



## Review article

# Research trends of acupuncture therapy on stress urinary incontinence from 1992 to 2022: A bibliometric analysis

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## ABSTRACT

**Background:** Stress urinary incontinence (SUI), the most prevalent type of urinary incontinence disorder, has aroused increasing attention among societies since it has caused much inconvenience in daily life. In addition to conventional conservative treatments like medication and pelvic floor muscle training, acupuncture is now frequently advised. However, a bibliometric analysis of the trend of SUI therapies is still lacking.

**Objectives:** This article was carried out using CiteSpace (6.3.1) software to research the use of acupuncture therapy on SUI worldwide over the past 30 years (since the database's inception).

**Methods:** All related articles included were retrieved from the Web of Science Core Collection. CiteSpace (6.3.1) software was used to analyze the number of publications, countries and institutions, authors and cited authors, and burst keywords to assess the hotspots and trends over the previous three decades. And Microsoft Office Excel 2019 was also used for sorting data and generating tables.

**Results:** The articles were retrieved on August 31, 2022. A total of 108 records with publication dates ranging from 1992 to 2022 were discovered. The annual number of publications generally increased. In the aspect of publication regions, the USA ranked first in centrality, but China had the largest number of publications. The China Academic of Chinese Medical Sciences, Beijing University of Chinese Medicine, and Shanghai University of Traditional Chinese Medicine were the top 3 institutions, according to the institution map. Liu Z (Liu ZS) was the most productive author, and Chen Y ranked first in the centrality. The article published by Liu Z (Liu ZS) in 2017 was the most cited reference. "Bladder neck suspension", "electrical stimulation" and "acupuncture" were popular therapies mentioned among the top ten hot topics. The keywords "therapy", "postprostatectomy incontinence", "muscle", "cell therapy", and "symptom" ranked in the top five on citation burst. The four frontier topics were "efficacy", "symptom", "cell therapy", and "medical technology".

**Conclusion:** This study illustrated that the application of acupuncture on SUI had an increasing acceptance worldwide. Recent research has concentrated mainly on acupuncture and electroacupuncture, however, there is still not enough literature on these topics. The valuable information was provided for acupuncture researchers to identify prospects including potential collaborators, cooperation institutions, hot themes, and research frontiers.

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## 1. Introduction

Stress urinary incontinence (SUI) is an involuntary urine leakage that happens when the abdominal pressure rises due to physical activity, sneezing or coughing [1]. SUI is one of the most prevalent types of urinary incontinence which frequently affects women in their middle age. Morbidity varies from country to country. The prevalence of SUI in Chinese females is 18.9%, and that in the USA is 17.1% [2]. The two populations have in common that the prevalence rate of the disease reached a peak during the age of 45–59, but the ratio of patients seeking clinical help is low.

However, the clinical therapies that could help SUI patients are various. The European Association of Urology recommended pelvic floor muscle training, electroacupuncture, pharmacological management (e.g. oestrogen, duloxetine) and surgical management for SUI in the Guidelines [3]. Physical therapy is the most generally accepted form of treatment due to its ease of implementation, but its long-term effect [4] is not that satisfying [5]. Besides, there are many pharmacological or surgical treatments available, but their efficacy and safety vary [5–7]. This leads to the increasing usage and acceptance of traditional Chinese medicine therapy worldwide, which is effective in both the short and long term [4] and is also cost-effective with few adverse effects. As one of the conservative therapies, previous studies have shown that electroacupuncture is effective in treating SUI [8–10]. With related research becoming prosperous, our study intends to assess and make conclusions about the status quo and the emerging trend in this field. Because of the high prevalence of SUI and high acceptance of acupuncture therapies in these two countries, we expected China, which is the birthplace of acupuncture, and America to lead the academic researches. Besides, we assumed the research on effectiveness of treating SUI with acupuncture therapies is still popular and heated, and this trend will last. And studies on treating SUI with electroacupuncture is expected to become the latest research trend.

Nowadays, literature metrology, which integrates mathematics, statistics and philology, can be used for quantitative analysis of the current trends in the literature [11]. It can assist in identifying any gaps or defects in existing studies and predict the course of future research as well.

CiteSpace is a bibliometric visualization software designed for analyzing and visualizing the hotspots and trends of published articles on a certain topic. We used CiteSpace (6.3.1) to conduct a bibliometric study of literature published from 1992 to 2022 to acquire a thorough understanding of the current state of acupuncture therapy for SUI [12,13]. Thus, our study aimed at summarizing the current research status of treating stress urinary incontinence with acupuncture therapies and guide the future research orientation.

## 2. Methods

### 2.1. Data collection

On July 31, 2022, data was extracted from the Web of Science Core Collection (since the database’s inception). When searching, we listed the terms for “acupuncture therapy,” such as acutherapy, electroacupuncture, fire needles, ear acupuncture, acupoint application, moxa moxibustion, and abdominal needle. Then we added the index words about SUI, such as stress urinary incontinence, incontinence, urinary stress, stress incontinence, urinary, etc. Lastly, articles that dealt with patients who had concurrent and concomitant disorders, mixed-type SUI patients, or urgent urine incontinence were excluded. Document types were article or review article or early access or correction or reprint (Table 1). We imported the record into the CiteSpace (6.3.1) software. After removing the duplications, 108 articles were included to conduct the bibliometric analysis. Fig. 1 shows the flow of literature through the assessment progress.

### 2.2. Analysis tool

CiteSpace (6.3.1) software was used for bibliometric visualization. We used CiteSpace to analyze the collaboration between countries, institutions, authors and journals, find out the bursts of keywords and identify the co-cited reference. All the results were visualized in the form of images constructed by nodes and lines. Every node has a centrality number. Once the number of centrality is over 0.1, the node will be marked in the colour orange, meaning high centrality. And high centrality stands for significant and essential

**Table 1**  
The topic search query.

Set	Results	Search Query
#1	266466	TS=(Electroacupuncture) OR (Electric acupuncture) OR (electrical acupuncture) OR (transcutaneous electrostimulation) OR (Percutaneous electrical stimulation) OR (acupuncture and moxibustion therapy) OR (needle therapy) OR (acutherapy) OR (acup-mox ther) OR (heated needle) OR (Fire Needling) OR (Fire needles) OR (Fire acupuncture) OR (Auricular Acupuncture) OR (auricular needling) OR (ear post) OR (Ear needle) OR (Ear acupuncture) OR (Auricular Needle) OR (Acupoint Application) OR (the Point Application) OR (moxa-wool moxibustion) OR (Moxa moxibustion) OR (sandwiched moxibustion) OR (indirect moxibustion) OR (Substance-partitioned moxibustion) OR (moxibustion with seed-sized moxa cone) OR (wheat grain moxibustion) OR (abdominal needle) OR (Warm Needling) OR (Scalp Acupuncture) OR (acupoints embedding) OR (Catgut implantation at acupoint) OR (Acupoint catgut embedding) OR (thread embedding)
#2	14334	TS=(Urinary Stress Incontinence) OR (Incontinence, Urinary Stress) OR (Stress Incontinence, Urinary)
#3	405179	TS=(Concomitant) OR (concurrent disease) OR (mixed type) OR (urgency)
#4	135	#1 AND #2 NOT #3 and Article or Review Article or Early Access or Correction or Reprint (Document Types)

points in a certain field, having great connection with other articles in the field as well as with the research topic. In the network for collaboration networks, the size of nodes indicates the number of articles published by any author/country/institution. In the keyword image, the size of nodes represents the frequency of the word. For the co-cited visualization, the size of nodes symbolizes the number of citations, and the colour of the links stands for the publication year of the first co-cited article. In addition, Microsoft Excel 2019 was used to analyze and sort the data and create tables and figures.

### 3. Results

#### 3.1. Annual publications

A total of 108 records were included, and the annual publication trend was shown in Fig. 2. The figure presented three phases of the research trend. The first stage is from 1992 to 2002. The number of annual publications increased from 1 reference to 7 references. From 5 references in 1999 to 3 references in 2001, there was a minor reduction, but it soon reached 7 references in 2002. The second wave of research heat dates from 2003 to 2014. Though there was only 1 reference in both 2003 and 2004. The number was restored to 4 references in 2005 and remained constant until it reached a high of 6 references in 2011. Then there was a gradual decrease from 4 references to 1 reference from 2012 to 2014. The last stage was from 2015 to 2022, when the number went up steadily. Even though the number of articles in 2022 was an incomplete statistic (it may still increase in the following part of the year), it still had the most publications (9 articles) in the past three decades.

#### 3.2. Distribution of countries and institutions

CiteSpace generated a map of the country with 26 nodes and 26 links (Fig. 3). Researchers from 26 different nations published 108 references. Among the top 5 countries for publications, the United States came in first place with 35 articles and the highest centrality of 0.34 (Table 2). It was followed by China, the birthplace of acupuncture therapy, with 28 articles. And the other three countries listed

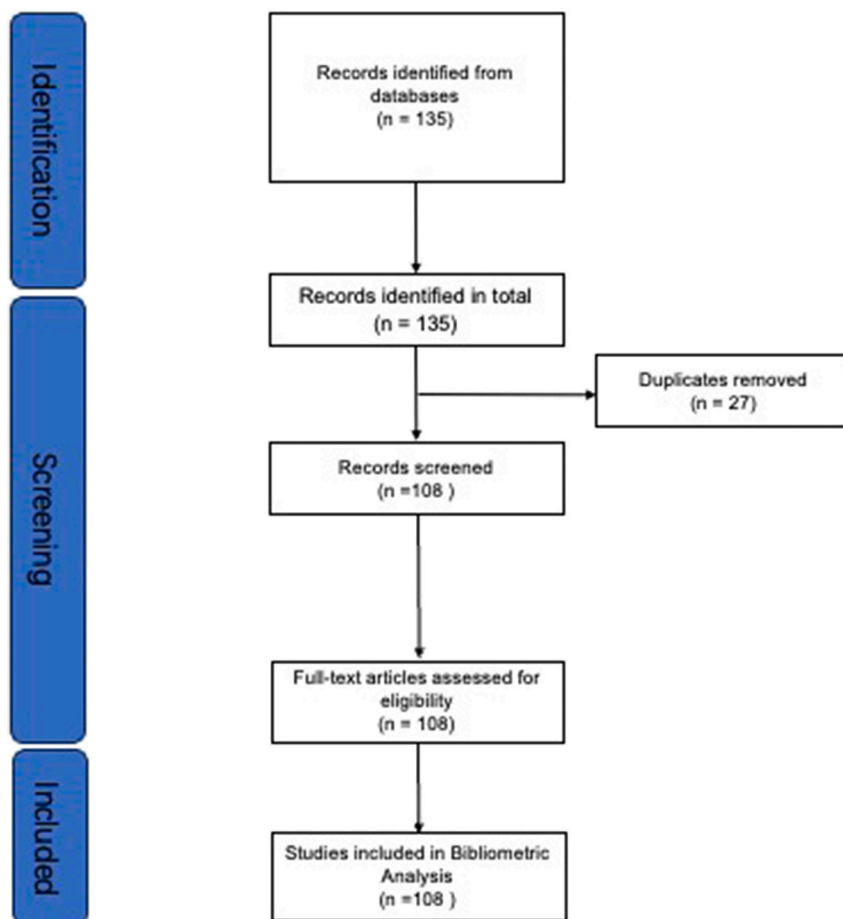


Fig. 1. Illustration of the flow diagram of studies identified.

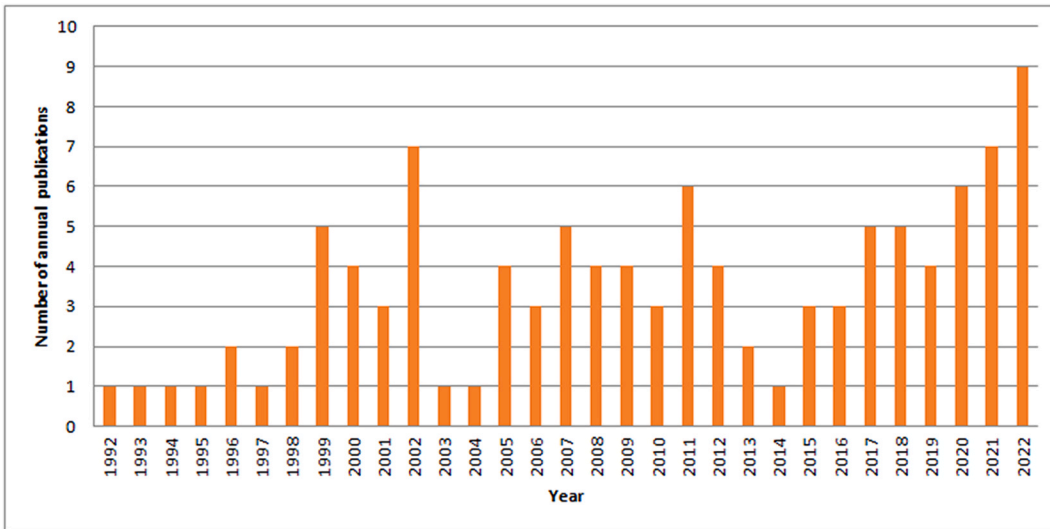


Fig. 2. The number of acupuncture therapy in SUI publications from 1992 to 2022.

among the top five countries of publications were Germany with 13 articles, Japan with 9 articles, and the United Kingdom with 5 articles.

There was a total of 187 institutions around the world paid close attention to the application of acupuncture therapy on SUI (Fig. 4). 3 of the top 4 institutions of publication were from China. They were the China Academic of Chinese Medical Sciences (13), Beijing University of Traditional Chinese Medicine (7), and Shanghai University of Traditional Chinese Medicine (6). And University of Pittsburgh, America ranked in second place with 8 publications.

3.3. Analysis of authors

In the number of publications, Liu Z (Liu ZS) was the most productive author (having 12 publications). And Liu B, Liu Y, and Chen Y tied for the second with 6 publications. After them was Yoshimura N having 5 publications. In terms of centrality, Chen Y was the first (0.03), followed by Li C (0.02), Liu Z (0.01), Chancellor M (0.01), and Chen B (0.01). There are two clusters in the map. One is formed by these active Chinese authors. Another cluster was formed by Japanese and American authors including Yoshimura N, Chancellor M and some other authors mainly from the USA institutions. However, the link between the two clusters lacks.

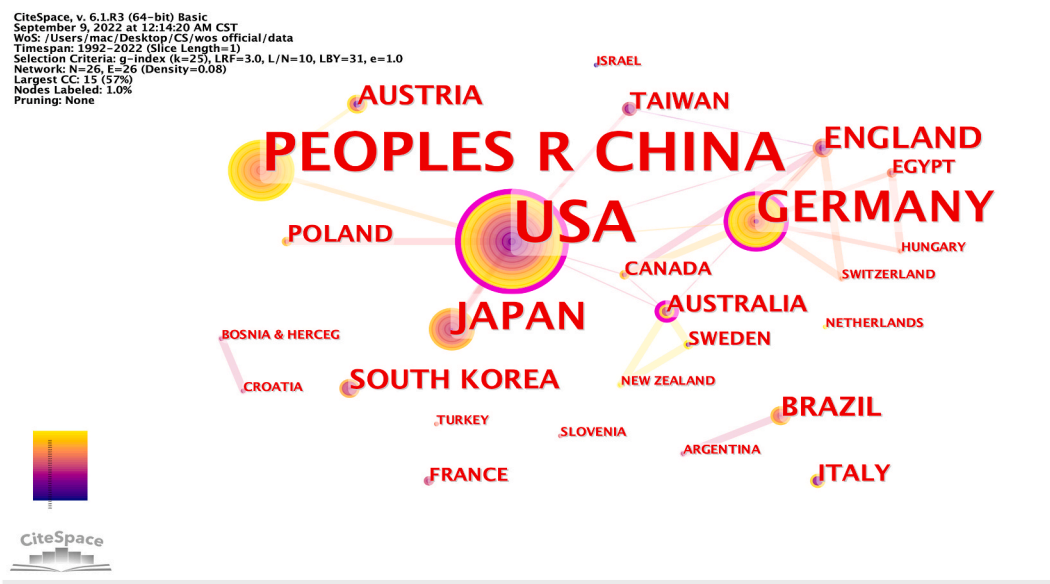


Fig. 3. The network of cooperation between countries and regions.

**Table 2**

Top 5 publications and centrality of countries related to acupuncture therapy on SUI.

Rank	Publications	Countries	Rank	Centrality	Countries
1	35	USA	1	0.34	USA
2	28	Peoples R China	2	0.18	Germany
3	13	Germany	3	0.16	Australia
4	9	Japan	4	0.09	Peoples R China
5	5	England	5	0.09	England



Fig. 4. The network map of cooperation between institutions.

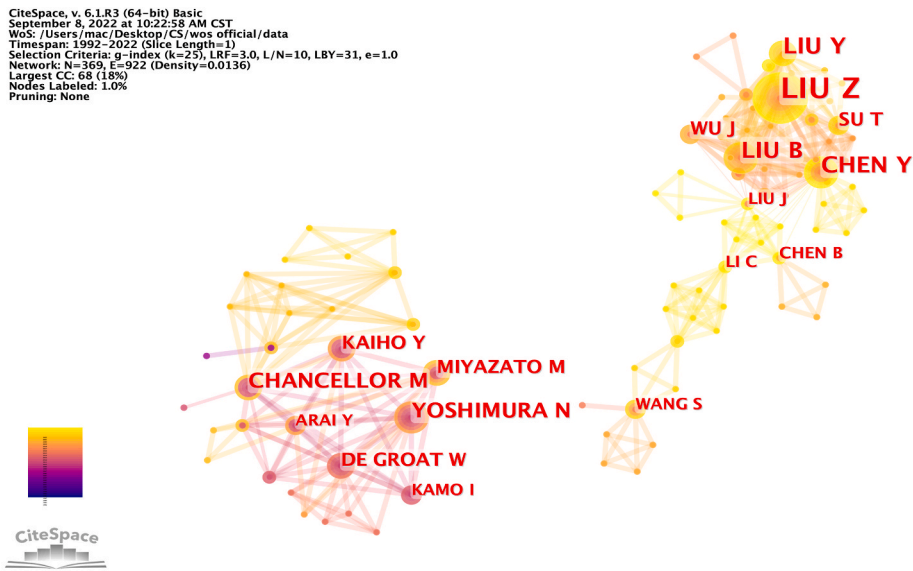


Fig. 5. The network map of the author related to acupuncture for SUI.

In the network map of cited authors, among 137 nodes and 473 links (Fig. 6), BLAIVAS JG ranked first among the cited authors, followed by ABRAMS P, BUMP RC, RAZ S and CHAIKIN DC (Table 3). The authors who were most frequently cited were mainly from the United States. The cited authors formed one large cluster consisting of 8 sub-clusters marked by different colours.

### 3.4. Analysis of cited references

With a period of 1992–2022 and a time slice of 1, a total of 653 references were generated from 108 records to analyze the cited references. When the modularity Q equals 0.8469 and a mean silhouette of 0.9443, the map consisted of 653 nodes and 2350 links. The warmer the colour of the node, the more recent the reference was published. In earlier times, cited papers were written by a small number of authors, while recent hot articles were published by many different authors among whom their cooperation was very close. Additionally, the clusters were rational as seen by the modularity Q value and mean silhouette.

According to the ranking of frequency in cited references (Fig. 7), the first was the article published in 2017 by Liu Z (Liu ZS) (centrality = 0.1) which had been cited 14 times. It was followed by Blaiivas JG (1988), Carr LK (2008), Abrams P (2002), and Abrams P (2003). Each of them had been cited about 7 times. Nevertheless, the top cited articles ranked by the centrality were written by Carr LK (2008), Abrams P (2002), Abrams P (2003), Blavias JG (1988), and Gittes RF (1987), all having great influence indicated by centrality values ranging from 0.4 to 0.14. These heated articles were almost published at the peak of each phase presented in the annual publication time axis.

From the timeline view (Fig. 8), 19 clusters were generated. Some were existing treatments like Kegel exercise, pelvic floor muscle therapy, electroacupuncture, medical technology, and artificial urinary sphincter. Others were different types of related urinary diseases and organs. Cluster 7 “electroacupuncture”, Cluster 10 “medical therapy” and Cluster 19 “woman” were painted in the brightest colour which meant the latest research.

Analysis of keywords and burst keywords; By analyzing the frequency and centrality of keywords and burst keywords, we can better understand the trend and frontiers of acupuncture therapy on SUI.

The network map consisted of 390 nodes and 1732 links (Fig. 9). According to the frequency and centrality, we sorted out that the popular keywords of acupuncture therapy on SUI in the past thirty years were “stress urinary incontinence,” “urinary incontinence,” “women,” “leak point pressure,” “efficacy,” “bladder neck suspension,” “management,” “postprostatectomy incontinence,” and “electrical stimulation” and “acupuncture”.

Burst keywords are those that are often referenced within a period and can suggest hot and emerging themes. The interval between the appearance and disappearance of burst keywords can be used to determine the direction of development in a certain field. 20 burst keywords (Fig. 10) were generated by setting the value of minimum duration to 0.45. In the first decade, urinary incontinence came into researchers’ sight and they conducted follow-up studies in women. In the second stage, animal experiments were also conducted, and the types and treatments were detailed. In the recent ten years, while muscle training was still popular, surgical treatment has matured, and acupuncture emerged as a nondrug and nonsurgical therapy.

The strongest 9 keywords burst in the recent decade were “therapy” (2012–2020), “postprostatectomy incontinence” (2011–2013), “muscle” (2016–2018), “cell therapy” (2017–2022), “symptom” (2014–2022), “surgical treatment” (2016–2020), “efficacy” (2013–2022), “randomized controlled trial” (2019–2020), and “acupuncture” (2013–2020). Newly burst keywords were “efficacy”,

CiteSpace, v. 6.1.R3 (64-bit) Basic  
 September 8, 2022 at 11:20:02 AM CST  
 WoS: /Users/mac/Desktop/CS/wos\_official/data  
 Timespan: 2000–2005 (Slice Length=1)  
 Selection Criteria: g-index (k=25), LRF=3.0, L/N=10, LBY=31, e=1.0  
 Network: N=137, E=472 (Density=0.0507)  
 Largest CC: 86 (62%)  
 Nodes Labeled: 1.0%  
 Pruning: None

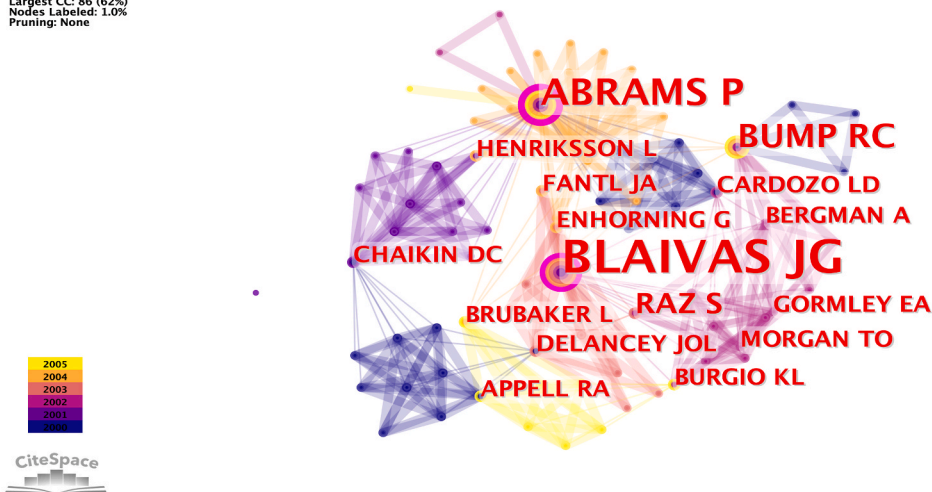


Fig. 6. The network map of cited author related to acupuncture for SUI.



**Table 3**

Top 5 cited authors related to acupuncture for SUI.

Rank	Cited Author	Freq	Rank	Cited Author	Centrality
1	BLAIVAS JG	8	1	ABRAMS P	0.36
2	ABRAMS P	5	2	BLAIVAS JG	0.13
3	BUMP RC	4	3	BUMP RC	0.09
4	RAZ S	3	4	CHAIKIN DC	0.09
5	CHAIKIN DC	2	5	APPELL RA	0.05

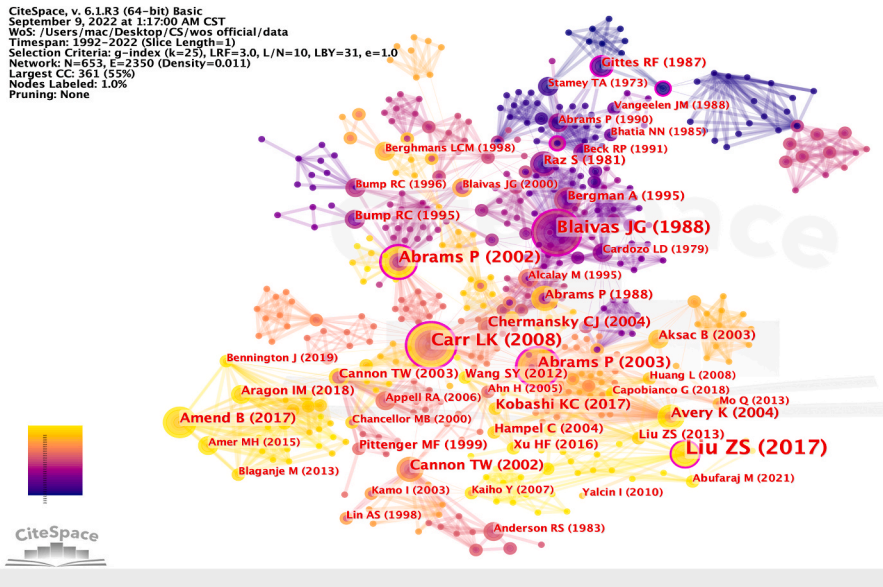


Fig. 7. The network map of cited references related to acupuncture for SUI.

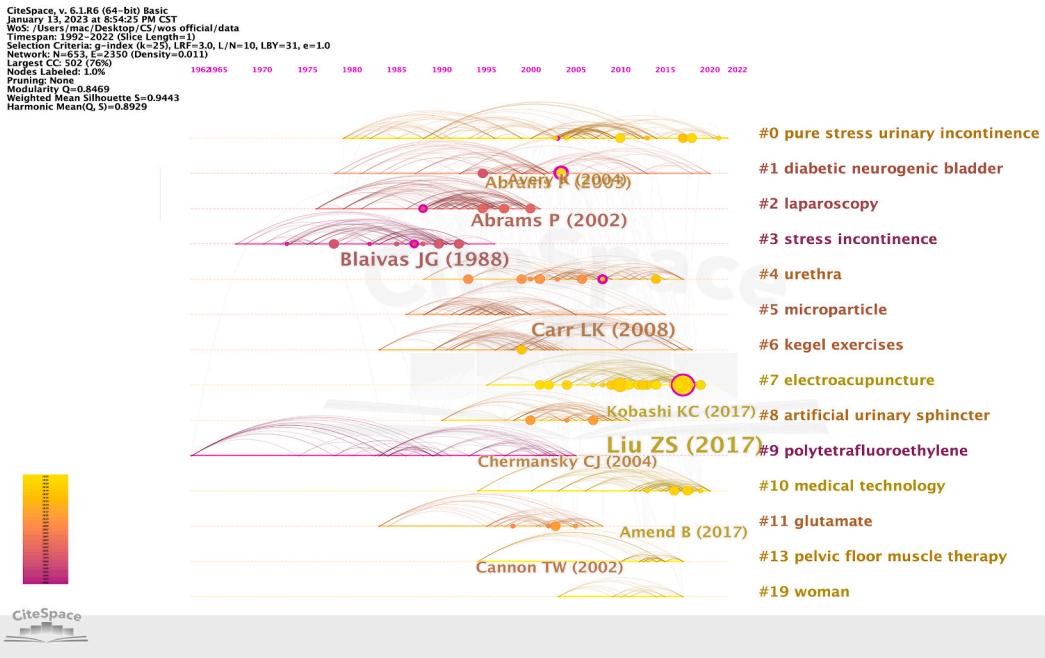


Fig. 8. The timeline view of cited references related to acupuncture for SUI.

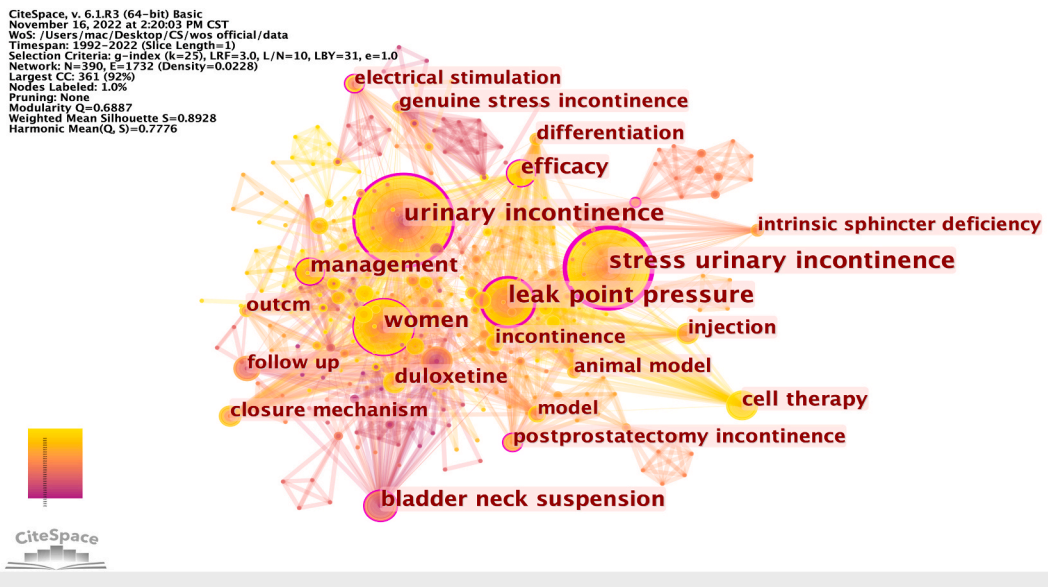


Fig. 9. The network map of keywords related to acupuncture for SUI.

“symptom”, “cell therapy”, and “medical technology”.

#### 4. Discussion

The evidence above indicates that, although the annual number of publications has fluctuated slightly over the past 30 years, it has generally increased with each stage of the decade [14]. In the past decade, much research has been carried out on the use of acupuncture in treating SUI. But the total number is still insufficient compared with the number of publications focused on acupuncture therapy for knee osteoarthritis, low back pain, and insomnia [15–17].

According to the country map, the USA ranked first, exceeding China. As we expected, with the prevalence of acupuncture treating SUI in these two countries, China and America has been leading the researches. But it is noteworthy that although China ranks second in terms of the number of articles published, its central median is only 0.09, smaller than the value meaning significant influence (0.1). This indicated that the most productive institutions and writers were largely from China, but there were not enough influential papers and international collaboration in the research process of acupuncture for SUI. Thus, there is a pressing need for multi-national cooperation. Since the recent meta-analysis and overviews [18,19] are calling for more high-quality papers, it is estimated that with more high-quality randomized clinical trials like the one published in *JAMA* [20], the paper’s influence may be elevated. The other three countries in the top 5 were Germany, Japan, and the UK. The European countries had relatively close cooperation among themselves, and with Japan. Generally, the publications are based in Asia, the origin of acupuncture therapy, and Europe where acupuncture was newly accepted. Additionally, the top 3 countries in terms of centrality were the USA (0.34), Germany (0.18), and Australia (0.16), implying that there was much cooperation among them [21,22].

In light of the geographical aspect, most of the institutions focusing on acupuncture therapy for SUI were from China, and they cooperated closely. In addition, institutions from US and Japan also showed relatively high interest, with their four local institutes cooperating frequently. But they lacked international cooperation with other countries, and this was also an international common problem, though the institutes from countries all over the world started to research acupuncture therapy for SUI. From the perspective of the publication date, Tokyo Medical and Dental University from Japan published the first article about acupuncture for SUI in 1992. While Chinese institutions did not publish their first article until 2008. Since the relevant research had just surged in the recent decade in China, and Chinese institutions led the way in the number of publications, it is recommended that Chinese institutions should pave the way for multinational projects, as in other fields of acupuncture treatment [23,24].

The top five authors by frequency formed a cluster in the network map of authors (Fig. 5), demonstrating the strong collaboration between these authors. They collaborated to study the efficacy of electroacupuncture in treating SUI [25–27]. The most productive author Liu S (Liu ZS) and the second most productive author Chen Y cooperated closely in the field of clinical trials [25,28]. Liu B and Liu Y were active in studying the application of acupuncture in treating SUI, especially for postmenopausal women [26,29]. In the other cluster, Chancellor M searched for the mechanism and treatment of urinary diseases [30–33]. And his recent articles focused on comorbidities and/or complications of urinary problems, namely urinary problems occurring together with other diseases, including Alzheimer’s disease and SARS-CoV-2 [34,35]. Another active author, YOSHIMURA N, cooperated with Chancellor M in the field of mechanism research and treatment. In addition, he also conducted animal experiments [36,37].

In terms of cited authors, BLAIVAS JG is an expert in surgically treating urinary incontinence [38–40] and has studied the use of



### Top 20 References with the Strongest Citation Bursts

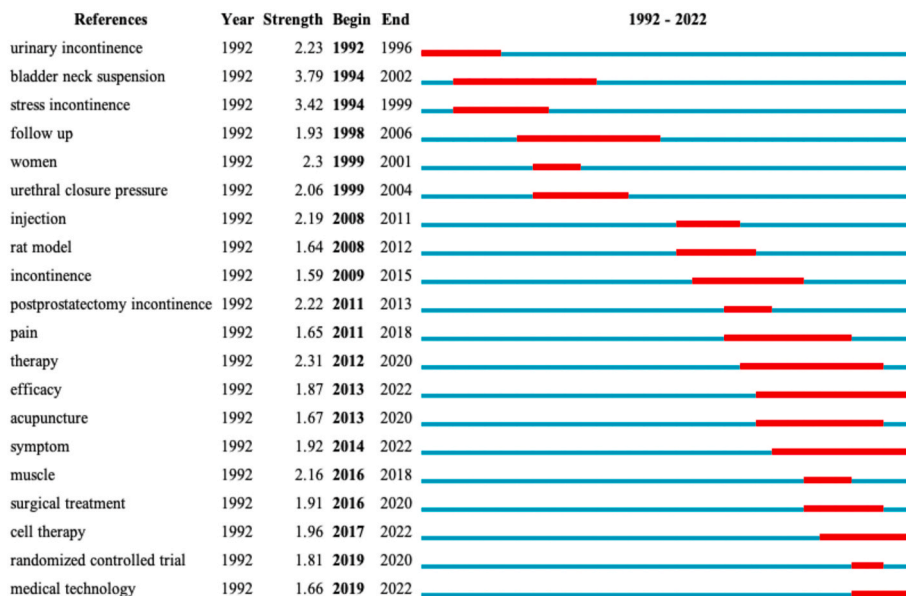


Fig. 10. Top 20 keywords with the strongest citation bursts.

urodynamics in diagnosing [41] and treating various lower urinary tract disorders in male patients [42]. He was also a member of the International Continence Society, which had published many guidelines, including guidelines on urodynamic equipment performance [17]. Aside from urinary incontinence, he has also been studying nocturia, a common and sometimes bothersome symptom that urges people to awake and void urine. He had recommended measurements and treatments for nocturia [43]. ABRAMS P came in second in terms of frequency but first in terms of centrality, indicating his great influence and the core state of his works. He was dedicated to the field of urinary diseases. He contributed to the classification and assessment of male lower urinary tract symptoms [44] as well as the treatment of male stress urinary [45,46]. He assessed operative procedures [47], especially for female stress urinary incontinence [48, 49]. He also made recommendations for optimizing care for perinatal women [50] and nocturia patients [51].

In the aspect of a cited reference, the most frequently cited article [20] carried out a multicenter randomized clinical trial to assess the efficacy of 6-week lumbosacral region electroacupuncture *versus* sham electroacupuncture for females with SUI. The electroacupuncture group that received treatment in the lumbosacral region reported less urine leakage as a result, and the significance of the result could last for at least 24 weeks after the end of the treatment. However, to assess the long-term effectiveness and mechanism of electroacupuncture in treating SUI, more studies are necessary. But the centrality of this article is only 0.1, which is the lowest among the most frequently cited 5 articles with others' centrality ranging from 0.4 to 0.17 (Table 4). The second was the article published by Blaivas JG in 1988 (centrality = 0.17). This article classified all kinds of SUI and the efficacy of existing surgical approaches at that time [52]. The third was the article published by Carr LK in 2008 (having the highest centrality with 0.4) with a cited frequency of 8. This article indicated that pure cellular therapy with MDSCs could have durable improvement both objectively and subjectively of SUI, but the appropriate dose of cells required further investigation [53]. And there were two articles [54,55] published by Abrams P both focusing on terminology standardization which ranked second and third in centrality. To sum up, Abrams P's articles were not only popular but also of significant importance. The findings coincide with the previous section of cited author analysis. As for Carr LK and Blaivas JG, though they are not big names in the cited-author network map, their papers were indeed influential.

Presented in the timeline view of cited references, only cited references of electroacupuncture on SUI formed a cluster. Based on these articles, previous researchers conducted a meta-analysis [56] showing that electroacupuncture, proven by moderate-quality evidence, may be able to improve SUI in women in clinical settings. In contrast, other acupuncture therapy did not form any cluster, indicating that the academe has not explored this field on a large scale. Besides, we could find some authors whose centrality is

Table 4  
Top 5 cited references related to acupuncture for SUI.

Rank	Cited Reference	Freq	Rank	Cited Reference	Centrality
1	Liu ZS, 2017	14	1	Carr LK, 2008	0.4
2	Blaivas JG, 1988	8	2	Abrams P, 2002	0.29
3	Carr LK, 2008	8	3	Abrams P, 2003	0.25
4	Abrams P, 2002	7	4	Blaivas JG, 1988	0.17
5	Abrams P, 2003	6	5	Gittes RF, 1987	0.14

lower than 0.1, which means little influence in the field of acupuncture therapy for SUI, were active in certain clusters. For example, the article published by Avery K in 2004 (centrality = 0.06) emerged in the top 5 most cited references of Cluster 1. Avery K's article was about the development and evaluation of the International Consultation on Incontinence Questionnaire (ICIQ) [57], a subjective scale for diagnosing SUI that is not closely related to a specific cure therapy, but this scale of measurement is the foundation of standardized research on SUI.

The timeline view showed that the former search topics were laparoscopy and stress incontinence, which was the tentative diagnosis. Later came "microparticle", "diabetic neurogenic bladder", "uretha", and "glutamate", implying that the researchers tend to focus on a micro level and a specific organ. In the recent decade, Cluster 7 "electroacupuncture", Cluster 10 "medical therapy" and Cluster 19 "woman" occurred. This implied that the researches on urinary incontinence tend to focus on therapeutic technologies, such as medical therapy and acupuncture therapy, especially electroacupuncture. The extension of pharmaceutical therapy bridges the gap created by the progression of conservative SUI treatment to surgical treatment. For example, duloxetine can increase the level of noradrenalin and serotonin, thus increasing the rhabdosphincter tone and contractility. It was evaluated [7] that duloxetine led to a 50% decrease in incontinence episode frequency (IEF) compared to the placebo group's 27.5–40%, which shows it is effective in treating SUI. But duloxetine can cause serious side effects such as nausea, anorexia and insomnia [7]. On the contrary, acupuncture therapies, especially electroacupuncture, have fewer adverse effects and longer-term curative effects than medicines [20]. But the quality of the evidence defending acupuncture's efficacy is still poor [58].

From the view of keywords and burst keywords, the research trend could be observed. In the first decade from 1992 to 2002, researchers started to study acupuncture therapy for SUI. The strongest burst keywords of these ten years were "stress urinary incontinence", "bladder neck suspension" and "women" which meant at the beginning academia mainly focused on the common type of SUI and the original therapy was surgical [59]. Moreover, the definitions of the symptoms and indicators of lower urinary tract dysfunction need to be standardized to establish the groundwork for this field. In this period, Abrams P was both productive and had great influence. The two articles [54,55] he published in 2002 and 2003 were frequently cited in the following study. When it comes to the next decade (2003–2012), "therapy", "postprostatectomy incontinence" and "rat model" emerged. In this period, the participant type focused on postprostatectomy patients [29]. For the studies of therapies, the injection was the hot topic and most trials were carried out on rats, where Chermansky CJ was one of the active authors in this decade [60]. In recent ten years, "acupuncture therapy" burst from 2013 to 2020. "Randomized controlled trial" was the main research method [61,62]. And the "efficacy" or "effectiveness" of all therapies has become hot and the latest topic in the study of acupuncture therapy on SUI as we predicted [8,19,29]. Liu Z (Liu ZS) was the most influential and productive author who was especially dedicated to the study of the efficacy of electroacupuncture in the recent decade [20]. With more high quality randomized controlled trials being published [5,9], studies on the efficacy of treating SUI with acupuncture therapies will remain a hot topic. Different from the expected results, electroacupuncture did not become a burst keyword. Among all acupuncture therapies, only "acupuncture" become a top 20 burst keyword. That indicates that academic research on treating SUI with acupuncture therapies is still on the stage where treatment methods has not been subdivided.

On the whole, researchers are gradually narrowing the scope into a certain type of urinary incontinence, such as stress urinary incontinence, and postprostatectomy urinary incontinence [29,63], and thus the gender of the patients also expands from female in the early years to male in the recent years. Academic discourse is getting more circumspect and rigorous, and lower urinary tract terminology is likewise becoming more standardized. In the aspect of the treatment methods, bladder neck suspension was first studied [64], followed by the insights of surgery [65], cell therapy [66] and muscle training [67]. Concentration on the study of acupuncture therapy only started in the recent decade. The outcome measurement included leak point pressure and efficacy [68,69]. Also, in terms of article type, the focus has changed from animal experiments on rats [70] to randomized controlled clinical trials [20,61,62]. In addition, a new hot concern in the field of acupuncture treatment for SUI is the most recent study on efficacy [8,71], particularly that of electroacupuncture, but systematic reviews and meta-analyses are still insufficient. Additionally, according to other bibliometric analyses of using acupuncture treating diseases like insomnia [15] and knee osteoarthritis [17], acupuncture therapy has already become the essential point with the highest centrality. While in our research, "acupuncture" only ranked 14th in all 20 burst keywords, which indicated that current researches on acupuncture therapies treating SUI is accumulating and about to reach a peak. Thus, this article clearly illustrated the latest research trend and helped promoting potential cooperation.

However, there are some limitations. First, we exclusively included articles from the Web of Science database, and Chinese articles could not be included in the analysis due to software restrictions. Secondly, due to the software restriction, the time-zone view map of keywords on acupuncture therapy for treating SUI could not be generated. As a result, the co-occurrence of the keywords could not be presented, and it might negatively influence our specificity in the interpretation of the temporal evolution of keywords. Therefore, further research is needed.

## 5. Conclusion

Using CiteSpace (6.3.1) software, we generated graphics implying a rising trend in the field of acupuncture therapy for SUI in the past thirty years. Researchers are having a more comprehensive understanding of stress urinary incontinence. And we anticipate more international cooperation in the future. But the efficacy of acupuncture therapies still requires more high-quality evidence to be supported. To sum up, this study is the first to carry a bibliometric analysis on treating SUI with acupuncture therapies by using CiteSpace software. Our study provides insight into the development trend and research hotspot of acupuncture therapy on SUI, to help identify potential scopes and collaborators.

## Author contribution statement

All authors listed have significantly contributed to the development and the writing of this article.

## Data availability statement

No data was used for the research described in the article.

## Additional information

No additional information is available for this paper.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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