, is a more recent technique that involves the electrical stimulation of acupuncture needles,[25] with the advantage of being able to be precisely regulated.

The objective of these techniques is to regulate the nervous, circulatory, endocrine, and exocrine systems and promote a state of well-being.[41] Acupuncture has gained recognition in the West, and scientific research in this field has increased in recent decades.[42–45] Besides, acupuncture is suggested to have positive effects on the improvement of sexual dysfunction, with no serious side effects.[46,47]

The aim of this work is to understand how acupuncture can contribute to the treatment of erectile dysfunction and what is the current state of scientific evidence.

## Erectile dysfunction in Chinese medicine

In Chinese medicine, erectile dysfunction can be attributed to a decline in Ming Men's fire (the gate of life), excessive sexual intercourse or masturbation, and disturbances in *Shen* (spirit). The treatment approach is centered around revitalizing Kidney *Qi* and supporting the Heart and Spleen.[48,49] Consequently, these same authors suggest that in acupuncture, the most commonly used acupuncture points are located along the Kidney meridian (*Shaoyin* of the foot), the *Ren Mai*, and the back *Shu* points, with the potential use of moxibustion on specific acupuncture points.

Additionally, electro-acupuncture and even acupuncture point injection can also be employed.[50]

As well, Wang et al.[51] indicate that the issue is related to the Kidney, Spleen, or Heart channels. Lai et al.[9] suggest that erectile dysfunction implies a deficiency of Kidney *Qi* or *Yang* but can sometimes be attributed to Damp-heat.

Wang et al.,[10] on the other hand, states that erectile dysfunction is associated with Spleen and Kidney deficiency and blockage of *Qi* and Blood (*Xue*). Therefore, treatment should focus on strengthening the Spleen, promoting Blood circulation, and simultaneously improving mood.[52]

## Recent scientific evidence on acupuncture for erectile dysfunction

A systematic review conducted by Lee et al.[53] included a total of four clinical studies involving patients with erectile dysfunction, conducted between 1994 and 2003, using acupuncture and electro-acupuncture. In this review, it was concluded that there were few studies that allowed for a clear understanding of the positive effects of these techniques on erectile dysfunction.

Regarding the study by Tsai et al.,[54] seven studies were included examining the use of acupuncture to treat male sexual dysfunction, five of which addressed erectile dysfunction. According to the results of this study, the authors state that the evidence is inconclusive about the effect of acupuncture for male sexual dysfunction. Nevertheless, positive results were generally found on the use of acupuncture to address erectile dysfunction.

Another recent systematic review[55] included three randomized controlled trials conducted between 1997 and 2012, two involving acupuncture and one involving electro-acupuncture. The authors concluded that the available evidence was not sufficient to demonstrate therapeutic effects of acupuncture in the treatment of erectile dysfunction.

The systematic review by Lai et al.[9] reported a total of 22 articles involving 1751 patients with erectile dysfunction, primarily caused by psychological factors, treated with acupuncture or electro-acupuncture. This study reported that there are no significant differences between acupuncture and sham acupuncture, tadalafil, or herbal medications. However, acupuncture in combination with other therapies seems to have a beneficial enhancing effect.

A more recent systematic review[51] reports on the same four studies found by Lee et al[53] In this review, the authors explore the topic and conclude that acupuncture may be beneficial for the treatment of erectile dysfunction, but the evidence is very limited.

The systematic review by Abdi et al.[46] explored the effects of acupuncture to improve sexual dysfunction. The results of the 13 studies included in this review suggested that acupuncture can positively impact sexual dysfunction by improving several domains, particularly erectile dysfunction. Similar to the previously discussed studies, these authors also conclude that more research is warranted.

### Quality of scientific evidence

Based on the systematic reviews analyzed in the previous topic, there are few studies investigating the effectiveness of acupuncture in treating erectile dysfunction, and, in general, the sample sizes are small.

All of them assert that the evidence is limited, and the methodology and quality of the included articles are generally weak.

In addition, a common conclusion in these studies is the need for further research, emphasizing that the methodology of these studies should be improved to better understand the potential effectiveness of acupuncture for erectile dysfunction.

### Clinical methodology in research on acupuncture for erectile dysfunction

The study by Tsai et al.[54] reported the most common acupuncture points used to address male sexual dysfunction. Despite not reporting separately for erectile dysfunction and premature ejaculation, the authors state that CV 4 *Guān yuan,* CV 6 *Qì hăi,* and S 30 *qì chōng* were the most used acupuncture points on the abdomen, B 23 *Shèn shū* on the back, and S 36 *Zú sān lĭ*, Sp 6 *Sān yīn jiāo,* K 3 *Tai xī,* and K 6 *Zhào hăi* on the legs. The course of treatment would usually last from four to eight weeks, two or three times a week, and a session duration of 20 to 30 min. For erectile dysfunction, electro-acupuncture was used in three studies, acupuncture plus moxibustion in one study, and acupuncture alone for another one.

According to the study by Lai et al.,[9] there are several commonly used acupuncture points for the treatment of erectile dysfunction, as shown in Table 1.

According to the authors, the stimulation of these points aims to achieve the flow of *Qi*. Additionally, with the use of abdominal and lumbosacral points (CV 4 *Guān yuán* and B 31 *Shàng liáo*), it was expected that the sensation would extend to the area of the penis or perineum. In addition to these, points to support the Kidney were used (B 32 *Cì liáo*, K6 *Zhào hăi,* and Sp 6 *Sān yīn jiāo*). Furthermore, points to counter

**Table 1** Most commonly used acupuncture points in the studies analyzed by Lai et al. (2019).

| *Guān yuán* | *Sān yīn jiāo* | *Shèn shū* | *Zú sān lĭ* | *Mìng mén* | *Tai chōng* | *Tai xī* | *Cì liáo* |
|---|---|---|---|---|---|---|---|
| CV 4 | Sp 6 | B 23 | S 36 | GV 4 | Li 3 | K 3 | B 32 |

damp-heat conditions might be necessary (Li 8 *Qū quán*, CV 12 *Zhōng wǎn*, and Sp 9 *Yīn líng qúan*). The included studies utilized acupuncture with and without moxibustion, electro-acupuncture, and acupuncture point injections.

Regarding the study by Wang et al.,[51] the most commonly used points are depicted in Fig. 2.

According to these authors, the principles of acupuncture point selection followed the logic of distal application (K 3 *Taì xī*, K 6 *Zhào hăi*, PC 6 *Nèi guān*, H 7 *Shén mén*, Sp 6 *Sān yīn jiāo*, etc.), as well as local application (CV 4 *Guān yuán*, CV 6 *Qì hăi*, CV 3 *Zhōng jí*, etc.). Moxibustion was also applied to some of these points.

In the included studies, the interventions lasted between one to six weeks, with a total of 8 to 20 treatments, and each session lasted for 10, 20, or 30 min.

## Possible mechanisms of action of acupuncture in erectile dysfunction

The mechanisms by which acupuncture affects the human body are gradually being discovered, particularly through modern techniques that have been developed. In the context of erectile dysfunction, some theories have been proposed by several authors.

### Regulation of the hypothalamus

As suggested earlier in this review, acupuncture may have some role in the treatment of erectile dysfunction, especially concerning psychological symptoms. It is known that the psychological aspect is closely related to erectile dysfunction, with studies indicating that more than 50% of patients suffer from depression, which is also correlated with the severity of erectile dysfunction.[56,57]

Additionally, Maestre-Lorén et al.[58] state that depression levels decrease when there is success in treating erectile dysfunction.

Depression is associated with the hyperactivity of the hypothalamus-pituitary–adrenal axis,[59] which results in an imbalance in cortisol production.

Cortisol is commonly known as the "stress hormone." Studies suggest that cortisol levels can be adjusted through acupuncture application.[60–62] Specifically, the study by Lee et al.[63] report that acupuncture applied at the PC 6 *Nèi guān* point significantly reduced anxiety and depression behaviors induced by corticosterone (CORT) in rats, while increasing the expression of neuropeptide Y in the hypothalamus. It is important to note that neuropeptides play a crucial role in male sexuality and pain relief mechanisms.[64–66]

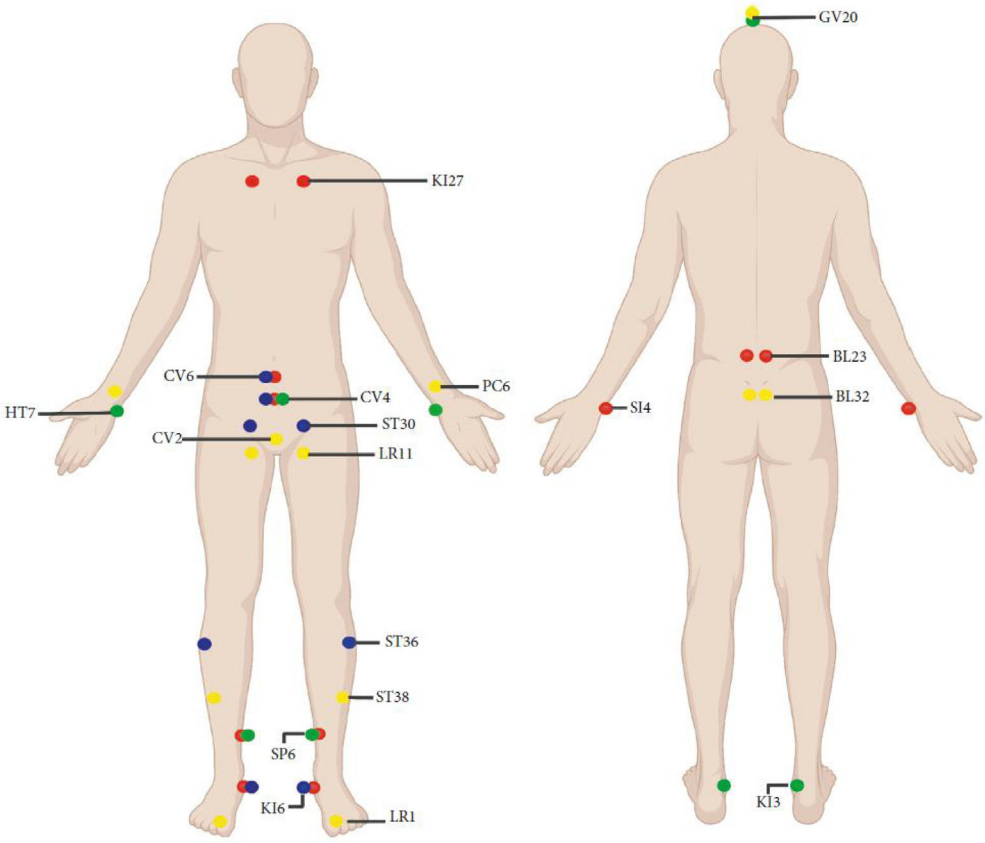


**Fig. 2** Location and distribution of acupuncture points. The colors represent the different groups of points applied in the four studies included in the review. Image taken from Wang et al. (2022). SP – Spleen (Sp), KI – Kidney (K), LR – Liver (Li), ST – Stomach (S), CV – Ren Mai/Conception vessel, HT – Heart (H), PC – Pericardium, BL – Bladder (B), GV – Du Mai/Governing vessel, SI – Small intestine.

Considering these results, it can be suggested that acupuncture has the potential to assist in the treatment of erectile dysfunction by regulating the hypothalamus-pituitary–adrenal axis, resulting in an improvement in mental health.

Another study showed that low-frequency electro-acupuncture at CV 4 *Guān yuán* and CV3 *Zhōng jí* acupoints improved serotonin (5-HT) levels and sexual behavior in rats.[67] Furthermore, glucose metabolism in the hypothalamus is lower in patients with psychological-related erectile dysfunction compared to healthy individuals, according to Hagemann et al[68] Regarding this topic, the results reported by Dong et al.[69] suggest that acupuncture can regulate glucose metabolism in various brain regions. Therefore, it can be suggested that acupuncture may have a potential beneficial effect on patients with erectile dysfunction by improving serotonin levels and regulating cerebral glucose metabolism.

### Hormonal regulation

Male sex hormones are related to sexual function and play a significant role in maintaining the normal structure of erections.[70] Although there are varied results regarding the efficacy of acupuncture in hormonal regulation, some studies suggest a beneficial effect.[71] For instance, the study by Zhang et al.[72] observed an increase in testosterone levels and a decrease in estradiol and prolactin levels. Therefore, it is suggested that acupuncture may act on hormonal imbalances and potentially contribute to the treatment of erectile dysfunction.

### Regulation of local nervous function

By applying acupuncture using points such as B 32 *Cì liáo*, CV 3 Zhōng jí, B 54 *Zhì biān*, and K 12 *Dà hè*, it is possible to significantly increase excitability in that region and improve the state of erection.[51] This can be explained by the relationship of these points with the anatomical location and their action on the spinal erectile center (located in the T12-L1 region of the spine) and the reflex erectile center (located in the S2-S4 region). In fact, acupuncture applied at the CV 3 Zhōng jí point can generate a sensation that radiates toward the perineum and the lower abdominal region, thus achieving a therapeutic effect for genitourinary diseases.[67,73]

Furthermore, since acupuncture can have an effect on pelvic nerve flow, stimulation of the perineal striated muscle (by the pudendal nerves) can improve the rigidity of penile tissue.[74–76]

## Considerations on research on acupuncture for erectile dysfunction

As concluded in the majority of the studies explored above, the quantity and quality of research on this topic are still limited. Suggestions for future research consistently emphasize the need for more studies with improved methodological quality. In addition to the small number of patients, it is expected that the potential benefits of acupuncture may emerge with longer interventions, something that is not the case in the majority of the conducted studies. According to Rodrigues et al.,[25] treatments with Chinese medicine techniques like acupuncture are a process that requires constant adjustments and that values the individuality of each patient. Therefore, these authors point out that there is a conflict between the treatment conception in Chinese and Western medicine, which results in an undervaluation of the effects of Chinese medicine techniques when evaluated through the scientific process developed in the West.

Furthermore, it is necessary to include specific evaluation methods from Chinese medicine to observe relevant systemic changes in patients beyond just the state of erection.[51]

Additionally, it is important to include other factors in the assessment of therapeutic success, such as the sexual satisfaction of partners, which also affects individuals with erectile dysfunction.[51,77] The sexual needs of partners can also cause distress in patients with erectile dysfunction and may even lead to family conflicts,[78–80] feeding the negative cycle previously discussed in this review.

### Acupuncture in mental health

Given the influence of a patient's emotional state on the onset or exacerbation of erectile dysfunction, it is important to understand the extent of acupuncture's effectiveness in improving the mental health of the population. This understanding can help draw further conclusions regarding acupuncture's potentially contributing to erectile dysfunction.

In a systematic review of meta-analyses conducted by Rodrigues et al.,[25] articles in English addressing the effects of traditional Chinese medicine techniques on mental health were analyzed.

With specific regard to acupuncture, the authors considered that there is moderate evidence of its benefits in reducing depression. Acupuncture can be used as an adjunct technique to conventional medication, enhancing positive effects and reducing adverse effects. Additionally, it is suggested that acupuncture can also be successfully used in conjunction with psychotherapy. Yang et al.[81] indicate that acupuncture can improve neural network and hippocampal neuroplasticity and reduce brain inflammation, thereby alleviating depression symptoms. Tu et al.[82] also suggest that this technique can modulate glutamate receptors and excitatory amino acid transporters, serving as a complementary therapy for some neuropsychiatric conditions.

## Conclusions

Erectile dysfunction is a condition that affects a significant portion of the population, with a profound impact on the patient's quality of life. The complexity of erectile dysfunction and its underlying factors ha beens considerable, often leading to treatments with limited efficacy or methods that cause discomfort to patients. Consequently, new treatments need to be developed to more effectively assist these patients.

Based on this work, it can be concluded that research on acupuncture for erectile dysfunction is still insufficient to definitively assert its benefits. More high-quality studies

with larger samples and longer durations are needed to draw firm conclusions about the benefits of acupuncture.

The mechanisms by which acupuncture acts on the body are beginning to be unraveled, suggesting that it may directly or indirectly benefit erectile dysfunction. The positive effects on mental health may be crucial for treatment success, and in this regard, acupuncture shows some evidence. Moreover, some notions are emerging regarding the benefits of acupuncture as a complementary therapy to conventional treatment for erectile dysfunction, which already suggests that acupuncture could be a valuable addition to treatment options.

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## Ethical approval

This mapping review does not require ethical approval.

## CRediT authorship contribution statement

**Kalina Simões:** Conceptualization, Data curation, Formal analysis, Project administration, Validation, Visualization, Writing – original draft, Writing – review & editing. **Jorge Magalhães Rodrigues:** Data curation, Methodology, Supervision, Validation, Visualization, Writing – review & editing.

## Declarations of interest

None.

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## References

1. Burnett AL, Nehra A, Breau RH, Culkin DJ, Faraday MM, Hakim LS, et al. Erectile dysfunction: AUA guideline. J Urol. 2018;200(3):633–41.
2. Mazzilli F. Erectile dysfunction: causes, diagnosis and treatment: an update. J Clin Med [Internet]. 2022;11(21).
3. Pellegrino F, Sjoberg DD, Tin AL, Benfante NE, Briganti A, Montorsi F, et al. Relationship Between Age, Comorbidity, and the Prevalence of Erectile Dysfunction. Eur Urol Focus. 2023;9(1):162–7.
4. Schouten B, Bosch J, Bernsen R, Blanker M, Thomas S, Bohnen A. Incidence rates of erectile dysfunction in the Dutch general population. Effects of definition, clinical relevance and duration of follow-up in the Krimpen Study. Int J Impot Res. 2005;17(1):58–62.
5. Pozzi E, Capogrosso P, Chierigo F, Pederzoli F, Ventimiglia E, Boeri L, et al. Clinical profile of young patients with erectile dysfunction: Preliminary findings of a real-life cross-sectional study. Eur Urol Focus. 2020;6(1):184–9.
6. Kessler A, Sollie S, Challacombe B, Briggs K, Van Hemelrijck M. The global prevalence of erectile dysfunction: a review. BJU Int. 2019;124(4):587–99.
7. Chen L, Shi G-R, Huang D-D, Li Y, Ma C-C, Shi M, et al. Male sexual dysfunction: a review of literature on its pathological mechanisms, potential risk factors, and herbal drug intervention. Biomed Pharmacother. 2019;112:108585.
8. Kalka D, Womperski M, Gebala J, Smolinski R, Depko A, Dulanowska A, et al. 564 Do socioeconomic factors influence the pathogenesis of erectile dysfunction through modifiable risk factors? J Sex Med. 2018;15(Supplement_3):S335-S.
9. Lai B-y, Cao H-j, Yang G-y, Jia L-y, Grant S, Fei Y-t, et al. Acupuncture for treatment of erectile dysfunction: a systematic review and meta-analysis. World J Men's Health. 2019;37(3):322.
10. Wang J, Zhou Y, Dai H, Bao B, Dang J, Li X, et al. The safety and efficacy of acupuncture for erectile dysfunction: a network meta-analysis. Medicine. 2019;98(2).
11. McCabe MP, Althof SE. A systematic review of the psychosocial outcomes associated with erectile dysfunction: does the impact of erectile dysfunction extend beyond a man's inability to have sex? J Sex Med. 2014;11(2):347–63.
12. Rosen RC, Cappelleri JC, Gendrano 3rd N. The International Index of Erectile Function (IIEF): a state-of-the-science review. Int J Impot Res. 2002;14(4):226–44.
13. Díaz-Mohedo E, Meldaña Sánchez A, Cabello Santamaría F, Molina García E, Hernández Hernández S, Hita-Contreras F. The Spanish Version of the International Index of Erectile Function: Adaptation and Validation. Int J Environ Res Public Health. 2023;20(3).
14. Guo H. Current status and research progress in the treatment of erectile dysfunction. J Clin Exp Med. 2013;12:222–4.
15. Andersson K, Becher E, Hendry B, Jonas U, Kim Y, Krane R. In: Jardin A, Wagner G, Khoury S, Giuliano F, Padma-Nathan H, Rosen Plymouth R, editors. Recommendations of the 1st International Consultation on Erectile Dysfunction. United Kingdom: Health Publications; 1999. p. 709–26.
16. McGwin G. Phosphodiesterase type 5 inhibitor use and hearing impairment. Arch Otolaryngol–Head Neck Surg. 2010;136(5):488–92.
17. Barreto MA, Bahmad Jr F. Phosphodiesterase type 5 inhibitors and sudden sensorineural hearing loss. Braz J Otorhinolaryngol. 2013;79(6):727–33.
18. Hatzimouratidis K, Hatzichristou DG. A comparative review of the options for treatment of erectile dysfunction: which treatment for which patient? Drugs. 2005;65:1621–50.
19. Bettocchi C, Palumbo F, Spilotros M, Lucarelli G, Palazzo S, Battaglia M, et al. Patient and partner satisfaction after AMS inflatable penile prosthesis implant. J Sex Med. 2010;7(1_Part_1):304-9.
20. Patel CK, Bennett N. Advances in the treatment of erectile dysfunction: what's new and upcoming? F1000Research. 2016:5.
21. Pelayo-Nieto M, Linden-Castro E, Alias-Melgar A, Grovas DE-P, Carreño-de la Rosa F, Bertrand-Noriega F, et al. Linear shock wave therapy in the treatment of erectile dysfunction. Actas Urológicas Españolas (English Edition). 2015;39(7):456–9.
22. Liu M-C, Chang M-L, Wang Y-C, Chen W-H, Wu C-C, Yeh S-D. Revisiting the regenerative therapeutic advances towards erectile dysfunction. Cells. 2020;9(5):1250.
23. Defeudis G, Mazzilli R, Di Tommaso AM, Zamponi V, Carlomagno F, Tuccinardi D, et al. Effects of diet and antihyperglycemic drugs on erectile dysfunction: a systematic review. Andrology. 2023;11(2):282–94.
24. Argiolas A, Argiolas FM, Argiolas G, Melis MR. Erectile dysfunction: treatments, advances and new therapeutic strategies. Brain Sci. 2023;13(5):802.
25. Rodrigues JM, Santos C, Ribeiro V, Silva A, Lopes L, Machado JP. Mental health benefits of traditional Chinese medicine – An

umbrella review of meta-analyses. Brain Behav Immun Integr. 2023;2, 100013.
26. Matos LC, Machado JP, Monteiro FJ, Greten HJ. Understanding traditional Chinese medicine therapeutics: an overview of the basics and clinical applications. Healthcare (Basel). 2021;9(3).
27. Cheung T. The difference and similarity between traditional chinese and western medicine. Chin J Integr Tradit West Med. 2000;1:68–70.
28. Rodrigues JM, Lopes L, Goncalves M, Machado JP. Taijiquan and qigong as a mindfulness cognitive-behavioural based therapy on the treatment of cothymia in school-age children - A preliminary study. J Bodyw Mov Ther. 2021;26:329–38.
29. Rodrigues JM, Lopes LT, Goncalves M, Machado JP. Perceived health benefits of Taijiquan and Qigong. Altern Ther Health Med. 2022;28(12).
30. Matos LC, Machado JP, Monteiro FJ, Greten HJ. Can traditional Chinese medicine diagnosis be parameterized and standardized? A narrative review. Healthcare (Basel). 2021;9(2):177.
31. Wang W-Y, Xie Y, Zhou H, Liu L. Contribution of traditional Chinese medicine to the treatment of COVID-19. Phytomedicine. 2021;85:153279.
32. Yang Y, Islam MS, Wang J, Li Y, Chen X. Traditional Chinese medicine in the treatment of patients infected with 2019-new coronavirus (SARS-CoV-2): a review and perspective. Int J Biol Sci. 2020;16(10):1708–17.
33. Ho LTF, Chan KKH, Chung VCH, Leung TH. Highlights of traditional Chinese medicine frontline expert advice in the China national guideline for COVID-19. Eur J Integr Med. 2020;36, 101116.
34. World Health Organization. WHO international standard terminologies on traditional Chinese medicine. Geneva. 2022.
35. Bodeker G, Organization WH, Ong CK. WHO Global Atlas of traditional, complementary and alternative medicine.WHO Centre for Health Development; 2005.
36. Legal status of traditional medicine and complementary/alternative medicine: A worldwide review, I 2001.
37. World Health Organization. Traditional, complementary and integrative medicine. Available from: http://www.who.int/traditional-complementary-integrative-medicine/en/.
38. Wu H, Gao Z, Dai D, Liu X, Fang Y, Chen X, et al. Efficacy and safety assessment of traditional Chinese medicine for erectile dysfunction: a meta-analysis and trial sequential analysis. Andrology. 2023;11(7):1345–67.
39. Wang YL, Geng LG, He CB, Yuan SY. Chinese herbal medicine combined with tadalafil for erectile dysfunction: a systematic review and meta-analysis. Andrology. 2020;8(2):268–76.
40. Wen TS. Acupuntura Clássica Chinesa.Cultrix; 1985;9–18.
41. Santos RV, Rodrigues JM, Jesus MI. Review on the effects of obesity treatment with acupuncture and phytoacupuncture. World J Acupunct Moxibustion. 2020;30(3):223–8.
42. Lee I-S, Lee H, Chen Y-H, Chae Y. Bibliometric analysis of research assessing the use of acupuncture for pain treatment over the past 20 years. J Pain Res. 2020;13:367–76.
43. Liu B, Chen B, Guo Y, Tian L. Acupuncture – a national heritage of China to the world: international clinical research advances from the past decade. Acupunct Herb Med. 2021;1(2).
44. Li R, Sun J, Hu H, Zhang Q, Sun R, Zhou S, et al. Research trends of acupuncture therapy on knee osteoarthritis from 2010 to 2019: a bibliometric analysis. J Pain Res. 2020;13:1901–13.
45. Zhu J, Li J, Yang L, Liu S. Acupuncture, from the ancient to the current. Anat Rec. 2021;304(11):2365–71.
46. Abdi F, Alimoradi Z, Roozbeh N, Amjadi MA, Robatjazi M. Does acupuncture improve sexual dysfunction? A systematic review. J Complement Integr Med. 2023;20(1):1–16.
47. Lee HW, Lee MS, Kim TH, Alraek T, Zaslawski C, Kim JW, et al. Ginseng for erectile dysfunction: a cochrane systematic review. World J Mens Health. 2022;40(2):264–9.
48. Kho H, Sweep C, Chen X, Rabsztyn P, Meuleman E. The use of acupuncture in the treatment of erectile dysfunction. Int J Impot Res. 1999;11(1):41–6.
49. Shamloul R, Bella A. Complementary and alternative medicine (CAM) for sexual dysfunction. J Sex Med. 2014;11(4):1097–8.
50. Tsai M-Y, Liu C-T, Chang C-C, Chen S-Y, Huang S-T. Overview of the relevant literature on the possible role of acupuncture in treating male sexual dysfunction. Acupunct Med. 2014;32(5):406–10.
51. Wang H, Zhao M, Zhang J, Yan B, Liu S, Zhao F, et al. The efficacy of acupuncture on patients with erectile dysfunction: a review. Evid Based Complement Alternat Med. 2022;2022:4807271.
52. Wang X, Wang M, Li J, Xiao L, Yang X. Discussing on the action mechanism of "two-way adjustment" of acupuncture. J Sichuan Tradit Chinese Med. 2017;35:40–2.
53. Lee MS, Shin BC, Ernst E. Acupuncture for treating erectile dysfunction: a systematic review. BJU Int. 2009;104(3):366–70.
54. Tsai MY, Liu CT, Chang CC, Chen SY, Huang ST. Overview of the relevant literature on the possible role of acupuncture in treating male sexual dysfunction. Acupunct Med. 2014;32(5):406–10.
55. Cui X, Zhou J, Qin Z, Liu Z. Acupuncture for erectile dysfunction: a systematic review. Biomed Res Int. 2016;2016.
56. Özkent MS, Hamarat MB, Taşkapu HH, Kılınç MT, Göger YE, Sönmez MG. Is erectile dysfunction related to self-esteem and depression? A prospective case–control study. Andrologia. 2021;53(1), e13910.
57. Ajo R, M-d-M Inda, Mateu M, Segura A, Ballester P, Muriel J, et al. Personality and psychiatric disorders in chronic pain male affected by erectile dysfunction: prospective and observational study. Int J Impot Res. 2021;33(3):339–47.
58. Maestre-Lorén F, Castillo-Garayoa JA, López-i-Martín X, Sarquella-Geli J, Andrés A, Cifre I. Psychological distress in erectile dysfunction: the moderating role of attachment. Sex Med. 2021;9(5), 100436.
59. Troubat R, Barone P, Leman S, Desmidt T, Cressant A, Atanasova B, et al. Neuroinflammation and depression: a review. Eur J Neurosci. 2021;53(1):151–71.
60. Vázquez RD, González-Macías L, Berlanga C, Aedo FJ. Effect of acupuncture treatment on depression: Correlation between psychological outcomes and salivary cortisol levels. Salud Mental. 2011;34(1):21–6.
61. Magarelli PC, Cridennda DK, Cohen M. Changes in serum cortisol and prolactin associated with acupuncture during controlled ovarian hyperstimulation in women undergoing in vitro fertilization–embryo transfer treatment. Fertil Steril. 2009;92(6):1870–9.
62. Lin M-L, Wu J-H, Lin C-W, Su C-T, Wu H-C, Shih Y-S, et al. Clinical effects of laser acupuncture plus Chinese cupping on the pain and plasma cortisol levels in patients with chronic nonspecific lower back pain: a randomized controlled trial. Evid Based Complement Alternat Med. 2017;2017:3140403.
63. Lee B, Shim I, Lee HJ, Yang Y, Hahm DH. Effects of acupuncture on chronic corticosterone-induced depression-like behavior and expression of neuropeptide Y in the rats. Neurosci Lett. 2009;453(3):151–6.
64. Carmichael MS, Humbert R, Dixen J, Palmisano G, Greenleaf W, Davidson JM. Plasma oxytocin increases in the human sexual response. J Clin Endocrinol Metab. 1987;64(1):27–31.
65. Dornan WA, Malsbury CW. Neuropeptides and male sexual behavior. Neurosci Biobehav Rev. 1989;13(1):1–15.
66. Fan Y, Kim DH, Gwak YS, Ahn D, Ryu Y, Chang S, et al. The role of substance P in acupuncture signal transduction and effects. Brain Behav Immun. 2021;91:683–94.
67. Huang AC, Liu MC, Tsai TH, Chang YH, Wu JM, Yeh KY. Low-frequency electroacupuncture at acupoints guanyuan (CV4) and zhongji (CV3) lengthen ejaculatory latency and improves sexual behavior in male rats. Chin J Physiol. 2020;63(4):163–70.

68. Hagemann JH, Berding G, Bergh S, Sleep DJ, Knapp WH, Jonas U, et al. Effects of visual sexual stimuli and apomorphine SL on cerebral activity in men with erectile dysfunction. Eur Urol. 2003;43(4):412–20.
69. Dong JC, Li J, Zuo CT. Influence of needling at yin-yang meridian points on cerebral glucose metabolism. Zhongguo Zhong Xi Yi Jie He Za Zhi. 2002;22(2):107–9.
70. Cunningham GR, Stephens-Shields AJ, Rosen RC, Wang C, Ellenberg SS, Matsumoto AM, et al. Association of sex hormones with sexual function, vitality, and physical function of symptomatic older men with low testosterone levels at baseline in the testosterone trials. J Clin Endocrinol Metab. 2015;100(3):1146–55.
71. Feng J, He H, Wang Y, Zhang X, Zhang X, Zhang T, et al. The efficacy and mechanism of acupuncture in the treatment of male infertility: a literature review. Front Endocrinol (Lausanne). 2022;13:1009537.
72. Zhang Y, Niu h. Influence of acupuncture on serum hormone of erectile dysfunction patients. J Acupunct Tuina Sci. 2011;9:223–5.
73. Ming S-r, Fu Y-l, Hou W-g, Chen Y-l. The effect of sensation of transmission along meridian acupuncture for chronic nonbacterial prostatitis. World J Acupunct Moxibustion. 2019;29(2):113–8.
74. Uchida S, Hotta H. Acupuncture affects regional blood flow in various organs. Evid Based Complement Alternat Med. 2008;5(2):145–51.
75. Prieto D. Physiological regulation of penile arteries and veins. Int J Impot Res. 2008;20(1):17–29.
76. Giuliano F, Rampin O. Neural control of erection. Physiol Behav. 2004;83(2):189–201.
77. Heiman JR, Talley DR, Bailen JL, Oskin TA, Rosenberg SJ, Pace CR, et al. Sexual function and satisfaction in heterosexual couples when men are administered sildenafil citrate (Viagra) for erectile dysfunction: a multicentre, randomised, double-blind, placebo-controlled trial. BJOG. 2007;114(4):437–47.
78. Fisher WA, Eardley I, McCabe M, Sand M. Erectile dysfunction (ED) is a shared sexual concern of couples I: couple conceptions of ED. J Sex Med. 2009;6(10):2746–60.
79. Fisher WA, Eardley I, McCabe M, Sand M. Erectile dysfunction (ED) is a shared sexual concern of couples II: association of female partner characteristics with male partner ED treatment seeking and phosphodiesterase type 5 inhibitor utilization. J Sex Med. 2009;6(11):3111–24.
80. Li H, Gao T, Wang R. The role of the sexual partner in managing erectile dysfunction. Nat Rev Urol. 2016;13(3):168–77.
81. Yang N-N, Lin L-L, Li Y-J, Li H-P, Cao Y, Tan C-X, et al. Potential mechanisms and clinical effectiveness of acupuncture in depression. Curr Neuropharmacol. 2022;20(4):738–50.
82. Tu C-H, MacDonald I, Chen Y-H. The effects of acupuncture on glutamatergic neurotransmission in depression, anxiety, schizophrenia, and Alzheimer's disease: a review of the literature. Front Psych. 2019:10.