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Yoga for treating urinary incontinence in women (Review)

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[Intervention Review]

Yoga for treating urinary incontinence in women

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ABSTRACT

Background

Urinary incontinence in women is associated with poor quality of life and difficulties in social, psychological and sexual functioning. The condition may affect up to 15% of middle-aged or older women in the general population. Conservative treatments such as lifestyle interventions, bladder training and pelvic floor muscle training (used either alone or in combination with other interventions) are the initial approaches to the management of urinary incontinence. Many women are interested in additional treatments such as yoga, a system of philosophy, lifestyle and physical practice that originated in ancient India.

Objectives

To assess the effects of yoga for treating urinary incontinence in women.

Search methods

We searched the Cochrane Incontinence and Cochrane Complementary Medicine Specialised Registers. We searched the World Health Organization International Clinical Trials Registry Platform (WHO ICTRP) and ClinicalTrials.gov to identify any ongoing or unpublished studies. We handsearched Proceedings of the International Congress on Complementary Medicine Research and the European Congress for Integrative Medicine. We searched the NHS Economic Evaluation Database for economic studies, and supplemented this search with searches for economics studies in MEDLINE and Embase from 2015 onwards. Database searches are up-to-date as of 21 June 2018.

Selection criteria

Randomised controlled trials in women diagnosed with urinary incontinence in which one group was allocated to treatment with yoga.

Data collection and analysis

Two review authors independently screened titles and abstracts of all retrieved articles, selected studies for inclusion, extracted data, assessed risk of bias and evaluated the certainty of the evidence for each reported outcome. Any disagreements were resolved by consensus. We planned to combine clinically comparable studies in Review Manager 5 using random-effects meta-analysis and to carry out sensitivity and subgroup analyses. We planned to create a table listing economic studies on yoga for incontinence but not carry out any analyses on these studies.

Main results

We included two studies (involving a total of 49 women). Each study compared yoga to a different comparator, therefore we were unable to combine the data in a meta-analysis. A third study that has been completed but not yet fully reported is awaiting assessment.

One included study was a six-week study comparing yoga to a waiting list in 19 women with either urgency urinary incontinence or stress urinary incontinence. We judged the certainty of the evidence for all reported outcomes as very low due to performance bias, detection bias, and imprecision. The number of women reporting cure was not reported. We are uncertain whether yoga results in satisfaction with cure or improvement of incontinence (risk ratio (RR) 6.33, 95% confidence interval (CI) 1.44 to 27.88; an increase of 592 from 111 per 1000, 95% CI 160 to 1000). We are uncertain whether there is a difference between yoga and waiting list in condition-specific quality of life as measured on the Incontinence Impact Questionnaire Short Form (mean difference (MD) 1.74, 95% CI -33.02 to 36.50); the number of micturitions (MD -0.77, 95% CI -2.13 to 0.59); the number of incontinence episodes (MD -1.57, 95% CI -2.83 to -0.31); or the bothersomeness of incontinence as measured on the Urogenital Distress Inventory 6 (MD -0.90, 95% CI -1.46 to -0.34). There was no evidence of a difference in the number of women who experienced at least one adverse event (risk difference 0%, 95% CI -38% to 38%; no difference from 222 per 1000, 95% CI 380 fewer to 380 more).

The second included study was an eight-week study in 30 women with urgency urinary incontinence that compared mindfulness-based stress reduction (MBSR) to an active control intervention of yoga classes. The study was unblinded, and there was high attrition from both study arms for all outcome assessments. We judged the certainty of the evidence for all reported outcomes as very low due to performance bias, attrition bias, imprecision and indirectness. The number of women reporting cure was not reported. We are uncertain whether women in the yoga group were less likely to report improvement in incontinence at eight weeks compared to women in the MBSR group (RR 0.09, 95% CI 0.01 to 1.43; a decrease of 419 from 461 per 1000, 95% CI 5 to 660). We are uncertain about the effect of MBSR compared to yoga on reports of cure or improvement in incontinence, improvement in condition-specific quality of life measured on the Overactive Bladder Health-Related Quality of Life Scale, reduction in incontinence episodes or reduction in bothersomeness of incontinence as measured on the Overactive Bladder Symptom and Quality of Life-Short Form at eight weeks. The study did not report on adverse effects.

Authors' conclusions

We identified few trials on yoga for incontinence, and the existing trials were small and at high risk of bias. In addition, we did not find any studies of economic outcomes related to yoga for urinary incontinence. Due to the lack of evidence to answer the review question, we are uncertain whether yoga is useful for women with urinary incontinence. Additional, well-conducted trials with larger sample sizes are needed.

PLAIN LANGUAGE SUMMARY

Yoga for urinary incontinence in women

Review question

We examined whether yoga is useful for treating urinary incontinence in women. We compared yoga to no treatment and to other treatments for incontinence. We also compared yoga added to other treatments to other treatments alone. We focused on incontinence symptoms, quality of life and adverse effects. We also looked for information on the value for money of yoga treatment.

Background

Up to 15% of women who are middle-aged or older may have urinary incontinence. Incontinence can be categorised as urgency urinary incontinence, defined as an involuntary loss of urine associated with a sudden strong desire to urinate, or stress urinary incontinence, where an activity such as sneezing triggers an involuntary leak of urine. Both types can negatively affect quality of life and social, psychological and sexual functioning. Treating incontinence usually begins with advice on lifestyle changes such as lowering caffeine use, behavioural interventions such as bladder training or exercises for the pelvic floor muscles. However, many women are interested in additional treatments such as yoga, a system of philosophy, lifestyle and physical practice that originated in ancient India.

How up-to-date is this review?

The evidence is current to 21 June 2018.

Study characteristics

We found two studies involving a total of 49 women. One was a six-week study comparing yoga to a waiting list (delayed treatment) in women with either stress or urgency urinary incontinence. The other was an eight-week study comparing yoga to mindfulness-based stress reduction (MBSR) in women with urgency urinary incontinence. We also identified an ongoing study involving 50 women that aims to compare yoga with stretching; we will include this study when the results are reported.

Key results

The trial comparing yoga to a waiting list did not report the number of women reporting cure but did report on symptoms, condition-specific quality of life and adverse effects. While this comparison generally favoured the yoga intervention, we are uncertain whether yoga improves urinary incontinence due to the very low certainty of the evidence. There was no difference between groups in the number of women reporting an adverse event and no serious adverse events were reported, but we are uncertain whether yoga increases harms as the certainty of the evidence is very low.

The trial comparing yoga to MBSR reported on symptoms and condition-specific quality of life but did not report the number of women reporting cure. While this comparison generally favoured the MBSR intervention, we are uncertain whether yoga improves urinary incontinence due to the very low certainty of the evidence. There was no information on adverse events.

We did not find any information on the value for money of yoga for urinary incontinence.

Quality of the evidence

Although we identified some evidence on yoga treatment for treating urinary incontinence in women, the included studies were very small and there were issues with the way they were conducted, which limits our confidence in the results. Due to the nature of the treatments, the participants and staff of the trial comparing yoga to a waiting list were aware of which groups the participants were assigned and it is possible that the women in the yoga group reported some benefits because they expected yoga to be helpful. The trial comparing yoga to MBSR did not intend to test yoga as a treatment for incontinence. Instead, the trial tested MBSR as a treatment and used yoga classes to ensure that women in the comparison group received attention from the study staff. In addition, the trial comparing yoga to MBSR did not collect outcomes on all women and it is possible that the women who reported outcomes had either better or worse results than the women who did not report outcomes. There is currently insufficient good-quality evidence to judge whether yoga is useful for women with urinary incontinence.

SUMMARY OF FINDINGS FOR THE MAIN COMPARISON *[Explanation]*

Yoga compared with wait-list for urinary incontinence in women

Patient or population: women with either stress-predominant or urge-predominant urinary incontinence
Settings: community
Intervention: yoga
Comparison: wait-list

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No. of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	Wait-list	Yoga				
Number of women who report they are cured (they no longer experience urinary incontinence)	-	-	-	-	-	The study did not report this outcome.
Number of women who report cure or improvement of urinary incontinence at short term (six weeks)	**111 per 1000**	**703 per 1000** (160 to 1000)	**RR 6.33** (1.44 to 27.88)	18 (1 study)	⊕◯◯◯ **very low**[1,2]	Number of women who reported satisfaction with change in urine leakage
Urinary incontinence condition- or symptom-specific quality of life at short term (6 weeks) Measured by Incontinence Impact Questionnaire Short Form (IIQ-7) (lower = better)	The mean change in the control group was a decrease of **31 units**.	The mean change in the intervention group was **1.74 units higher** (33.02 units lower to 36.50 units higher).	Not applicable	18 (1 study)	⊕◯◯◯ **very low**[1,2]	

Number of micturitions (daily) at short term (6 weeks)	The mean change in the control group was a decrease of **0.13 micturitions**.	The mean change in the intervention group was **0.77 fewer micturitions** (2.13 fewer to 0.59 more).	Not applicable	18 (1 study)	⊕○○○ **very low**[1,2]	
Number of episodes of incontinence (daily) at short term (6 weeks)	The mean change in the control group was a decrease of **0.27 episodes**.	The mean change in the intervention group was **1.57 fewer episodes** (2.83 to 0.31 to fewer).	Not applicable	18 (1 study)	⊕○○○ **very low**[1,2]	
Bothersomeness of symptoms at short term (6 weeks) Measured by Urogenital Distress Inventory 6 (UDI-6) (lower = better)	The mean change in the control group was a decrease of **0.1 units**.	The mean change in the intervention group was **0.90 units lower** (0.34 to 1.46 lower).	Not applicable	18 (1 study)	⊕○○○ **very low**[1,2]	
Adverse effects at short term (6 weeks)	**222 per 1000**	**222 per 1000** (0 to 600)	**RD 0%** (-38% to 38%)	18 (1 study)	⊕○○○ **very low**[1,2]	2 women in each group reported an adverse effect. However, there were 7 adverse effects overall and the distribution of adverse effects between groups is not reported. None of the adverse effects were considered to be potentially related to the study and none were serious

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).
CI: confidence interval; **RD**: risk difference; **RR:** risk ratio

GRADE Working Group grades of evidence
High certainty: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate certainty: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low certainty: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low certainty: We are very uncertain about the estimate.

[1]Downgraded two levels for risk of bias because there was no blinding of participants or providers (risk of performance bias), and outcome was self assessed and self recorded by participants (risk of detection bias).
[2]Downgraded one level for imprecision (< 400 participants).

BACKGROUND

Description of the condition

The International Continence Society (ICS) and the International Urogynecological Association define urinary incontinence as "the complaint of involuntary loss of urine" (Bø 2017; Haylen 2010). Estimates of the prevalence of urinary incontinence are contested and vary widely according to case definitions as well as methods of ascertainment. Women often delay seeking help for urinary incontinence, and it is likely that this stigmatised condition is underreported (Wójtowicz 2014). In pregnant or postpartum women, estimates of the prevalence of urinary incontinence are 30% or higher (Milsom 2017). In women in the general population who are middle-aged or older, daily urinary incontinence is estimated to be between 5% and 15%, while the prevalence of any incontinence symptoms among all adult women is estimated to be between 25% and 45% (Milsom 2017). Increasing age is the most widely accepted risk factor, although parity (particularly assisted vaginal births), obesity and menopausal status are also often considered to be important risk factors (Milsom 2017).

There are three major types of urinary incontinence, which are defined according to symptoms: stress urinary incontinence (SUI), urgency urinary incontinence (UUI) and mixed urinary incontinence (MUI). Although the specific prevalence rates are inconsistent between studies, SUI is consistently the most common type of urinary incontinence, responsible for approximately half of all cases of urinary incontinence, followed by MUI and then by UUI (Milsom 2017).

Stress urinary incontinence is defined as the involuntary loss of urine on effort or physical exertion, or on sneezing or coughing (Bø 2017; Haylen 2010). Stress urinary incontinence occurs when intra-abdominal pressure rises with exertion or during a sneeze or cough, and the pressure upon the bladder is greater than the closure pressure of the urethral sphincter (Cannon 2004). Although SUI may involve a number of causes, it is often associated with weakened pelvic muscles and collagen-dependent tissue, which can lead to a lack of urethral support and the inability to maintain urethral sphincter pressure (Long 2008).

Urgency urinary incontinence is defined as involuntary loss of urine associated with urgency (Bø 2017; Haylen 2010). Urgency is defined as a sudden and compelling desire to void urine, which is difficult to defer (Abrams 2013). Urgency urinary incontinence is a form of overactive bladder, which includes symptoms of urgency, frequency and waking at night to urinate (nocturia). The causes of overactive bladder and UUI specifically are unclear, but it is believed that the underlying pathophysiological factors include disturbances in the urothelium and overactivity of the detrusor smooth muscle and nerves (Steers 2002).

Mixed urinary incontinence is defined as the presence of both SUI and UUI symptoms (Bø 2017; Haylen 2010).

Urinary incontinence in women is associated with poor quality of life, and negatively impacts social, psychological and sexual functioning (Sinclair 2011). Depression appears to be associated with urinary incontinence, although it is unclear whether the physical and social effects of incontinence lead to development of depression or the presence of depression accentuates the bother of incontinence symptoms (Abrams 2013). Although all forms of urinary incontinence are associated with poor quality of life, and more severe incontinence appears to have a greater impact on quality of life, women with UUI or MUI may be more likely than women with SUI to report 'great' bother due to incontinence. Additionally, women with severe levels of MUI may experience greater impact upon their quality of life compared to women with severe levels of UUI or SUI (Minassian 2013; Monz 2007).

Description of the intervention

Yoga, a system of philosophy, lifestyle and physical practice that originated in ancient India, has become popular in the West during the last century. Although yoga is traditionally described as having eight 'limbs' or 'rungs' of practice, many currently practised styles of yoga primarily emphasise the integration of physical poses (asanas), controlled breathing (pranayama) and concentration (dharana) or meditation (dhyana) (Hewitt 2001; Taneja 2014). The popularity of yoga in the West has continued to increase over the past decade. For example, according to the US National Health Interview Survey (NHIS) conducted in 2002, 2007 and 2012, the reported use of yoga in the USA increased from approximately 5.1% of adults in 2002 to over 9.5% in 2012 (Clarke 2015). In the 2012 NHIS, use of yoga was higher among women than men, and higher among adults aged 18 to 44 years than for older age groups (Cramer 2016).

Yoga has been suggested to be useful in managing a range of medical conditions, including musculoskeletal conditions, cardiovascular conditions, stress, depression and anxiety (Taneja 2014). In the 2012 NHIS, the most common therapeutic uses of yoga were for back pain (19.7%), stress (6.4%) and arthritis (6.4%) (Cramer 2016).

Yoga appears to be a relatively safe practice. A review of case reports and case series of adverse events of yoga identified musculoskeletal issues as the most common adverse events, and the headstand, shoulder stand, lotus position and forceful breathing as the most common yoga techniques associated with adverse events (Cramer 2013). Cramer 2013 advised that yoga practices should be adapted to pre-existing medical conditions and practised under the supervision of a qualified teacher. A recent review of randomised trials of yoga found that yoga is associated with a greater risk of intervention-related and non-serious adverse effects than psychological or educational interventions, but not with an increased risk of serious adverse events. The review also stated that yoga is associated with the same risk of serious, non-serious and intervention-related adverse effects as usual care or non-yoga exercise interven-

tions (Cramer 2015). The overall rate of serious adverse events in the yoga arms of the trials was 0.6% (Cramer 2015).

How the intervention might work

Urinary incontinence is usually initially managed by conservative therapies (Abrams 2013). These include lifestyle interventions, bladder training and pelvic floor muscle training (used either alone or in combination with other active treatments such as biofeedback) (Ayeleke 2015; Dumoulin 2018; Herderschee 2011; Imamura 2015; Wallace 2004).

There is good evidence to support the use of pelvic floor muscle training as a first approach to managing urinary incontinence, particularly SUI (Dumoulin 2018). With pelvic floor muscle training, appropriately timed conscious pelvic floor muscle contractions may increase urethral pressure and prevent the urinary leakage associated with SUI (DeLancey 1988; Miller 1998). Strengthening of the pelvic floor muscles may also improve support of the bladder neck, which may reduce urinary incontinence (Bø 2004). Finally, pelvic floor muscle contractions may inhibit detrusor muscle contractions, which could prevent the urinary leakage associated with UUI (Bø 2000).

Some studies suggest that some yoga breathing, relaxation and muscle control techniques may assist in the strengthening of the pelvic floor (Bø 2013; Tenfelde 2014). Specific yoga poses that are believed to be helpful and have been tested include the Utkatasana (chair pose), Trikonasana (triangle pose) and the Malasana (squat pose) (Huang 2014b). Yoga may help improve general body alignment, flexibility, strength, control and awareness, all of which are thought to assist in strengthening the pelvic floor muscles (Tenfelde 2014). Yoga may therefore function as either an alternative method of pelvic floor muscle training or as a supplement to training. Yoga may also address mental health and quality of life issues through potential effects on depression, stress and anxiety, and help patients manage their medical condition.

Why it is important to do this review

Urinary incontinence is a highly prevalent and distressing condition in women. Although many treatments are available for urinary incontinence, there is no universally effective and acceptable treatment and additional approaches to treatment may be of value. Yoga is a mind-body practice that is increasingly popular in the West, and is particularly popular with women. A pre-post trial of pelvic floor muscle training with adjunctive Hatha yoga in women with stress incontinence reported that the combined intervention was effective in improving incontinence (Kim 2015). Also, at least one randomised trial of Iyengar yoga for urinary incontinence has provided promising results in the treatment of SUI and UUI with yoga (Huang 2014b). However, there is a paucity of evidence on the effectiveness of yoga for incontinence and no available guidance for clinicians or the public. It is therefore important to assess whether yoga may be effective as either a primary or adjuvant treatment for urinary incontinence in women.

OBJECTIVES

To assess the effects of yoga for treating urinary incontinence in women.

METHODS

Criteria for considering studies for this review

Types of studies

We included randomised controlled trials (RCTs) and the first period of cross-over RCTs. We excluded quasi-randomised controlled trials (i.e. trials in which assignment to treatment was made using a non-random method such as alternation) because the method of allocation may lead to biased estimates of effect. We did not restrict study eligibility by language or publication status. We only included health economic studies conducted alongside studies that were included in the clinical component of this systematic review (Shemilt 2011).

Types of participants

We included studies with women aged 18 years or more who were diagnosed as having urinary incontinence on the basis of symptoms, signs or urodynamic evaluation (as defined by the trial authors). We only included trials that recruited both men and women if at least 90% of participants were women or if the trial provided demographic and outcome data separately for women. We included trials with women diagnosed as having stress, urgency or mixed urinary incontinence, as well as trials with participants who had mixed or unclassified types of urinary incontinence.

We included trials carried out on women who were experiencing urinary incontinence during the antenatal or postnatal period. Because this group has physiological differences from women who are not pregnant or postpartum, and the natural history of incontinence in this population differs from that in non-pregnant women, the observed effects of the intervention may differ in this group. We therefore did not group this population with women who were not pregnant or postpartum and we planned to analyse the studies separately throughout the review.

We excluded studies of women who had urinary incontinence thought to be due to factors beyond the urinary tract such as neurological or psychiatric disorders, cognitive impairment, or mobility problems. We also excluded studies that focused on women who were experiencing nocturnal enuresis.

Types of interventions

We included studies of yoga as a treatment for urinary incontinence, where the study report specified that the intervention was 'yoga' provided at any dose, with any frequency and for any duration, because we believe these factors are likely to vary in practice. We included interventions that belonged to any yoga tradition but excluded studies in which the yoga intervention did not include a physical practice component. We included studies that compared yoga to no treatment or to another active treatment. We also included studies that compared yoga as an adjunct to other treatments versus those same treatments without yoga. The types of included comparisons were as follows.

- Yoga versus no specific active intervention (e.g. usual care, waiting list).
- Yoga versus an active intervention (e.g. lifestyle intervention or pelvic floor muscle training), for which we considered different active comparators separately (e.g. yoga versus lifestyle advice, yoga versus pelvic floor muscle training).
- Yoga plus an intervention versus the same intervention without yoga (e.g. yoga as an add-on intervention to pelvic floor training versus pelvic floor training alone), for which we considered different interventions separately.

We included studies in which co-interventions were provided if they were similar between intervention groups (e.g. both the yoga and the comparison groups received advice on behavioural management techniques).

Studies that compare yoga to a sham yoga intervention do not appear to be common (Park 2014). However, we planned that we would consider such studies to represent an additional type of comparison (i.e. yoga versus sham yoga) and would analyse them separately.

We excluded studies of interventions based on yoga (e.g. exercises based on yoga postures) but not characterised as yoga, as well as studies of multimodal interventions in which yoga is only one component amongst others, such as mindfulness-based stress reduction (MBSR).

Types of outcome measures

We used outcomes suggested by the Standardisation Committee of the International Continence Society (Bø 2017; Haylen 2010). The following five categories of outcomes are recommended for research investigating the effect of therapeutic interventions for women with urinary incontinence (Lose 2001):

- The woman's observations (e.g. symptoms);
- Quantification of the woman's symptoms (e.g. urine loss);
- The clinician's observations (anatomical and functional signs);
- The woman's quality of life (urinary incontinence - specific and general);
- Economic measures.

In this review, we considered at least one outcome from each of the first four categories. We included specific outcomes that are commonly found in other Cochrane Incontinence reviews for urinary incontinence in women so that this review may produce results that are easily compared to or combined with those of other reviews of treatment for the same condition.

Primary outcomes

- Number of women who report they are cured (they no longer experience urinary incontinence).
- Number of women who report cure or improvement of urinary incontinence.
- Urinary incontinence condition- or symptom-specific quality of life, as measured by any relevant scale (e.g. the Urinary Incontinence Quality of Life scale (Patrick 1999), the Incontinence Impact Questionnaire (Uebersax 1995), the International Consultation on Incontinence Modular Questionnaire Lower Urinary Tract Symptoms Quality of Life (ICIQ-LUTSqol) (Nystrom 2015), or the Pelvic Floor Distress Inventory (PFDI) and the Pelvic Floor Impact Questionnaire (PFIQ) (Barber 2001)).

Secondary outcomes

- Quantification of symptoms
  - Number of micturitions (daily).
  - Number of episodes of incontinence (daily).
  - Urine loss as measured with a pad or paper towel weight test (either the short- or long-term test).
  - Symptoms as reported by study participants on any condition-specific scale (e.g. the Severity Index for Urinary Incontinence in Women (Sandvik 1993)).
- Clinician's observations (anatomical and functional signs)
  - Clinical assessment of presence of incontinence, such as urine leakage during a cough test.
  - Measurement of pelvic floor muscle function, such as by electromyography, vaginal squeeze pressure, pelvic floor muscle force, and morphological measurements (dynamometry, ultrasound).
- Quality of life
  - Quality of life measured on a scale that is not condition- or symptom-specific (e.g. the 36-Item Short Form Health Survey (SF-36)).
  - Depression, anxiety or distress as measured on relevant scales (e.g. Beck Depression Inventory (BDI), Hospital Anxiety and Depression Scale (HADS)).
  - Other measures of emotional and social impact of the disorder such as the bothersomeness of the condition, the social impact of the condition and sexual functioning.
- Adverse effects
  - Number of adverse effects (e.g. pain, discomfort).

Main outcomes for 'Summary of findings' tables

The GRADE working group recommends including up to seven critical outcomes in a systematic review (Guyatt 2011a; Guyatt 2011b). We therefore considered the following outcomes for assessing the certainty of the evidence:

- Number of women who report they are cured (they no longer experience urinary incontinence);
- Number of women who report cure or improvement of urinary incontinence;
- Urinary incontinence condition-specific or symptom-specific quality of life;
- Number of micturitions (daily);
- Number of episodes of incontinence (daily);
- Adverse effects.

Timing of outcome assessment

We grouped all outcomes into three time points: short-term (closest to three months after randomisation), intermediate-term (closest to six months after randomisation) and long-term (closest to one year after randomisation). When an included trial presented multiple time points, we considered the short-term time point as primary and other time points as secondary.

Search methods for identification of studies

We did not impose any restrictions, for example language or publication status, on the literature searches described below.

Electronic searches

Cochrane Incontinence Specialised Register

We drew on the search strategy developed for Cochrane Incontinence. We identified relevant trials from the Cochrane Incontinence Specialised Register. For more details of the search methods used to build the Specialised Register, please see the Group's webpages where details of the Register's development (from inception) and the most recent searches performed to populate the Register can be found. To summarise, the register contains trials identified from the Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE, MEDLINE In-Process, MEDLINE Epub Ahead of Print, CINAHL, the US National Institutes of Health Ongoing Trials Register, ClinicalTrials.gov, the World Health Organization International Clinical Trials Registry Platform (WHO ICTRP) and handsearches of journals and conference proceedings. Many of the trials in the Cochrane Incontinence Specialised Register are also contained in CENTRAL.

The terms used to search the Cochrane Incontinence Specialised Register are provided in Appendix 1. The search is up-to-date as of 21 June 2018.

We searched for all eligible published and unpublished trials in all languages. We planned to translate any non-English language abstracts for potential inclusion. We based our search strategy on concepts of types of study population, types of study design and symptoms of urinary incontinence such as leakage of urine.

Other electronic bibliographic databases

We also used the terms in Appendix 1 to search the Cochrane Complementary Medicine Field Specialised Register for relevant trials of yoga. The Complementary Medicine Field Specialised Register contains trials identified from CENTRAL, Chinese databases, Korean databases and multiple small databases that have been identified as good sources of complementary medicine trials (Wieland 2013). The search was last updated on 21 June 2018.

We performed searches of the NHS Economic Evaluation Database (NHS EED) in order to identify potential economic studies. As the last database searches for NHS EED were carried out in December 2014, we used the NHS EED search filters on 25 September 2017 to search MEDLINE and Embase for economics studies from January 2015 onwards. To retrieve the maximum number of potentially relevant records, we searched the NHS EED for 'yoga' and combined the term 'yoga' with the NHS EED search filters when searching MEDLINE and Embase. See Appendix 2 for the NHS EED search filters. A further updated search of MEDLINE and Embase was conducted on 22 January 2019 adding an additional set of terms to identify urinary incontinence related studies. This set of urinary incontinence related terms was combined with the NHS EED filters and the yoga terms - further details can be found in Appendix 2.

We did not search AMED (Allied and Complementary Medicine Database), CINAHL (Cumulative Index to Nursing and Allied Health Literature) and IndMED for this version of the review because we ran preliminary test searches of these databases for the protocol and, after de-duplication against the Cochrane Incontinence Specialised Register, they did not yield any additional records that met our inclusion criteria (Wieland 2017). For full details, please see Appendix 3 (AMED), Appendix 4 (CINAHL) and Appendix 5 (IndMED).

Searching other resources

We checked the reference lists of all included studies and systematic reviews for additional references. We contacted experts in the field and authors of included studies to identify additional unpublished studies. We also checked the proceedings of the following conferences for relevant research:

- International Congress on Complementary Medicine Research (ICCMR) (2010 to 2017); and
- European Congress for Integrative Medicine (ECIM) (2009, 2011 to 2017).

Data collection and analysis

Per our published protocol (Wieland 2017), we conducted the following data collection and analysis in accordance with the recommendations in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011a).

Selection of studies

Two review authors independently screened the titles and abstracts of all retrieved references in Covidence (Covidence 2017). We retrieved the full-text study reports for all citations that at least one review author considered potentially relevant. Two review authors independently screened the full-text articles and identified studies for inclusion and identified and recorded reasons for excluded studies in the Characteristics of excluded studies. Any disagreements were resolved by discussion.

We collated multiple reports of the same study so that each study, rather than each report, was the unit of interest in the review. We recorded the selection process in sufficient detail to complete a PRISMA flow diagram (Moher 2009).

Data extraction and management

We used a standardised piloted data collection form in Microsoft Excel 2018 for Mac Version 16.20 and extracted the following study characteristics and outcome data.

- Methods: study design.
- Participants: number randomised, number with each type(s) of incontinence and how incontinence was diagnosed, if participants were pregnant or postpartum, how many were pregnant and how many were postpartum, severity and duration of urinary incontinence if reported, study participant mean age or age range, study location and setting, recruitment methods and inclusion and exclusion criteria.
- Interventions: description of yoga intervention characteristics, dose and duration of yoga intervention, description of comparison intervention characteristics, adherence to the yoga and comparison interventions, description of any co-interventions, length of follow-up, number of withdrawals and reasons for withdrawal.
- Outcomes: description of primary and secondary outcomes in the review that were reported in the trial, and listing of other outcomes collected in the trial.
- Notes: funding for trial and notable conflicts of interest of trial authors.
- 'Risk of bias' assessment.

Two review authors independently extracted outcome data from the included studies into Microsoft Excel 2018 spreadsheets and compared the data to identify any discrepancies in data entry. Any disagreements were resolved by consensus. We noted in the Characteristics of included studies if a trial did not report outcome data in a usable way. We transferred all outcome data into Cochrane's Review Manager 5 software (Review Manager 2014). In addition to extracting data from included studies as described above, we planned to include an appendix of bibliographic detail of any identified economic studies. As such, we did not conduct a further review of potential economic studies.

Assessment of risk of bias in included studies

Two review authors (LSW, ZSL) independently assessed the risk of bias for each included trial using Cochrane's 'Risk of bias' tool (Higgins 2011a). Any disagreements were resolved by discussion. We assessed the risk of bias for the following domains: random sequence generation (selection bias), allocation concealment (selection bias), blinding of participants and personnel (performance bias), blinding of outcome assessment for each outcome (detection bias), incomplete outcome data (attrition bias), selective outcome reporting (reporting bias) and other bias (such as validity of outcome measure and baseline comparability).

We assessed each potential source of bias as either high, low, or unclear and provided a quotation from the study report together with a justification for our judgement in the 'Risk of bias' tables. We summarised the judgements across different studies for each of the domains listed.

The participants and personnel in most yoga trials are not blinded. As the primary outcomes of this review depended upon the perception and reporting of the study participant, we have not included blinding of personnel, participants or outcome assessors in our dichotomising of trials into higher versus lower risk of bias. Instead, for our sensitivity analyses of the primary outcomes by higher versus lower risk of bias, we classified studies as having a relatively lower risk of bias if they had a low risk of bias for random allocation, allocation concealment and incomplete outcome assessment, and did not have a high risk of bias for selective outcome reporting or other bias (see Sensitivity analysis).

Measures of treatment effect

We uploaded the outcome data for each study into the data tables in Review Manager 5 to calculate treatment effects (Review Manager 2014). We used the risk ratio (RR) for dichotomous outcomes related to benefit of treatment (e.g. cure). We used the absolute risk difference (RD) for adverse events. We used the mean difference (MD) for continuous outcomes reported on the same scale, and the standardised mean difference (SMD) for continuous outcomes measured on different scales in different trials included in the same meta-analysis. We expressed the uncertainty with 95% confidence intervals (CIs) for all effect estimates.

If the included studies only reported effect estimates and their CIs, standard errors or exact P values, we uploaded these data into Review Manager 5 in order to apply the generic inverse variance method (Review Manager 2014). We ensured that higher scores for continuous outcomes had the same meaning for a given outcome

and explained the direction to the reader. When we were unable to enter the results in either of the above ways, we described them in the Characteristics of included studies or entered the data into the Additional tables.

Unit of analysis issues

Where appropriate, we planned to include the first period of crossover studies. We also planned to include cluster-randomised studies if they were suitable according to the guidance in Chapter 16 of the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011b).

Dealing with missing data

We contacted investigators or study sponsors in order to verify key study characteristics and to obtain missing numerical outcome data where possible. If numerical outcome data such as standard deviations (SDs) or correlation coefficients were missing, we attempted to calculate them from other available statistics, such as P values, according to the methods described in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011a). If we were unable to obtain a full report even after contacting the study authors, we listed the study as 'awaiting classification'.

Assessment of heterogeneity

We assessed clinical heterogeneity (i.e. differences in study populations, interventions and outcomes) between studies qualitatively. For studies that we judged to have sufficient clinical homogeneity to combine in a meta-analysis, we planned to assess heterogeneity in three ways: visual examination of the forest plots; the Chi² test ($P \leq 0.10$) for heterogeneity; and the I^2 statistic, which describes the per cent of the variability in the estimate that is due to clinical or methodological heterogeneity rather than to chance. We planned to consider the implications of the observed value of the I^2 statistic as follows:

- 0% to 40%: might not be important;
- 30% to 60%: may represent moderate heterogeneity;
- 50% to 90%: may represent substantial heterogeneity;
- 75% to 100%: considerable heterogeneity (Deeks 2011).

We planned to assess the importance of the value of the I^2 statistic in light of the range and direction of effects as observed from the forest plots and the strength of the evidence for heterogeneity based upon the Chi² test (Deeks 2011). We planned to seek and discuss plausible explanations for observed statistical heterogeneity. We planned to investigate causes of heterogeneity between trials, qualitatively assessing any differences between individual trials in the populations and interventions. We also planned to explore heterogeneity through the use of subgroup and sensitivity analyses.

Assessment of reporting biases

We searched study registries of prospectively registered trials to identify completed, but not published, trials. We planned to use a funnel plot and Egger's test to assess the potential for publication bias in meta-analyses with more than 10 trials (Egger 1997; Sterne 2011).

Data synthesis

Where trials were clinically comparable (i.e. clinical comparability of population, intervention, comparison, outcome and timing of measurement), we planned to combine the outcome data from the individual trials in a meta-analysis using Review Manager 5 (Review Manager 2014). We planned to analyse pregnant and postpartum women separately in call cases. However, for non-pregnant, non-postpartum populations, we planned to group together women with SUI, UUI, MUI and mixed or unclear urinary incontinence diagnoses in the primary analysis, and examine different types of urinary incontinence diagnoses using subgroup analyses (see Subgroup analysis and investigation of heterogeneity).
As yoga is a complex intervention with variations in practice components and implementation and we expected some between-study variation due to these factors, we planned to use the random-effects model for meta-analysis.
When outcome data from individual trials were not sufficiently similar to be combined quantitatively, we planned to narratively describe the results from clinically comparable trials.

Subgroup analysis and investigation of heterogeneity

As the mechanisms of SUI and UUI are different, the effects of yoga may vary across types of urinary incontinence. We planned that if there were sufficient data, we would carry out subgroup analyses by type of urinary incontinence in the following groups:

- SUI;
- UUI;
- MUI; and
- a range of urinary incontinence diagnoses, where data are not reported separately by urinary incontinence subgroup.

If sufficient data become available, we also plan to conduct subgroup analyses of trials conducted in older (mean age 65 years or greater) versus younger populations, as populations from different age groups may vary in their ability to perform yoga. Among women who are pregnant or postpartum, we plan to perform subgroup analyses of trials conducted in women who are pregnant versus postpartum, as the natural history of incontinence is different in the two states. We also intend to carry out subgroup analyses by style (e.g. Iyengar yoga, Viniyoga, Yin yoga), dose and duration of yoga intervention to determine whether type of yoga, amount of yoga or duration of yoga modifies the effect of the yoga intervention.

Sensitivity analysis

When both endpoint and change data were available, we used endpoint data for our primary analysis and carried out a sensitivity analysis to check whether the results varied according to endpoint versus change data. In cases where study participants were lost to follow-up and intention-to-treat analyses were conducted using imputation alongside available-case analyses, we used the observed data for our primary analysis and performed a sensitivity analysis to check whether the results varied according to imputed versus available-case data. In cases where both unadjusted and adjusted data were available, we used the unadjusted data for our primary analysis and performed a sensitivity analysis to check whether the results varied according to adjusted versus unadjusted data.
If sufficient data become available, we plan to assess the robustness of our conclusions by excluding studies that we judge to have a high risk of bias from our meta-analyses for the primary outcomes.

'Summary of findings' tables

We created a 'Summary of findings' table using the GRADE criteria (Guyatt 2011a; Guyatt 2011b). We planned to prepare separate 'Summary of findings' tables for trials carried out with women who were pregnant or postpartum.
Two review authors (LSW and ZSL) independently undertook GRADE assessments and compared results. Consensus was reached through discussion when necessary. We justified all decisions to downgrade the certainty of the evidence using footnotes and made comments to aid readers' understanding of the review.
We considered the following factors in our assessment of the certainty of the evidence.

- Limitations in the study design and conduct (i.e. risk of bias).
- Inconsistency of results.
- Indirectness of evidence.
- Imprecision.
- Publication bias.

We downgraded the certainty of the evidence for a given outcome by one level according to the performance of the included studies against each of the five factors.

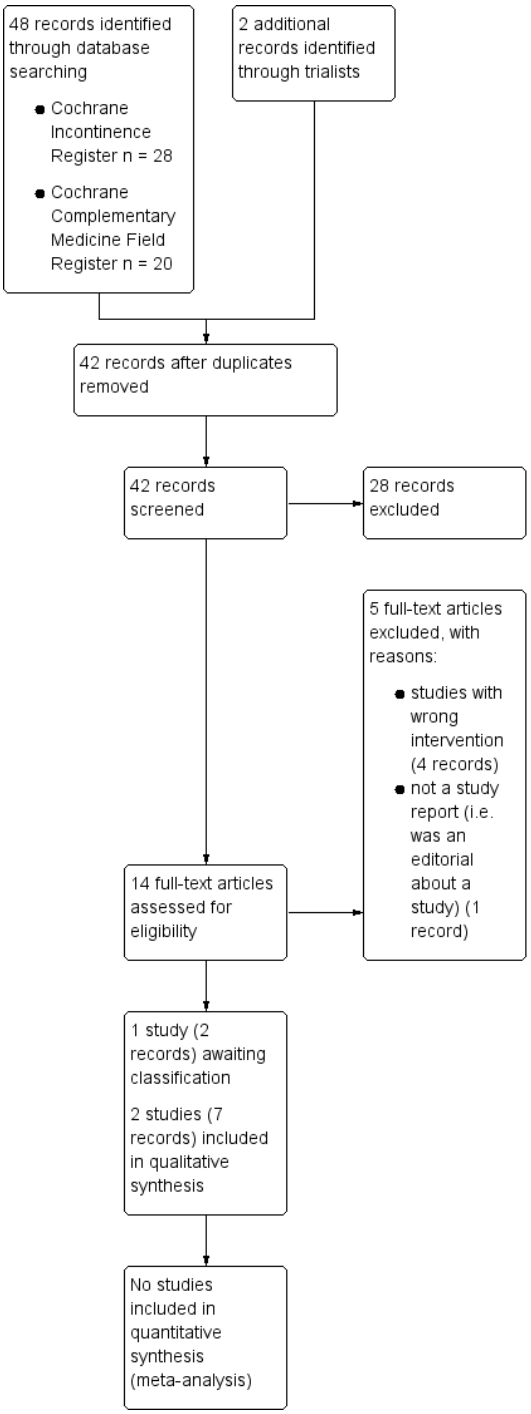
RESULTS

Description of studies

Results of the search

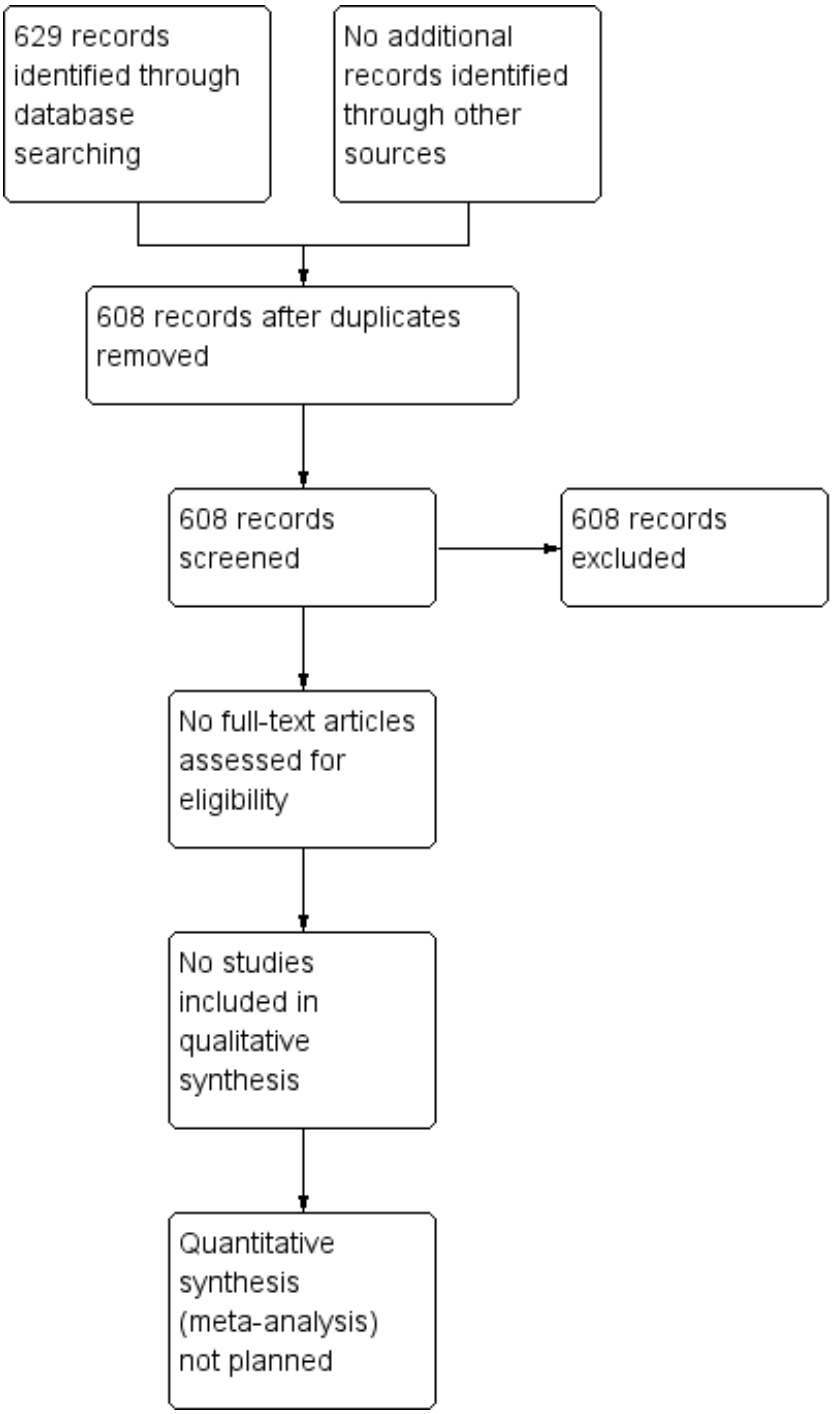
The search produced a total of 42 titles and abstracts, from which 14 records were selected for full-text review. Two trials in seven reports were eligible for inclusion in the review. The full report of one study for which we were able to obtain a trial register record and an unpublished abstract was not available, therefore we assessed this study as 'awaiting classification' as per our protocol (Huang 2018). We excluded five studies in five reports; the reasons for exclusion are provided in the Characteristics of excluded studies. The PRISMA flow chart in Figure 1 illustrates the flow of literature through the search and selection process.

Figure 1. PRISMA study flow diagram.



Our search for economic studies produced a total of 608 titles and abstracts, from which none were selected for further assessment. The PRISMA flow chart in Figure 2 illustrates the flow of economic literature through the search and selection process. Economic studies are not considered further in this review.

Figure 2. Study flow diagram for economics studies.



Included studies

Both included trials were two-arm parallel randomised controlled trials conducted in the USA (Baker 2014; Huang 2014a). The trials included a total of 49 women.

Sample characteristics

Baker 2014 included participants ranging in age from 22 to 79 years, with a median age of 58 years in the yoga group and 59 years in the comparison group. Huang 2014a required participants to be aged at least 40, resulting in a sample with a mean age of 61 years. Most participants in Baker 2014 were postmenopausal, while pregnancy during the past year was an exclusion criterion for Huang 2014a.

In Baker 2014, all participants had urge-predominant urinary incontinence. In Huang 2014a, 63% of participants had urge-predominant urinary incontinence and 37% of participants had stress-predominant urinary incontinence. Neither trial specified how urinary incontinence was diagnosed.

Interventions and comparators

The comparisons to yoga differed in the two trials. In Baker 2014, yoga was an active control for mindfulness-based stress reduction (MBSR), which was the intervention of interest. The yoga intervention was described as following the basic principles of yoga and focusing on asanas and relaxation. It did not include any postures or muscle contractions designed to treat incontinence. In Huang 2014a, which was a pilot study to determine the feasibility of a group-based yoga therapy intervention for women with urinary incontinence, a specially designed yoga program based on Iyengar yoga was compared to a wait-list control.

Outcomes

Both trials collected and reported information on improvement in incontinence, condition- or symptom-specific quality of life, daily episodes of incontinence, and other measures of emotional and social impact of incontinence. Huang 2014a reported additional information on daily micturitions and adverse events. Baker 2014 reported all outcomes other than improvement in incontinence using medians and ranges, and these data were not extracted for analysis.

Further details about participants, interventions, comparators and outcomes are provided in the Characteristics of included studies.

Excluded studies

We excluded four trials in which yoga was not an intervention. We excluded an additional article because it was not a primary study report but rather an editorial on an included study (Huang 2014a). Reasons for exclusion of the five records are provided in the Characteristics of excluded studies.

Risk of bias in included studies

Figure 3 and Figure 4 summarise the risk of bias of the included trials.

Figure 3. Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies.

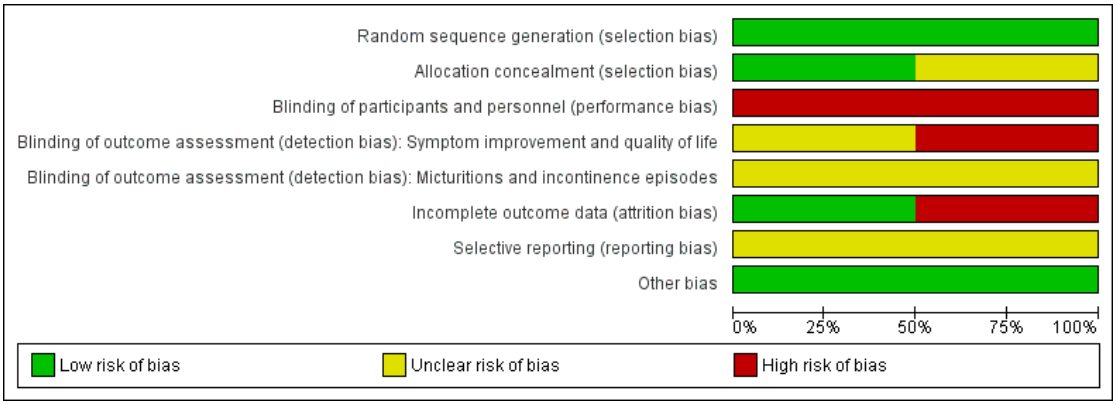
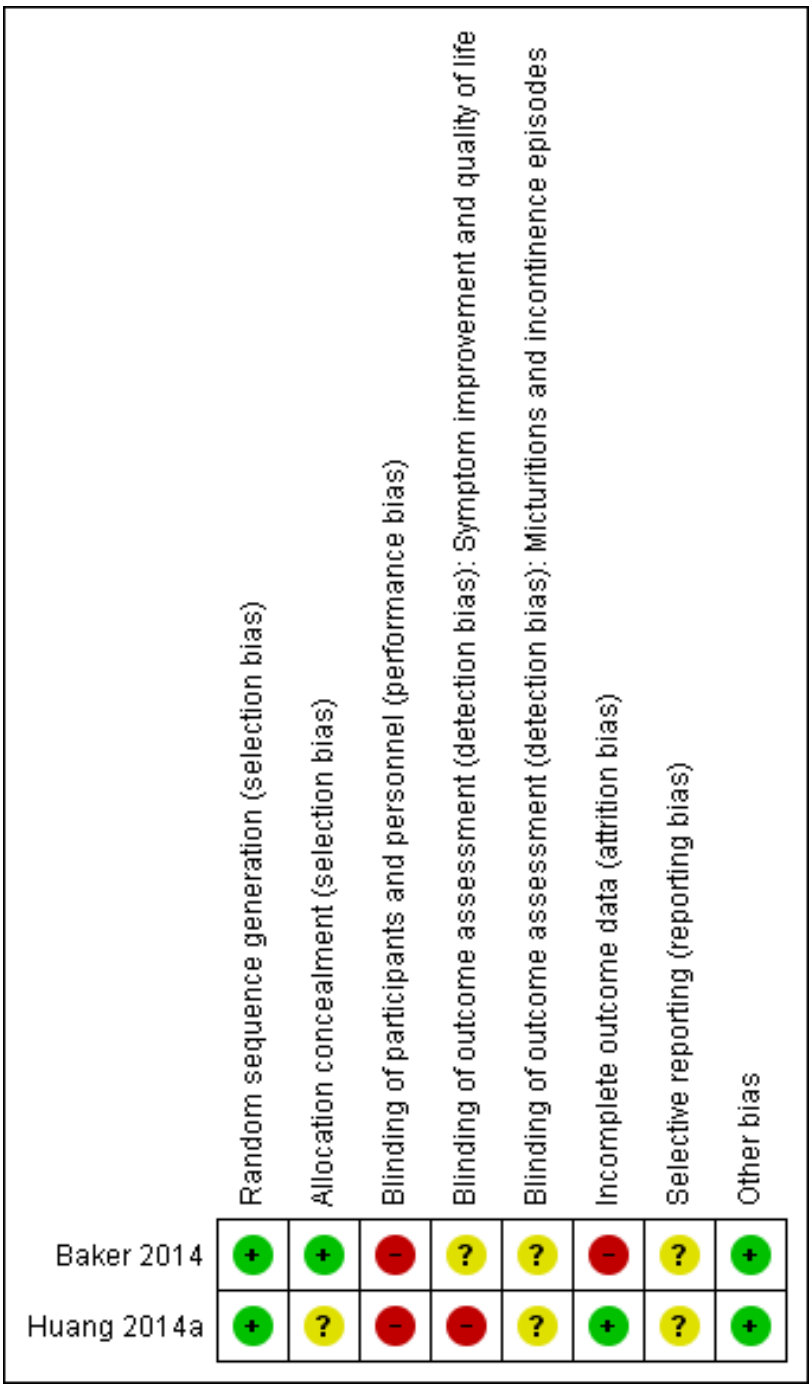


Figure 4. Risk of bias summary: review authors' judgements about each risk of bias item for each included study.



Allocation

We considered the risk of bias for random sequence generation to be low for one trial reporting that random sequence generation was carried out by computer (Huang 2014a). However, allocation concealment was not described, therefore we considered the risk of bias for allocation concealment to be unclear. In the other trial, the shuffling of 'security tint' envelopes containing the group assignment was used to generate the random sequence (Baker 2014). We therefore considered the risk of bias for both random sequence generation and allocation concealment to be low, given the processes followed.

Blinding

There was no indication in either study that participants and personnel were unaware of the intervention assignments and, given the nature of yoga interventions, we considered blinding to be highly unlikely. We therefore considered the risk of performance bias to be high in both studies. Because participants were not blinded and the control condition in Huang 2014a was a waiting list, we considered outcomes that relied upon participant judgement (e.g. overall improvement) to be at high risk of detection bias. We considered more objective outcomes that relied upon participant identification of events (e.g. diary recording of incontinence episodes) to be at unclear risk of detection bias, despite the use of masked assessors to extract diary data. In Baker 2014, both interventions were active and, because it is possible that the participants were unaware whether MBSR or yoga was the intervention of interest, we considered that the risk of detection bias was unclear for all outcomes.

Incomplete outcome data

In Baker 2014, there were high rates of loss to follow-up and, as the rates of loss to follow-up differed between groups and reasons for loss to follow-up were not described, we considered the study to be at high risk of attrition bias. In Huang 2014a, only one participant was lost to follow-up, and we considered the study to be at low risk of attrition bias.

Selective reporting

Both included studies were registered at ClinicalTrials.gov and reported primary outcomes consistent with the trial registration, but also reported secondary outcomes that were not included in the trial registration. We considered the risk of reporting bias to be unclear for both trials.

Other potential sources of bias

We identified no other potential sources of bias for either trial.

Effects of interventions

See: **Summary of findings for the main comparison** Yoga versus no specific active intervention; **Summary of findings 2** Yoga versus an active intervention

The two included trials compared yoga to a wait-list condition (one trial with 19 women) and to a mindfulness-based stress reduction (MBSR) intervention (one trial with 30 women). Neither trial included information on the number of women reporting continence, but both trials reported data on the number of women who reported improvement in urinary incontinence. Both trials also reported condition- or symptom-specific quality of life outcomes. Both trials reported on the change in number of episodes of incontinence, but neither trial reported data on clinical observations of clinical or anatomical functioning. The following results were reported.

Yoga versus no specific active intervention

One small trial (n = 19) compared the effects of a yoga intervention to a waiting list in women with urge-predominant urinary incontinence (n = 12) or stress-predominant urinary incontinence (n = 7) (Huang 2014a). All outcomes were measured at six weeks after randomisation, and all evidence was assessed as of very low certainty due to the very small sample size and lack of blinding of study participants, personnel and outcome assessors. See Summary of findings for the main comparison for a summary of the main results.

Primary outcome measures

Number of women who report they are cured (they no longer experience incontinence)

Not reported.

Number of women who report cure or improvement of urinary incontinence

Women were not asked directly whether their incontinence had been cured or improved but were asked whether they were satisfied with the change in urine leakage, which is an indirect measure of improvement of urinary incontinence. There was very low-certainty evidence that women in the yoga group were six times more likely than women in the wait-list group to be at least moderately

satisfied with the change in their urine leakage (risk ratio (RR) 6.33, 95% confidence interval (CI) 1.44 to 27.88; Analysis 1.1).

Urinary incontinence condition- or symptom-specific quality of life

There was very low-certainty evidence of no difference between the yoga and wait-list groups in quality of life as measured on the Incontinence Impact Questionnaire Short Form (IIQ-7) (mean difference (MD) 1.74, 95% CI -33.02 to 36.50; Analysis 1.2). At baseline, the yoga group had lower mean scores on the IIQ-7 and, after adjusting for the baseline scores, the difference in changes between groups was in the opposite direction favouring the wait-list group, but there was still no difference between groups (MD -27.70, 95% CI -66.80 to 11.40; Analysis 1.3).

Secondary outcome measures

Number of micturitions (daily)

There was very low-certainty evidence of little or no difference in the frequency of total daily micturitions between groups (MD -0.77, 95% CI -2.13 to 0.59; Analysis 1.4). At baseline, the yoga group had a slightly higher mean number of total daily micturitions compared to the wait-list group and, after the analysis adjusted for baseline micturitions, the difference in changes between groups was further reduced (MD -0.12, 95% CI -1.73 to 1.49; Analysis 1.5).

Number of episodes of incontinence (daily)

There was very low-certainty evidence of a greater reduction in the yoga group compared to the wait-list group in the frequency of total daily episodes of incontinence (MD -1.57, 95% CI -2.83 to -0.31; Analysis 1.6). After adjusting for baseline outcome levels, the difference between groups was consistent with the unadjusted analysis (MD -1.40, 95% CI -2.79 to -0.01; Analysis 1.7).

Urine loss as measured with a pad or paper towel weight test

Not reported.

Symptoms as reported by study participants on any condition-specific scale

Not reported.

Clinical assessment of presence of incontinence

Not reported.

Measurement of pelvic floor muscle function

Not reported.

Quality of life measured on a scale that is not condition- or symptom-specific

Not reported.

Depression, anxiety or distress

Not reported.

Other measures of emotional and social impact of the disorder

There was very low-certainty evidence of a greater reduction in the yoga group compared to the wait-list group in the subjective bothersomeness of incontinence symptoms as measured on the Urogenital Distress Inventory 6 (UDI-6) (MD -0.90, 95% CI -1.46 to -0.34; Analysis 1.8). After adjusting for baseline outcome levels, the difference between groups was nearly identical to the unadjusted analysis (MD -0.90, 95% -1.40 to -0.40; Analysis 1.9).

Adverse effects

There was very low-certainty of no evidence of a difference between yoga and wait-list groups in the number of women who experienced one or more adverse events (risk difference (RD) 0.00, 95% CI -0.38 to 0.38; Analysis 1.10).

Yoga versus an active intervention

One small trial (n = 30) compared the effects of a yoga intervention to a mindfulness-based stress reduction (MBSR) intervention in women with urgency urinary incontinence (Baker 2014). The yoga intervention was conceived as an active control for the MBSR intervention, which was the treatment of interest. The yoga intervention did not include any postures, techniques or instructions intended to improve bladder control or reduce incontinence. All outcomes were measured at eight weeks, six months and one year and were reported in the publication as medians and ranges, likely due to highly skewed data and a small sample size, with the exception of the number of women reporting improvement in incontinence. We extracted data on improvement in incontinence into Review Manager 5; all other data reported below are as presented in the study publication. We assessed all evidence as of very low certainty due to the very small sample size, lack of blinding (i.e. performance bias), attrition bias and indirectness (i.e. the yoga intervention was not an intervention designed to improve incontinence). See Summary of findings 2 for a summary of the main results.

Primary outcome measures

Number of women who report they are cured (they no longer experience incontinence)

Not reported.

Number of women who report cure or improvement of urinary incontinence

There was very low-certainty evidence of no difference between women in the MBSR group and women in the yoga group in improvement in incontinence, as measured on the Patient Global Impression of Improvement (PGI-I) at eight weeks (RR 0.09, 95% CI 0.01 to 1.43; Analysis 2.1); six months (RR 0.20, 95% CI 0.03 to 1.42; Analysis 2.2); and one year (RR 0.22, 95% CI 0.03 to 1.53; Analysis 2.3).

Urinary incontinence condition- or symptom-specific quality of life

There was very low-certainty evidence that women in the MBSR group had greater improvement in urinary incontinence-specific quality of life compared to women in the yoga group, as measured on the Overactive Bladder Health-Related Quality of Life (OAB-HRQL) scale. The median per cent improvement at eight weeks was 8.70 in the yoga group (interquartile range (IQR) 1.75 to 20.59, n = 11) and 29.27 in the MBSR group (IQR 8.11 to 93.33, n = 13; reported P value = 0.03). The median per cent improvement at six months was 8.0 in the yoga group (IQR 5.17 to 17.39, n = 10) and 43.90 in the MBSR group (IQR 2.92 to 84.62, n = 10; reported P value = 0.38). The median per cent improvement at one year was 13.04 in the yoga group (IQR 10.34 to 20.75, n = 9) and 36.09 in the MBSR group (IQR 4.55 to 79.76, n = 12; reported P value = 0.52). The trialists carried out intention-to-treat (ITT) analyses in which baseline values were carried forward for missing participants and results of the ITT analyses were consistent with the results of the analyses of women who completed the study.

Secondary outcome measures

Number of micturitions (daily)

Not reported.

Number of episodes of incontinence (daily)

There was very low-certainty evidence that women in the MBSR group had a greater reduction in number of daily urinary incontinence episodes compared to women in the yoga group at each outcome assessment time. The median per cent improvement at eight weeks was -33.33 in the yoga group (IQR -50.00 to 16.67, n = 11) and -60 in the MBSR group (IQR -88.89 to -50.00, n = 13; reported P value = 0.03). The median per cent improvement at six months was -22.62 in the yoga group (IQR -50.00 to -16.67, n = 10) and -71.43 in the MBSR group (IQR -100.00 to -40.00, n = 10; reported P value = 0.01). The median per cent improvement at one year was -41.67 in the yoga group (IQR -66.67 to -28.57, n = 9) and -69.11 in the MBSR group (IQR -91.43 to -49.17, n = 12; reported P value = 0.04). The trialists carried out ITT analyses in which baseline values were carried forward for missing participants and the results of the ITT analyses were consistent with the results of the analyses of women who completed the study.

Urine loss as measured with a pad or paper towel weight test

Not reported.

Symptoms as reported by study participants on any condition-specific scale

Not reported.

Clinical assessment of presence of incontinence

Not reported.

Measurement of pelvic floor muscle function

Not reported.

Quality of life measured on a scale that is not condition- or symptom-specific

Not reported.

Depression, anxiety or distress

Not reported.

Other measures of emotional and social impact of the disorder

There was very low-certainty evidence that women in the MBSR group had greater reductions in bothersomeness compared to women in the yoga group, as measured on the Overactive Bladder Symptom and Quality of Life-Short Form (OABq-SF). The score from this six-item scale is transformed into a 0-to-100 scale in which higher scores reflect greater bother and impact. The median per cent change at eight weeks was -25.0 in the yoga group (IQR -35 to 20, n = 11) and -55.6 in the MBSR group (IQR -50 to -87, n = 13; reported P value = 0.005). The median per cent improvement at six months was -25 in the yoga group (IQR -30 to -11.67,

n = 10) and -54.13 in the MBSR group (IQR -66.67 to 0, n = 10; reported P value = 0.13). The median per cent improvement at one year was -35.29 in the yoga group (IQR -50 to -8.33, n = 9) and -73.91 in the MBSR group (IQR -80 to -9.52, n = 12; reported P value = 0.14). The trialists carried out ITT analyses in which baseline values were carried forward for missing participants and the results of the ITT analyses were consistent with the results of the analyses of women who completed the study.

Adverse effects

Not reported.

Yoga plus an intervention versus the same intervention without yoga

We did not find any eligible trials for this comparison.

Sensitivity analyses

We planned to assess the robustness of our conclusions by excluding studies that we judged to have a high risk of bias from our meta-analyses for the primary outcomes. However, only a single study was included for each comparison.

For one included study, both available-case and imputed data were reported but we were unable to extract data from any analyses into Review Manager 5. We have reported both available-case and imputed analysis information from the study publication.

For the other study, we extracted information for analyses adjusted for outcomes at baseline and included this sensitivity analysis in the reporting of results from the study.

ADDITIONAL SUMMARY OF FINDINGS *[Explanation]*

Yoga compared with mindfulness-based stress reduction (MBSR) for urinary incontinence in women

Patient or population: women with urge-predominant urinary incontinence
Settings: community
Intervention: yoga
Comparison: mindfulness-based stress reduction (MBSR)

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No. of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	MBSR	Yoga				
Number of women who report they are cured (they no longer experience urinary incontinence)	-	-	-	-	-	The study did not report this outcome.
Number of women who report cure or improvement of urinary incontinence at short term (8 weeks)	**461 per 1000**	**42 per 1000** (5 to 660)	**RR 0.09** (0.01 to 1.43)	24 (1 study)	⊕◯◯◯ **very low**[1,2,3]	
Urinary incontinence condition- or symptom-specific quality of life at short term (8 weeks) Measured by the Overactive Bladder Health-Related Quality of Life (OAB-HRQL) scale (higher per cent im-	-	-	-	-	⊕◯◯◯ **very low**[1,2,3]	The study reported medians and IQR, therefore we could not extract data for meta-analysis. The authors reported that the median per cent improvement at 8 weeks was 8.70 (IQR 1.75 to 20.59)

provement = better)					in the yoga group (n = 11) and 29.27 (IQR 8.11 to 93.33) in the MBSR group (n = 13) (reported P value = 0.03)
Number of micturitions (daily)	-	-	-	-	The study did not report this outcome.
Number of episodes of incontinence (daily) at short term (8 weeks)	-	-	-	- ⊕◯◯◯ **very low**[1,2,3]	The study reported medians and IQR, therefore we could not extract data for meta-analysis. The authors reported that the median per cent improvement at 8 weeks was -33.33 (IQR -50.00 to 16.67) in the yoga group (n = 11) and -60 (IQR -88.89 to -50.00) in the MBSR group (n = 13) (reported P value = 0.03)
Bothersomeness of symptoms at short term (6 weeks) Measured by the Overactive Bladder Symptom and Quality of Life-Short Form (OABq-SF) (lower = better)	-	-	-	- ⊕◯◯◯ **very low**[1,2,3]	The study reported medians and IQR, therefore we could not extract data for meta-analysis. The authors reported that the median per cent change at 8 weeks was -25.0 (IQR -35 to 20) in the yoga group (n = 11) and -55.6 (IQR -50 to -87) in the MBSR

						group (n = 13) (reported P value = 0.005)
Adverse effects	-	-	-	-	-	The study did not report on adverse effects.

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).
CI: confidence interval; **IQR:** interquartile range; **RR:** risk ratio

GRADE Working Group grades of evidence
High certainty: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate certainty: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low certainty: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low certainty: We are very uncertain about the estimate.

[1]Downgraded two levels for risk of bias because there was no blinding of participants or providers (risk of performance bias), and there was a high percentage of loss to follow-up that was unbalanced across study arms (risk of attrition bias).
[2]Downgraded one level for indirectness because the yoga intervention was not designed to treat urinary incontinence.
[3]Downgraded one level for imprecision (< 400 participants).

DISCUSSION

Summary of main results

We identified two small, short-term studies examining yoga for women with incontinence for inclusion in the review. One study compared six weeks of yoga to a waiting list in women with either urgency or stress urinary incontinence (Huang 2014a), while the other study compared eight weeks of MBSR to a yoga intervention in women with urgency urinary incontinence (Baker 2014). Comparisons between yoga and a waiting list generally favoured the yoga intervention, while comparisons between MBSR and yoga generally favoured the MBSR intervention. However, both studies were very small and had issues related to risk of bias. We did not find any trials that compared yoga plus an intervention against the same intervention without yoga. Consequently, there was insufficient information to draw conclusions about whether yoga is effective in treating either urgency or stress urinary incontinence in women. We identified no potentially relevant economic evaluations.

Overall completeness and applicability of evidence

The included studies involved women with a minimum frequency of urinary incontinence. One study included women with urgency urinary incontinence (Baker 2014). Huang 2014a included women with either urgency or stress urinary incontinence, although the majority had urgency incontinence. The study comparing yoga to MBSR was designed to test the effects of MBSR, with yoga as an active control arm that was not intended to improve incontinence. Both studies provided short-term interventions of eight weeks or less, and although one study followed participants for one year after randomisation (Baker 2014), there was substantial attrition from both study arms at all outcome assessment times. There is very limited evidence on the short- or long-term effectiveness of yoga compared to no intervention or MBSR, and a lack of evidence concerning yoga compared to other active interventions or as an adjunct to active interventions.

Quality of the evidence

Study limitations (risk of bias)

We identified no serious concerns about randomisation, allocation concealment or selective reporting. Both studies were unblinded and were therefore susceptible to performance bias. In Huang 2014a, all outcomes were self-assessed and we therefore judged this study to be at risk of detection bias due to outcome assessment by unblinded participants. While Baker 2014 also relied upon participant-assessed outcomes, the study had two active intervention groups, which may have mitigated bias resulting from outcome assessment by unblinded participants. However, Baker 2014 had high levels of attrition, which varied between study groups, at each outcome assessment time. We downgraded the certainty of the evidence from Huang 2014a once for risk of performance bias and once for risk of detection bias, and downgraded the certainty of the evidence from Baker 2014 once for risk of performance bias and once for risk of attrition bias.

Consistency

As there was only one study for each comparison, consistency could not be assessed.

Indirectness

There was no indirectness in Huang 2014a. The study comparing MBSR and yoga included yoga as an 'active' control group for MBSR, which was the intervention of interest (Baker 2014). The yoga intervention was a restorative yoga programme that was not designed to improve incontinence. We therefore downgraded the certainty of the evidence for each outcome from Baker 2014 for indirectness.

Imprecision

The studies were very small, therefore we downgraded the certainty of the evidence from both studies once for imprecision.

Publication bias

We consulted with experts, handsearched conference proceedings, and searched trial registers and identified no additional unpublished studies aside from a recently completed trial, which we will assess for inclusion when the authors publish the results in full. We did not downgrade the certainty of the evidence for publication bias.

We downgraded the certainty of the evidence for each outcome in the comparison of yoga to a waiting list to very low (Huang 2014a). We downgraded the evidence one level due to risk of performance bias, one level due to risk of detection bias and one level due to imprecision. We downgraded the certainty of the evidence for each outcome in the comparison of yoga to MBSR to very low (Baker 2014). We downgraded the evidence one level due to risk of performance bias, one level due to risk of attrition bias, one level due to indirectness and one level due to imprecision.

Potential biases in the review process

The Cochrane Incontinence Specialised Register and the Cochrane Complementary Medicine Field Specialised Register

draw upon multiple sources of trials and we believe that our searches of these registers, together with searches of trial registers, identified all existing relevant trials. However, we cannot rule out that searches of additional specialised databases might have identified additional trials.

Agreements and disagreements with other studies or reviews

There are no other systematic reviews focusing on yoga for incontinence in women. We found one systematic review of non-surgical treatments for incontinence in women that mentioned yoga and identified the same two trials that are included in this review (AHRQ 2018). The review grouped yoga with other interventions such as education, biofeedback, electroacupuncture and weight loss into the category of behavioural interventions, and did not report conclusions specific to yoga.

AUTHORS' CONCLUSIONS

Implications for practice

Comparisons between yoga and a waiting list generally favoured the yoga intervention, while comparisons between mindfulness-based stress reduction (MBSR) and yoga generally favoured the MBSR intervention, based on studies with very low-certainty evidence. However, the limited number and size of studies prevented us from drawing any firm conclusions about the effectiveness of yoga for treating incontinence in women. Regarding safety, the included trial that assessed adverse events found very low-certainty of no evidence of a difference between yoga and wait-list groups in the number of women who experienced one or more non-serious adverse events (Huang 2014a). This is consistent with previous evidence from observational studies and randomised trials indicating that yoga is a relatively safe practice (Cramer 2013; Cramer 2015). Consequently, if women wish to try yoga for treating incontinence, it may be safe for them to do so but there is no reliable evidence for its effectiveness.

Implications for research

There is a need for additional well-conducted trials with sufficient sample sizes to determine the effectiveness of yoga as a primary or adjunct intervention for urinary incontinence in women. Future trials should either compare yoga to an active intervention that is supported by good evidence, such as pelvic floor muscle training, or compare yoga plus such active interventions to those interventions alone. It should also be noted that the available trials were conducted primarily in women with urge-predominant urinary incontinence, which is less common than stress-predominant urinary incontinence (Milsom 2017). Further research should therefore include women with stress-predominant urinary incontinence. Finally, the outcomes of greatest relevance to women, including cure, improvement in symptoms, quality of life, and adverse effects, should be clearly and completely reported, together with clinician's observations and economic measures. Until such additional studies are conducted, it will not be possible to judge the effectiveness of yoga for urinary incontinence in women.

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* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Baker 2014

Methods	**Design:** parallel randomised controlled trial **Country:** USA **Setting:** study run through university but location of intervention delivery (e.g. clinic, community yoga studio) not specified
Participants	30 women with urge-predominant urinary incontinence **Types of incontinence:** all women had urge-predominant UI **Diagnostic criteria for incontinence:** not specified **Severity and duration of incontinence:** at baseline, the 3-day average number of UI episodes for yoga participants was median 2.67 (range 1.67 to 6.33) and for MBSR participants was median 3.00 (1.67 to 9.33) **Age:** yoga median age 58 (range 22 to 79) years; MBSR median age 59 (range 34 to 74) years **Pregnant/postpartum/menopausal status:** "most were postmenopausal" **Weight:** BMI range 20.34 to 36.15 kg/m²; yoga median 25.82 (range 20.90 to 36.15) kg/m²; MBSR median 26.15 (range 20.34 to 33.22) kg/m² **Recruitment:** radio and newspaper within the community and poster advertisements at the university hospital, outpatient clinics and campus sites **Inclusion criteria:** "[W]omen aged 18 years or older who had 5 or more UUI episodes, with urge predominance (urge >50% of total incontinent episodes), on a 3-day voiding diary." **Exclusion criteria:** "...anticholinergic medication use within 2 weeks of baseline assessments and past nonpharmacologic treatment of UUI such as supervised behavioral therapy, supervised or unsupervised physical therapy, supervised biofeedback transvaginal electrical stimulation, tibial nerve stimulation, sacral neuromodulation, and botulinum toxin bladder injections. Women were also excluded if they had a past diagnosis of painful bladder, interstitial cystitis, and/or neurological disorder."
Interventions	**Yoga group:** 8 weekly yoga classes following "basic principles of yoga" and focusing on physical poses and relaxation. "Information was given on restorative yoga that emphasized the use of gravity, props, and floor poses for muscle relaxation. No education was given on breathing techniques in this yoga control program. Class time was also spent on education about the 7 chakras, self-massage, and essential oils and how they can also assist in muscle relaxation." **Teacher(s):** the classes were taught by a certified massage therapist/yoga instructor **Home practice:** not described **Mindfulness-based stress reduction (MBSR) group:** 8 weekly group meetings following the traditional protocol of the Center for Mindfulness at the University of Massachusetts Medical Center. "The 8-week MBSR program is a structured program that teaches participants a variety of meditation practices, mindful-yoga, walking meditation, and discussions on the relationship between stress, illness, and health." **Teacher(s):** the classes were taught by a licensed occupational therapist with teacher training in mindfulness-based therapy **Home practice:** women were given 'A Mindfulness-Based Stress Reduction Workbook'

	and 15- to 30-minute tapes to listen to. Women were asked to record instances of formal and informal techniques used in home practice sessions. "On average, the participants did a structured practice 5 times/wk (range, <1-15.4 times/wk) and unstructured practice 9.7 times/wk (range, <1-22 times/wk)." **Adherence to yoga and comparison interventions:** 11/15 (73%) yoga participants and 13/15 (87%) MBSR participants completed at least 5 of 8 sessions **Common interventions:** women were asked not to seek any other incontinence treatment while participating in the study. No women received any of the usual treatments of UUI, including bladder education, fluid management, or pelvic floor muscle exercises. None of the group sessions focused on bladder control. **Co-interventions:** no mention of included or excluded co-interventions **Duration and follow-up:** interventions were provided for 8 weeks with follow-up visits at 6 and 12 months **Number of withdrawals, with reasons:** loss to follow-up in the yoga group was 4/15 (27%) at 8 weeks, 5/15 (33.3%) at 6 months and 6/15 (40%) at 1 year. Loss to follow-up in the MBSR group was 2/15 (13%) at 8 weeks, 5/15 (33.3%) at 6 months, and 3/15 (20%) at 1 year. It was not reported whether the women who did not complete follow-up included withdrawals from treatment. Reasons for loss to follow-up were not reported
Outcomes	**Participant report of continence or improvement.** Patient Global Impression of Improvement (PGI-I). Women self reported their overall impression of improvement, and the outcome was dichotomised as much better or very much better versus other responses. Information reported at 8 weeks, 6 months and 1 year **Condition- or symptom-specific quality of life.** Overactive Bladder Health-Related Quality of Life (OAB-HRQL). The OAB-HRQL score is obtained from summing the 13 items on the HRQL subscales of the Overactive Bladder Symptom and Health-Related Quality of Life Questionnaire (OAB-q). This score is transformed to a 0-to-100 scale in which higher scores reflect better quality of life. Median per cent change and IQR are reported at 8 weeks, 6 months and 1 year **Quantification of symptoms: number of incontinence episodes.** The 3-day average of incontinence episodes was collected from a diary. Median per cent change and IQR are reported at 8 weeks, 6 months and 1 year **Other measures of social or emotional impact of incontinence.** Bothersomeness, as measured on the Overactive Bladder Symptom and Quality of Life-Short Form (OABq-SF). The score from this 6-item scale is transformed to a 0-to-100 scale in which higher scores reflect greater bother and impact. Median per cent change and IQR are reported at 8 weeks, 6 months and 1 year **Other outcomes collected:** urge incontinence episodes, daytime voids, nighttime voids and pad use
Notes	**Adverse events:** no discussion of safety or adverse events **Measurement of expectations or treatment preferences at baseline:** none **Unpublished data:** Dr Jan Baker emailed LSW the statistical analysis report and details of the calculation and interpretation of the OAB-HRQL and the OABq-SF measures, including the questionnaire and scoring manual, on 27 September 2017. No unpublished baseline or outcome data were used in the review. **Funding:** university and government. "This study was funded by an unrestricted grant from the University of Utah and was also supported by the University of Utah Study

	Design and Biostatistics Center, with funding in part from the National Center for Research Resources and the National Center for Advancing Translational Sciences, National Institutes of Health, through grant 8UL1TR000105 (formerly UL1RR025764)."

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Randomisation was carried out by shuffling 'security tint' envelopes; the *Cochrane Handbook for Systematic Reviews of Interventions* indicates that shuffling envelopes corresponds to a low risk of bias for sequence generation. "Randomization was completed by block randomization at each of the 3 periods to maintain an equal number in each group. When an accurate count was obtained of women who signed the consent for participation in a group session, group assignments were placed in security envelopes and shuffled. Subjects were then allowed to pick an envelope. The envelope was opened in front of the research personnel and was noted on the randomization key along with the subjects' study number. This randomization key was then placed in a sealed envelope. The randomization key was given to the data manager and was noted as either group 1 or group 2 on the data spread sheet. The statistician was given the randomization key."
Allocation concealment (selection bias)	Low risk	"When an accurate count was obtained of women who signed the consent for participation in a group session, group assignments were placed in security envelopes and shuffled. Subjects were then allowed to pick an envelope."
Blinding of participants and personnel (performance bias) All outcomes	High risk	All participants and personnel were aware of the interventions being delivered. Study personnel may have been aware that MBSR was the intervention of interest and yoga considered an active control condition
Blinding of outcome assessment (detection bias) Symptom improvement and quality of life	Unclear risk	All outcomes were assessed by the participants themselves, who were not blinded to the interventions. However, since both interventions were active, it is unclear to

Baker 2014 (*Continued*)

		what extent this may have biased outcome assessment
Blinding of outcome assessment (detection bias) Micturitions and incontinence episodes	Unclear risk	All outcomes were assessed by the participants themselves through diary entries, and the participants were not blinded to the interventions. However, since both interventions were active, it is unclear to what extent this may have biased outcome assessment
Incomplete outcome data (attrition bias) All outcomes	High risk	There were high rates of loss to follow-up, and rates differed between groups. Loss to follow-up in the yoga group was 4/15 (27%) at 8 weeks, 5/15 (33.3%) at 6 months, and 6/15 (40%) at 1 year. Loss to follow-up in the MBSR group was 2/15 (13%) at 8 weeks, 5/15 (33.3%) at 6 months, and 3/15 (20%) at 1 year. Reasons for loss to follow-up are not described
Selective reporting (reporting bias)	Unclear risk	Study was registered and the primary and secondary outcomes from the trial registration are reported. However, only 2 of the secondary outcomes reported in the article are listed in the protocol
Other bias	Low risk	Groups were comparable on baseline characteristics and the study appeared to be free of conflicts of interest related to funding

Huang 2014a

Methods	**Design:** parallel randomised controlled trial **Country:** USA **Setting:** study run through university but location of intervention delivery (e.g. clinic, community yoga studio) not specified
Participants	19 women with either stress or urgency urinary incontinence **Types of incontinence:** urgency-predominant: all 12/19 (63%); yoga 6/10 (60%); control 6/9 (67%). Stress-predominant: all 7/19 (37%); yoga 4/10 (40%); control 3/9 (33%) **Diagnostic criteria for incontinence:** not specified **Severity and duration of incontinence:** total incontinence episodes/day (based on 7-day voiding diary) at baseline: yoga mean (SD) 2.77 (1.3); control mean (SD) 2.16 (1.2). Duration of incontinence not specified, but duration of 3 months or longer was an inclusion criterion **Age:** yoga mean (SD) age 60.5 (8.4) years; control mean (SD) age 62.4 (8.3) years **Pregnant/postpartum/menopausal status:** pregnancy in the last year was an exclusion

	criterion; menopausal status was not reported **Weight:** yoga BMI mean (SD) 24.7 (2.7) kg/m²; control BMI mean (SD) 25.8 (3.8) kg/m² **Recruitment:** "combination of newspaper advertisements, flyers posted in local community centers and businesses, and direct recruitment from clinician offices." **Inclusion criteria:** "[W]omen had to be at least aged 40 years, report experiencing incontinence for at least 3 months, and document at least 7 episodes of incontinence on a screening 7-day voiding diary, with at least half of those episodes being stress-type or urgency-type incontinence." **Exclusion criteria:** "Women were excluded if they had severe mobility limitations that would prevent them from participating in a yoga therapy program (inability to walk up a single flight of stairs or at least 2 city blocks on level ground or an inability to stand up from a supine position unaided within 10 seconds) or if they reported formal yoga instruction within the past year or any prior use of yoga specifically to treat incontinence. Other exclusion criteria included pregnancy within the past 6 months; current urinary tract infection or hematuria (assessed by urine dipstick testing) or history of 3 or more urinary tract infections in the past year; major neurologic condition such as stroke, multiple sclerosis, or Parkinson disease; history of congenital defect leading to incontinence, fistula in the bladder or rectum, pelvic cancer or radiation, or interstitial cystitis or chronic pelvic pain; current symptomatic pelvic organ prolapse; body mass index greater than 35 kg/m2; or prior surgery to the urinary tract. Participants also could not have used practitioner-supervised behavioral, pharmacological, or other clinical treatments (e.g. pessary) for incontinence within the past 3 months or be planning to initiate new clinical incontinence treatments during the study."
Interventions	**Yoga group:** 90-minute Iyengar yoga classes were provided twice per week for 6 weeks. The class focus was on physical poses and relaxation. "Tadasana (mountain pose), Utkatasana (chair pose), Trikonasana (triangle pose), Malasana (squat pose), Viparita Karani Variation (legs up the wall pose), Salamba Set Bandhasana (supported bridge pose), Supta Baddha Konasana (reclined cobbler's pose), and Savasana (corpse pose). While teaching these postures, instructors emphasized specific ways of practicing each posture to foster awareness of the pelvic floor structures and increase control over the pelvic floor muscles, in addition to improving general fitness and conditioning and promoting mindfulness, deep breathing, and relaxation." **Teacher(s):** classes were taught by an experienced certified instructor and an assistant **Home practice:** "Participants were also instructed to practice yoga at home for at least 1 additional hour per week and to record the dates and duration of practice in a home yoga diary. Participants were given a limited set of yoga props (mat, belt, and block) to take home and a manual with written descriptions and pictures depicting each of the key yoga postures featured in the classes. Tips on how to practice each posture safely and comfortably and how to adapt each posture to improve incontinence and pelvic floor function were also provided in the manual." **Wait-list control group: "**Women randomized to the control group did not attend group yoga therapy classes and were instructed to avoid outside yoga instruction for 6 weeks. At the end of the 6-week study, control group participants were given a $180 gift certificate for yoga classes at a local yoga studio and a limited set of home yoga props (block, mat, and strap) to take home." **Adherence to yoga and comparison interventions:** 9 (100%) women attended at least 1 group class, and 6/9 (67%) attended all group classes. 9 women (100%) completed at

	least 1 hour/week of home practice (self reported) **Common interventions:** women were given a pamphlet with standard education and behavioural management strategies for incontinence **Co-interventions:** no mention of included or excluded co-interventions **Duration and follow-up:** interventions were provided for 6 weeks, and there was a telephone call at 3 weeks and a clinic visit at 6 weeks **Number of withdrawals, with reasons:** "After the randomization, but before the start of the yoga therapy program, 1 yoga therapy participant dropped out of the study citing worsened health." No other women in either group withdrew or were lost to follow-up
Outcomes	**Participant report of continence or improvement.** Overall satisfaction with change in urine leakage was measured on a 5-point Likert scale, ranging from "very unsatisfied" to "very satisfied", dichotomised as "moderately satisfied" or more versus less than "moderately satisfied". Assessed at 6 weeks **Condition- or symptom-specific quality of life.** "Incontinence Impact Questionnaire Short Form (IIQ-7), a 7-item measure of the impact of incontinence on physical activities, emotional health, travel, and social relationships." The IIQ-7 is measured on a scale from 0 to 100, with higher scores indicating more negative impact of incontinence upon activities, relationships and feelings. Mean (SD) of change is reported at 6 weeks **Quantification of symptoms: number of micturitions.** The mean episodes/day of voiding in the toilet, as measured on a 7-day voiding diary. Mean (SD) of change is reported at 6 weeks **Quantification of symptoms: number of incontinence episodes.** The mean episodes/day of urinary incontinence, as measured on a 7-day voiding diary. Mean (SD) of change is reported at 6 weeks **Other measures of social or emotional impact of incontinence.** Bothersomeness, as assessed on the Urogenital Distress Inventory 6 (UDI-6) (a 6-item questionnaire that assesses subjective bother associated with incontinence-related symptoms). Scale is 0 to 100, with higher scores indicating more negative impact of incontinence upon activities, relationships and feelings. Mean (SD) of change is reported at 6 weeks **Other outcomes collected:** yoga adherence, yoga self efficacy, the Patient Perception for Bladder Condition (PPBC) ("a single-item questionnaire assessing the degree to which participants consider their bladder condition to be a problem"), stress incontinence episodes/day, urgency incontinence episodes/day, daytime incontinence, nighttime incontinence, daytime voids and nighttime voids
Notes	**Adverse events:** "During a 3-week telephone call and a 6-week clinic visit, coordinators asked participants about any negative changes in their health and recorded any reported negative changes as adverse events on standardized forms. Adverse events were considered 'serious adverse events' if they met the standard definition of resulting in death, disability, or hospitalization. Participants were also encouraged to call study staff to report any negative changes in their health between scheduled calls or visits." **Measurement of expectations or treatment preferences at baseline:** none **Unpublished data:** none **Funding:** university/non-profit. "This research was supported by a University of California San Francisco Osher Center for Integrative Medicine Pilot Award from the Mt Zion Health Fund." Investigators also report receiving support from the National Institutes of Health and the American Federation for Aging Research

Huang 2014a (*Continued*)

Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"Eligible participants were randomly assigned by a computer in a 1:1 ratio to participate in a 6-week group-based yoga therapy program (yoga therapy group) or receive no yoga instruction for 6 weeks followed by a gift certificate for local yoga studio classes (control group). Randomization was stratified by incontinence type (stress or stress-predominant vs urgency or urgency-predominant)."
Allocation concealment (selection bias)	Unclear risk	Although randomisation was carried out by computer, the exact procedures surrounding allocation were unclear
Blinding of participants and personnel (performance bias) All outcomes	High risk	Participants and providers were aware of treatment assignment
Blinding of outcome assessment (detection bias) Symptom improvement and quality of life	High risk	Participants self reported symptom improvement, bothersomeness and quality of life. They were not masked to their treatment assignments and the control condition was an inactive, waiting-list control
Blinding of outcome assessment (detection bias) Micturitions and incontinence episodes	Unclear risk	Participants recorded micturitions and incontinence episodes on 7-day diaries, and the data were abstracted by masked assessors. However, since the participants were aware of treatment assignment, it is possible that this affected their assessment and recording of micturition and incontinence episodes
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition from yoga group at follow-up was 10% (1/10), and there was no attrition from the control group
Selective reporting (reporting bias)	Unclear risk	Study appears to be free of selective reporting. The primary outcome was prespecified in the trial registration, however none of the reported secondary outcomes are mentioned in the trial registration

Huang 2014a (*Continued*)

Other bias	Low risk	Although groups were different on the IIQ-7 and in frequency of voiding in toilets at baseline, this is consistent with simple randomisation of a small sample. Funding is university, non-profit and government, and there is no indication of researcher bias. First author was previously funded by pharma, which is disclosed

BMI: body mass index
IQR: interquartile range
MBSR: mindfulness-based stress reduction
SD: standard deviation
UI: urinary incontinence
UUI: urgency urinary incontinence

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Burgio 2003	Not an intervention of interest
Burgio 2006	Not an intervention of interest
Felsted 2017	Not an intervention of interest
Wein 2015	Not a primary study report (i.e. editorial about study)
Wells 1999	Not an intervention of interest

Characteristics of studies awaiting assessment *[ordered by study ID]*

Huang 2018

Methods	**Design:** parallel randomised controlled trial **Country:** USA **Setting:** study run through university but location of intervention delivery (e.g. clinic, community yoga studio) not specified
Participants	50 women with at least daily urinary incontinence **Types of incontinence:** not reported **Diagnostic criteria for incontinence:** not reported

Huang 2018 (*Continued*)

	Severity and duration of incontinence: not reported **Age:** mean 65 (8) years (range 55 to 83 years) **Pregnant/postpartum/menopausal status:** age greater than 50 was an inclusion criterion; menopausal status was not reported **Weight:** not reported **Recruitment:** not reported **Inclusion criteria:** "[A]mbulatory women aged 50 years or older who reported at least daily UI, were not already engaged in yoga, and were willing to temporarily forgo using clinical UI treatments." **Exclusion criteria:** not reported
Interventions	**Yoga group:** twice-weekly Iyengar yoga classes were provided twice per week for 3 months. The class focus was on specialised Iyengar-style yoga techniques. **Teacher(s):** not reported **Home practice:** once weekly **Stretching control group:** "a non-specific muscle stretching/strengthening program designed to provide a rigorous time-and-attention control for the yoga program." **Adherence to yoga and comparison interventions:** 75% of women attended > 90% of group classes, and 88% of women completed > 90% of home practice hours. Adherence by group was not reported **Common interventions:** women were given a brief instruction and written information on behavioural management strategies for incontinence **Co-interventions:** no mention of included or excluded co-interventions **Duration and follow-up:** interventions were provided for 3 months, and outcomes were assessed at 3 months after baseline **Number of withdrawals, with reasons:** 6/56 (11%) of women withdrew. Withdrawals by group and withdrawal reasons were not reported
Outcomes	**Quantification of symptoms: number of incontinence episodes.** Change in mean episodes of urinary incontinence; how this was measured is not reported. Data for decrease in total UI frequency in the 2 groups are provided, together with P value for comparison between groups, but this cannot be used in a data analysis because the number of participants in each group is unclear **Other outcomes collected:** not reported
Notes	**Adverse events:** no discussion of safety or adverse events **Measurement of expectations or treatment preferences at baseline:** not reported **Unpublished data:** Dr Margaret Chesney emailed LSW a submitted conference abstract on 1 December 2017 **Funding:** not reported. Trial registration states that sponsors and collaborators are University of California, San Francisco and the National Center for Complementary and Integrative Health

UI: urinary incontinence

DATA AND ANALYSES

Comparison 1. Yoga versus no specific active intervention

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of women who report cure or improvement of urinary incontinence (at short term - 6 weeks)	1	18	Risk Ratio (M-H, Fixed, 95% CI)	6.33 [1.44, 27.88]
2 Urinary incontinence condition- or symptom-specific quality of life (at short term - 6 weeks)	1	18	Mean Difference (IV, Fixed, 95% CI)	1.74 [-33.02, 36.50]
3 Adjusted analysis for condition- or symptom-specific quality of life at short term (6 weeks)	1		Mean Difference (Fixed, 95% CI)	-27.7 [-66.80, 11. 40]
4 Number of micturitions (daily) (at short term - 6 weeks)	1	18	Mean Difference (IV, Fixed, 95% CI)	-0.77 [-2.13, 0.59]
5 Adjusted analysis for number of micturitions at short term (6 weeks)	1		Mean Difference (Fixed, 95% CI)	-0.12 [-1.73, 1.49]
6 Number of episodes of incontinence (daily) (at short term - 6 weeks)	1	18	Mean Difference (IV, Fixed, 95% CI)	-1.57 [-2.83, -0.31]
7 Adjusted analysis for number of incontinence episodes at short term (6 weeks)	1		Mean Difference (Fixed, 95% CI)	-1.4 [-2.79, -0.01]
8 Bothersomeness of symptoms (at short term - 6 weeks)	1	18	Mean Difference (IV, Fixed, 95% CI)	-0.90 [-1.46, -0.34]
9 Adjusted analysis for bothersomeness of symptoms at short term (6 weeks)	1		Mean Difference (Fixed, 95% CI)	-0.9 [-1.40, -0.40]
10 Adverse effects (at short term - 6 weeks)	1	18	Risk Difference (M-H, Fixed, 95% CI)	0.0 [-0.38, 0.38]

Comparison 2. Yoga versus an active intervention

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of women who report cure or improvement of urinary incontinence (at short term - 8 weeks)	1	24	Risk Ratio (M-H, Fixed, 95% CI)	0.09 [0.01, 1.43]

2 Number of women who report cure or improvement of urinary incontinence (at intermediate term - 6 months)	1	20	Risk Ratio (M-H, Fixed, 95% CI)	0.2 [0.03, 1.42]
3 Number of women who report cure or improvement of urinary incontinence (at long term - 1 year)	1	21	Risk Ratio (M-H, Fixed, 95% CI)	0.22 [0.03, 1.53]

CONTRIBUTIONS OF AUTHORS

LSW: searched for studies, screened studies, extracted data, and carried out GRADE assessments. Contributed to writing the review and approved the final draft.

NS: conceived the protocol, screened studies and extracted data. Contributed to writing the review and approved the final draft.

ZSL: screened studies, extracted data, and carried out GRADE assessments. Contributed to writing the review and approved the final draft

SP: conceived the protocol and screened studies. Contributed to writing the review and approved the final draft.

DC: contributed to writing the review and approved the final draft.

NS: screened studies, contributed to writing the review and approved the final draft.

DECLARATIONS OF INTEREST

LSW: none known.

NS: none known.

ZSL: none known.

SP: none known.

DC: none known.

NS: none known.

SOURCES OF SUPPORT

Internal sources

- No sources of support supplied

External sources

- National Institute for Health Research (NIHR), UK.

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- National Institutes of Health (NIH), USA.

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DIFFERENCES BETWEEN PROTOCOL AND REVIEW

1. We originally planned to use Covidence to extract study data but chose to use a piloted data extraction spreadsheet in Microsoft Excel 2018 for ease of use. However, we did use Covidence for study screening.

2. We originally planned to search all conference proceedings for European Congress for Integrative Medicine (ECIM) and International Congress on Complementary Medicine Research (ICCMR) but were unable to obtain ECIM proceedings for 2008 and 2010 or ICCMR proceedings for 2006 to 2009.

3. We originally planned to include the secondary outcomes of 'urine loss as measured with a pad or paper towel weight test' and 'quality of life measured on a scale that is not condition- or symptom-specific' in the 'Summary of findings' tables. However, as neither of the included studies reported these outcomes, we therefore chose to include the secondary outcomes of 'number of micturitions (daily)' and 'number of episodes of incontinence (daily)' in the 'Summary of findings' tables.