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Bladder training for treating overactive bladder in adults (Review)

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TABLE OF CONTENTS

[Intervention Review]

Bladder training for treating overactive bladder in adults

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ABSTRACT

Background

Overactive bladder (OAB) is a common chronic and bothersome condition. Bladder training is widely prescribed as a first-line treatment for OAB, but the efficacy has been systematically evaluated for urinary incontinence rather than OAB alone.

Objectives

To evaluate the benefits and harms of bladder training for treating adults with OAB compared to no treatment, anticholinergics, β3-adrenoceptor agonists, or pelvic floor muscle training (PFMT) alone or in combination.

Search methods

We used standard, extensive Cochrane search methods. The latest search date was 6 November 2022.

Selection criteria

We included randomized controlled trials involving adults aged 18 years or older with non-neurogenic OAB. We excluded studies of participants whose symptoms were caused by factors outside the urinary tract (e.g. neurologic disorders, cognitive impairment, gynecologic diseases).

Data collection and analysis

We used standard Cochrane methods. Our primary outcomes were 1. participant-reported cure or improvement, 2. symptom- and condition-related quality of life (QoL), and 3. adverse events. Secondary outcomes included 4. participant-reported satisfaction, 5. number of incontinence episodes, 6. number of urgency episodes, and 7. number of micturition episodes. For the purpose of this review, we considered two time points: immediately after the treatment (early phase) and at least two months after the treatment (late phase). We used GRADE to assess certainty of evidence for each outcome.

Main results

We included 15 trials with 2007 participants; participants in these trials were predominantly women (89.3%). We assessed the risk of bias of results for primary and secondary outcomes, which across all studies was similar and predominantly of high risk of bias, and none were at low risk of bias. The certainty of evidence was low to very low, with some moderate, across measured outcomes.

Bladder training versus no treatment: three studies involving 92 participants compared bladder training to no treatment. The evidence is very uncertain about the effects of bladder training on cure or improvement at the early phase (risk ratio (RR) 17.00, 95% confidence interval (CI) 1.13 to 256.56; 1 study, 18 participants; very low-certainty evidence). Bladder training may reduce the number of incontinence episodes (mean difference (MD) −1.86, 95% CI −3.47 to −0.25; 1 study, 14 participants; low-certainty evidence). No studies measured symptom- and

condition-related QoL, number of adverse events, participant-reported satisfaction, number of urgency episodes, or number of micturition episodes in the early phase.

Bladder training versus anticholinergics: seven studies (602 participants) investigated the effects of bladder training versus anticholinergic therapy. Bladder training may be more effective than anticholinergics on cure or improvement at the early phase (RR 1.37, 95% CI 1.10 to 1.70; 4 studies, 258 participants; low-certainty evidence). The evidence is very uncertain about the effects of bladder training on symptom- and condition-related QoL (standardized mean difference (SMD) −0.06, 95% CI −0.89 to 0.77; 2 studies, 117 participants; very low-certainty evidence). Although the evidence is very uncertain, there were fewer adverse events in the bladder training group than in the anticholinergics group (RR 0.03, 95% CI 0.01 to 0.17; 3 studies, 187 participants; very low-certainty evidence). The evidence is very uncertain about the effects of the number of incontinence episodes per 24 hours (MD 0.36, 95% CI −0.27 to 1.00; 2 studies, 117 participants; very low-certainty evidence), the number of urgency episodes per 24 hours (MD 0.70, 95% CI −0.62 to 2.02; 2 studies, 92 participants; very low-certainty evidence), and the number of micturition episodes per 24 hours (MD −0.35, 95% CI −1.90 to 1.20; 3 studies, 175 participants; very low-certainty evidence). No studies measured participant-reported satisfaction in the early phase.

Bladder training versus PFMT: three studies involving 203 participants compared bladder training to PFMT. The evidence is very uncertain about the different effects between bladder training and PFMT on symptom- and condition-related QoL at the early phase (SMD 0.10, 95% CI −0.19 to 0.40; 2 studies, 178 participants; very low-certainty evidence). There were no adverse events in either group at the early phase (1 study, 97 participants; moderate-certainty evidence). The evidence is uncertain about the effects of the number of incontinence episodes per 24 hours (MD 0.02, 95% CI −0.35 to 0.39, 1 study, 81 participants; low-certainty evidence) and very uncertain about the number of micturition episodes per 24 hours (MD 0.10, 95% CI −1.44 to 1.64; 1 study, 81 participants; very low-certainty evidence). No studies measured cure or improvement, participant-reported satisfaction, or number of urgency episodes in the early phase.

Although we were interested in studies examining bladder training versus β3-adrenoceptor agonists, in combination with β3-adrenoceptor agonists versus β3-adrenoceptor agonists alone, and in combination with PFMT versus PFMT alone, we did not identify any eligible studies for these comparisons.

Authors' conclusions

This review focused on the effect of bladder training to treat OAB. However, most of the evidence was low or very-low certainty. Based on the low- or very low-certainty evidence, bladder training may cure or improve OAB compared to no treatment. Bladder training may be more effective to cure or improve OAB than anticholinergics, and there may be fewer adverse events. There may be no difference in efficacy or safety between bladder training and PFMT. More well-designed trials are needed to reach a firm conclusion.

PLAIN LANGUAGE SUMMARY

Bladder training for treating overactive bladder in adults

What did we want to find out?

We wanted to compare the effectiveness of bladder training to other treatments for adults with overactive bladder (OAB).

Background

OAB is a common chronic condition involving daytime frequent urination, urination during sleep, and sudden urge to urinate with or without urinary incontinence (unintentional passing of urine). The disorder reduces quality of life and results in a significant economic burden on society. Bladder training is a behavioral therapy that establishes treatment goals and uses techniques to modify inappropriate responses to urinary urgency. The aim is to improve OAB symptoms by minimizing the frequent urge to urinate. Although clinical guidelines recommend bladder training to treat OAB, there is no review to evaluate the efficacy systematically.

What did we do?

We searched for studies that investigated bladder training in the following seven interventions: 1. compared to no treatment, 2. compared to medicines called anticholinergics, 3. compared to medicines called β3-adrenoceptor agonists, 4. compared to pelvic floor muscle training (PFMT; strengthening of the muscles around the bladder, anus, and vagina or penis), 5. in combination with anticholinergics versus anticholinergics alone, 6. in combination with β3-adrenoceptor agonists versus β3-adrenoceptor agonists alone, and 7. in combination with PFMT versus PFMT alone.

What did we find?

We found 15 eligible studies involving 2007 participants. Most participants were women. The studies compared bladder training to three comparisons: no treatment, anticholinergics, and PFMT in adults with OAB. No studies investigated the other four comparisons. Seven studies were publicly funded. Two studies received grants from drug companies. Six studies did not declare their funding sources.

Key results

Bladder training versus no treatment: bladder training may cure or improve OAB symptoms, but we are very uncertain about the results. Bladder training may reduce the number of incontinence episodes. We found no studies to help us answer our question on the other outcomes.

Bladder training versus anticholinergics: bladder training may cure or improve OAB symptoms more than anticholinergics. We do not know whether bladder training has an effect on the other outcomes, and we found no studies to help us answer our question on patient-reported satisfaction.

Bladder training versus PFMT: bladder training may make little to no difference to quality of life or the number of incontinence episodes per 24 hours. The only study that looked at side effects reported zero events. It is unclear if bladder training has an effect on urination episodes. We found no studies that measured the other outcomes.

What are the limitations of the evidence?

Most of the included studies were limited due to small numbers of participants and poor reporting of study details, which lead to uncertainty in the evidence. The evidence to date is insufficient to show the effectiveness of bladder training to treat OAB and more well-designed studies are needed to reach a firm conclusion.

How up to date is this review?

The evidence is up to date to 6 November 2022.

Summary of findings 1. Summary of findings table - Bladder training compared to no treatment for overactive bladder

Bladder training compared to no treatment for overactive bladder

Patient or population: overactive bladder
Setting: outpatient
Intervention: bladder training
Comparison: no treatment

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with no treatment	Risk with bladder training				
Participant-reported cure or improvement: immediately after treatment	0 per 1000	**0 per 1000** (0 to 0)	**RR 17.00** (1.13 to 256.56)	18 (1 RCT)	⊕⊖⊖⊖ Very low[a,b]	Although bladder training may result in cure or improvement of an overactive ladder, the evidence is very uncertain as it was based on only 1 study that is leading to very wide CIs.
Symptom- and condition-related quality of life: immediately after treatment	-			(0 studies)	-	
Number of any adverse events: immediately after treatment	-			(0 studies)	-	
Participant-reported satisfaction: immediately after treatment	-			(0 studies)	-	
Number of incontinence episodes per 24 hours: immediately after treatment	The mean number of incontinence episodes per 24 hours: immediately after treatment was **2.57**	MD **1.86 lower** (3.47 lower to 0.25 lower)	-	14 (1 RCT)	⊕⊕⊖⊖ Low[b]	Although bladder training may reduce the number of incontinence episodes, it was based on only 1 study with very wide CIs.
Number of urgency episodes per 24 hours: immediately after treatment	-			(0 studies)	-	

Number of micturition episodes per 24 hours: immediately after treatment	-		(0 studies)	-

*__The risk in the intervention group__ (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; **MD:** mean difference; **RR:** risk ratio

GRADE Working Group grades of evidence
High certainty: we are very confident that the true effect lies close to that of the estimate of the effect.
Moderate certainty: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low certainty: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect.
Very low certainty: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.

See interactive version of this table: https://gdt.gradepro.org/presentations/#/isof/isof_question_revman_web_423485434552773248.

[a] Downgraded one level due to risk of bias: high risk of bias in only one included study.
[b] Downgraded two levels due to imprecision: small sample size (fewer than 400 participants) with low number of events that is leading to very wide CIs.

Summary of findings 2. Summary of findings table - Bladder training compared to anticholinergics for overactive bladder

Bladder training compared to anticholinergics for overactive bladder

Patient or population: overactive bladder
Setting: outpatient
Intervention: bladder training
Comparison: anticholinergics

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with anticholinergics	Risk with bladder training				
Participant-reported cure or improvement: immediately after treatment	602 per 1000	**824 per 1000** (662 to 1000)	**RR 1.37** (1.10 to 1.70)	258 (4 RCTs)	⊕⊕⊖⊖ Low[a,b]	Bladder training may result in cure or improvement of an overactive bladder compared with anticholinergics.
Symptom- and condition-related quality of life: immediately after treatment	-	SMD **0.06 SD lower** (0.89 lower to 0.77 higher)	-	117 (2 RCTs)	⊕⊖⊖⊖ Very low[c,d,e]	The evidence is uncertain about the effect of bladder training on symptom-related quality of life compared with anticholinergics.

Number of any adverse events: immediately after treatment	434 per 1000	**13 per 1000** (4 to 74)	**RR 0.03** (0.01 to 0.17)	187 (3 RCTs)	⊕⊖⊖⊖ Very low[b,c]	The evidence is uncertain about the effect of bladder training on adverse events compared with anticholinergics.
Participant-reported satisfaction: immediately after treatment	-			(0 studies)	-	
Number of incontinence episodes per 24 hours: immediately after treatment	The mean number of incontinence episodes per 24 hours: immediately after treatment was **0.10 to 0.51**	MD **0.36 higher** (0.27 lower to 1 higher)	-	117 (2 RCTs)	⊕⊖⊖⊖ Very low[b,c,f]	The evidence is uncertain about the effect of bladder training on the number of incontinence episodes compared with anticholinergics.
Number of urgency episodes per 24 hours: immediately after treatment	The mean number of urgency episodes per 24 hours: immediately after treatment was **1.1 to 1.5**	MD **0.7 higher** (0.62 lower to 2.02 higher)	-	92 (2 RCTs)	⊕⊖⊖⊖ Very low[b,c]	The evidence is uncertain about the effect of bladder training on the number of urgency episodes compared with anticholinergics.
Number of micturition episodes per 24 hours: immediately after treatment	The mean number of micturition episodes per 24 hours: immediately after treatment was **6.3 to 11.3**	MD **0.35 lower** (1.9 lower to 1.2 higher)	-	175 (3 RCTs)	⊕⊖⊖⊖ Very low[b,c]	The evidence is uncertain about the effect of bladder training on the number of micturition episodes compared with anticholinergics.

*__The risk in the intervention group__ (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; **MD:** mean difference; **RR:** risk ratio; **SMD:** standardised mean difference

GRADE Working Group grades of evidence
High certainty: we are very confident that the true effect lies close to that of the estimate of the effect.
Moderate certainty: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low certainty: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect.
Very low certainty: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.

See interactive version of this table: https://gdt.gradepro.org/presentations/#/isof/isof_question_revman_web_423485506556390153.

[a] Downgraded one level due to risk of bias: overall high risk of bias in at least one study but less than half of the included studies.
[b] Downgraded one level due to imprecision: small sample size (fewer than 400 participants).
[c] Downgraded two levels due to risk of bias: overall high risk of bias in all included studies.

[d] Downgraded one level due to inconsistency: serious heterogeneity was shown visually.
[e] Downgraded two levels due to imprecision: small sample size (fewer than 400 participants) and the CIs were consistent with both benefit and harm.
[f] Downgraded one level due to inconsistency: there was statistical heterogeneity (I2 = 80%).

Summary of findings 3. Summary of findings table - Bladder training compared to pelvic floor muscle training (PFMT) for overactive bladder

Bladder training compared to pelvic floor muscle training (PFMT) for overactive bladder

Patient or population: overactive bladder
Setting: outpatients
Intervention: bladder training
Comparison: pelvic floor muscle training (PFMT)

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with pelvic floor muscle training (PFMT)	Risk with bladder training				
Participant-reported cure or improvement: immediately after treatment	-			(0 studies)	-	
Symptom-related quality of life: immediately after treatment	-	SMD **0.1 SD higher** (0.19 lower to 0.4 higher)	-	178 (2 RCTs)	⊕⊕⊖⊖ Low[a,b]	There may be no difference in symptom-related quality of life between bladder training and PFMT.
Number of adverse events: immediately after treatment	Not pooled	Not pooled	Not pooled	97 (1 RCT)	⊕⊕⊕⊖ Moderate[b]	Although there were 0 adverse events in either group, it was based on only 1 study.
Participant-reported satisfaction: immediately after treatment	-			(0 studies)	-	
Number of incontinence episodes per 24 hours: immediately after treatment	The mean number of incontinence episodes per 24 hours: immediately after treatment was **0.54**	MD **0.02 higher** (0.35 lower to 0.39 higher)	-	81 (1 RCT)	⊕⊕⊖⊖ Low[a,b]	There may be no difference in the number of incontinence episodes between bladder training and PFMT.

Number of urgency episodes per 24 hours: immediately after treatment	-			(0 studies)	-	
Number of micturition episodes per 24 hours: immediately after treatment	The mean number of micturition episodes per 24 hours: immediately after treatment was **9.6**	MD **0.1 higher** (1.44 lower to 1.64 higher)	-	81 (1 RCT)	⊕⊖⊖⊖ Very low[a,c]	The evidence is uncertain about the effect of bladder training on micturition episodes compared with PFMT.

*__The risk in the intervention group__ (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; **MD:** mean difference; **RR:** risk ratio; **SMD:** standardised mean difference

GRADE Working Group grades of evidence
High certainty: we are very confident that the true effect lies close to that of the estimate of the effect.
Moderate certainty: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
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Very low certainty: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.

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[a] Downgraded one level due to risk of bias: overall high risk of bias in at least one study but less than half of the included studies.
[b] Downgraded one level due to imprecision: small numbers of events (fewer than 400 participants).
[c] Downgraded two levels due to imprecision: small sample size (fewer than 400 participants) and the CIs were consistent with both benefit and harm.

BACKGROUND

For a glossary of terms used, see Appendix 1.

Description of the condition

Overactive bladder (OAB) is a common chronic condition associated with voiding dysfunction. The disorder reduces health-related quality of life (HRQoL) and results in a significant economic burden on society (Irwin 2011; Vaughan 2011).

According to the International Continence Society (ICS), OAB is defined as "urinary urgency, usually accompanied by increased daytime frequency and/or nocturia, with urinary incontinence (UI) (OAB-wet) or without (OAB-dry), in the absence of urinary tract infection or other detectable diseases" (Haylen 2010). OAB can be classified into two subtypes: OAB with UI (OAB-wet) and OAB without incontinence (OAB-dry). The pathophysiologic mechanisms contributing to OAB are categorized as neuropathic and non-neuropathic mechanisms, although there is a lack of conclusive evidence in this regard. Neurogenic mechanisms operate through the following pathways: supraspinal (e.g. Parkinson's disease), spinal (e.g. spinal cord injury), and peripheral nerve (e.g. diabetes mellitus) (Kennelly 2008). OAB that occurs in the absence of such neurogenic mechanisms is attributed to non-neurogenic pathology and the contributory pathophysiologic mechanisms remain unclear.

Depending on the definition of OAB, the estimated prevalence of OAB varies from 11.8% to 35.6% across studies (Coyne 2011; Irwin 2006; Milsom 2001; Stewart 2003). However, most observe that the prevalence of OAB increases with age. One study reported that the prevalence of OAB among people from Asia was lower than that in other races in both men and women (Coyne 2012), while another reported an increase in the global prevalence of OAB, particularly in low- and middle-income countries within Africa, South America, and Asia (Irwin 2011).

The symptoms of OAB have a significant negative impact on a patient's physical, social, and emotional well-being and thus OAB is considered a major public health concern, with one study reporting that OAB might significantly diminish HRQoL (Vaughan 2011). In addition, OAB results in a notable economic burden on society. The EPIC study reported that the estimated total expenditure on OAB in six Western countries included in the study was EUR 9.7 billion in 2005 (Irwin 2009). As stated above, the prevalence of OAB is increasing in an aging society and the economic burden is expected to become a more serious issue.

Description of the intervention

Treatment options for OAB include lifestyle interventions, behavioral therapy, pharmacotherapy, onabotulinum toxin A administration, peripheral tibial nerve stimulation, sacral neuromodulation, and surgery (Corcos 2017; Lightner 2019). The American Urology Association (AUA) guidelines recommend behavioral therapy as the first-line treatment for OAB and pharmacotherapy as the second-line treatment (Lightner 2019). Compared with antimuscarinics, behavioral therapy is associated with a lower risk of adverse events (Rai 2012). This is a significant advantage because OAB is a benign condition. Occasionally, behavioral intervention and pharmacotherapy are used in combination to provide an additive effect.

Bladder training (sometimes called 'bladder drill', 'bladder retraining', or 'bladder re-education') is one component of behavioral therapy for OAB that can help by minimizing the frequent urge to urinate. Although bladder training has no standardized definition or standardized administration, this review defined bladder training to include the following components (Fantl 1996).

- **Patient education:** explaining the mechanism of bladder action and voiding function to enable patients to gain a better understanding of their excretory function.
- **Scheduled voiding:** training to void at fixed voiding intervals while awake, which progressively lengthens as successful control is achieved.
- **Positive reinforcement:** psychological support to patients to encourage them to continue the practice.

Despite the similarity in the basic framework, treatment protocols often differ, particularly with respect to where the intervention is delivered (such as outpatient, inpatient, and home environments). Bladder training is usually provided directly by healthcare providers, although pamphlets, educational materials, or information and communication technology (ICT) are occasionally used. It can be performed as either individual or group therapy. The duration of the therapy can vary, but is usually recommended for eight to 12 weeks (Lightner 2019).

How the intervention might work

Bladder training in people with OAB helps to control urgency by diverting their attention (e.g. performing mental arithmetic or pelvic floor muscle contractions) and helping them to relax (e.g. with deep breathing activities), and gradually prolonging the voiding interval by 15 minutes (Nygaard 2010). Eventually, the patient may be able to void every three to four hours without the frequent urge to urinate.

Although the mechanism of action remains unclear, the specific goals of bladder training are to adjust habit patterns of frequent urination, improve control over bladder urgency, prolong voiding intervals, increase bladder capacity, reduce incontinent episodes, and restore patient confidence in controlling bladder function (Bo 2017).

Bladder training is occasionally combined with other therapies, such as pelvic floor muscle training (PFMT) and pharmacotherapy, for an additive effect. In clinical practice, bladder training and PFMT are prescribed in combination and European Association of Urology (EAU) guidelines introduced both therapies as "behavioural and physical therapies" (Nambiar 2018). Pharmacotherapy, especially anticholinergics, is also combined with bladder training in clinical practice; AUA guidelines recommend the combination, but the evidence is of low quality (Lightner 2019).

Why it is important to do this review

Although several systematic reviews have discussed bladder training for UI and limited evidence has suggested its effectiveness (Roe 2007; Shamliyan 2008; Wallace 2004), few have assessed this intervention for OAB. Despite the clinical overlap, OAB does not necessarily accompany UI and the symptoms associated with both conditions can range in severity from mild (OAB) to moderate-

to-severe (UI). Therefore, it is appropriate to investigate the effectiveness of bladder training in people presenting with OAB.

OBJECTIVES

To evaluate the benefits and harms of bladder training for treating adults with OAB compared to no treatment, anticholinergics, β3-adrenoceptor agonists, or pelvic floor muscle training (PFMT) alone or in combination.

METHODS

Criteria for considering studies for this review

Types of studies

We included randomized controlled trials (RCTs) assessing bladder training in adults with non-neurogenic OAB. We also included cross-over RCTs and cluster-RCTs. For randomized cross-over trials, we used data from the first period of treatment only. We included studies that use the terms 'bladder drill', 'bladder retraining', or 'bladder re-education'.

We excluded quasi-RCTs as their method of randomization leaves these studies open to a high risk of selection bias.

Types of participants

We included studies of adults (aged over 18 years, or according to the study authors' definition of 'adult') with non-neurogenic OAB. We also included studies of urge urinary incontinence (UUI) and detrusor instability (DI) as OAB because the three are not clearly distinguishable disease concepts and overlap with each other.

We excluded studies of participants whose symptoms were caused by factors outside the urinary tract (e.g. neurologic disorders, cognitive impairment, gynecologic diseases). We also excluded studies that recruited specific populations, such as people with nocturnal enuresis, people who had undergone urinary tract surgery or vaginal surgery, and prenatal or postnatal women.

Types of interventions

We included studies with at least one study arm involving bladder training for treating OAB, as well as studies that investigated the additive effect with another treatment compared with monotherapy.

We also included studies where the interventions were termed 'patient education', 'scheduled voiding', and 'positive reinforcement'.

As recommended in the AUA guidelines (Lightner 2019), behavioral therapy and pharmacologic treatment are often prescribed in combination in clinical practice. However, the optimal treatment combination remains uncertain (Chancellor 2008). Therefore, we included the following comparisons.

- Bladder training versus no treatment
- Bladder training versus anticholinergics
- Bladder training versus β3-adrenoceptor agonists
- Bladder training versus PFMT
- Bladder training combined with anticholinergics versus anticholinergics alone
- Bladder training combined with β3-adrenoceptor agonists versus β3-adrenoceptor agonists alone
- Bladder training combined with PFMT versus PFMT alone

We believe that the comparisons of particular interest to patients and clinicians are 'bladder training versus no treatment', 'bladder training versus anticholinergics', 'bladder training versus β3-adrenoceptor agonists', and 'bladder training versus PFMT'.

Types of outcome measures

Primary outcomes

- **Participant-reported cure or improvement** (assessed by validated self-reported questionnaires such as the Patient Global Impression of Improvement (PGI-I) Index (Busner 2007). In studies that did not use validated scales, we included author-defined data regarding the number of participants who perceived cure or improvement. For studies in which participants reported more than a single level of improvement (e.g. much better and somewhat better), we entered data for the greater degree of improvement reported).
- **Symptom- and condition-related quality of life (QoL)** (assessed using validated questionnaires, such as Overactive Bladder Questionnaire (Coyne 2002) and King's Health Questionnaire (Kelleher 1997)).
- **Any adverse events** (e.g. dry mouth, constipation, nausea, headache, dizziness, deceased visual acuity, and urinary tract infection).

Secondary outcomes

- **Participant-reported satisfaction**
- **Number of incontinence episodes** per 24 hours
- **Number of urgency episodes** per 24 hours
- **Number of micturition episodes** per 24 hours

Timing of outcome measurement

We considered two time points for all primary and secondary outcomes: immediately after treatment and at least two months after treatment, to assess longer-term effects. For adverse events, we also sought data during treatment and at follow-up.

Main outcomes for summary of findings tables

We assessed all primary and secondary outcomes for the summary of findings tables immediately after treatment with the exception of adverse events, which we assessed *during* treatment.

Search methods for identification of studies

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

Electronic searches

We identified relevant trials from the Cochrane Incontinence Specialised Register, which contains trials identified from the Cochrane Central Register of Controlled Trials (CENTRAL) (on CRS Web), MEDLINE (on Ovid), MEDLINE In-Process, In-Data-Review & Other Non-Indexed Citations (on Ovid), MEDLINE Epub Ahead of Print (on Ovid), MEDLINE Daily (on Ovid), ClinicalTrials.gov (clinicaltrials.gov), World Health Organization International Clinical Trials Registry Platform (trialsearch.who.int), and handsearching of journals and conference proceedings. Many of the trials in the

Cochrane Incontinence Specialised Register are also contained in CENTRAL. The date of the most recent search of the Register was 6 November 2022. The terms we used to search the Cochrane Incontinence Specialised Register are in Appendix 2.

Searching other resources

We searched the reference lists of relevant articles for potentially eligible studies.

Data collection and analysis

As reported in our protocol (Funada 2020), we conducted data collection and analysis in accordance with methods specified in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2022).

Selection of studies

Two review authors (SF and TY) independently screened the list of titles and abstracts identified by our literature search and assessed the eligibility of full-text articles for inclusion in the review. Where necessary, we contacted study investigators for further information. We resolved disagreements through discussion with a third review author (YL). We recorded the reasons for the exclusion of excluded studies at the full-text screening in the Characteristics of excluded studies table.

Data extraction and management

Two review authors (SF and YL) independently extracted data onto a prepiloted form, which was cross-checked by a third review author (TY). For trials with multiple publications, we used only the most up-to-date data or complete data for each outcome. Where the necessary data were not reported or were not reported in a form that could be directly used for meta-analysis, we contacted the trial authors for further information.

Assessment of risk of bias in included studies

At least two review authors (SF and YL) independently assessed the risk of bias of included studies using Cochrane's RoB 2 tool (Higgins 2022). We used the Excel tool to implement RoB 2 and store our data (available at www.riskofbias.info/welcome/rob-2-0-tool). The types of bias include the following: bias arising from the randomization process; bias due to deviations from the intended intervention; bias due to outcome data; bias in measurement of the outcome; bias in selection of the reported results; and overall bias.

We assessed the outcomes and time points included in the summary of findings tables, and focused on the assessment of the effect of assignment to the interventions at baseline.

We categorized each potential domain of bias as follows.

- Low risk of bias: the study is considered to show a low risk of bias.
- Some concerns: a few concerns are expected to be associated with the study in at least one domain, but it does not warrant categorization as a study with a high risk of bias with regard to any domain.
- High risk of bias: the study is considered at high risk of bias in at least one domain; or a few concerns with regard to multiple domains are observed in the study such that these concerns significantly lower confidence in the study results.

We summarized our findings in the risk of bias tables. We expressed the percentage of agreement about the judgment of risk of bias and resolved any disagreements by consulting a third review author (TY).

Measures of treatment effect

For categorical data, we used the ratio of the number of people who presented with the outcome to the number of people at risk in each group to calculate a risk ratio (RR) with 95% confidence intervals (CI) (Higgins 2022).

For continuous data, we used means and standard deviations (SDs) to calculate a mean difference (MD) with 95% CI. When studies used different scales, we reported standardized mean differences (SMD) (Higgins 2022).

If data to calculate RRs or MDs were not reported, we used the most appropriate numerical data available to calculate the actual numbers or means and SDs (e.g. test statistics and P values) (Higgins 2022).

Unit of analysis issues

We analyzed trials that included multiple treatment groups by treating each pair of trial arms as a separate comparison. In such cases, we divided the number of comparison groups dependent on the multiple intervention groups to avoid double counting. For randomized cross-over trials, we only used data from the first period of treatment. For cluster-randomized trials, we made corrections using an intracluster correlation coefficient (ICC). If this was not possible, we calculated the ICC based on similar studies included in the review, or we extracted primary data and calculated RRs with 95% CIs. We selected 'after treatment' as a single time point and analyzed data obtained only at this time.

Dealing with missing data

We attempted to obtain missing data from the trial authors. Where this was not possible, we analyzed the trial data based on the intention-to-treat (ITT) approach. We included summary statistics when studies used approaches including mixed-effects models for repeated measurements or multiple imputation methods. If studies reported sufficient details to calculate MDs or SMDs but not the associated SD, we assumed the outcome to show an SD equal to the highest SD from other trials within the same analysis. For studies with missing SDs, we pursued simple imputation by using the SDs from studies in another published meta-analysis as per the guidance in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2022), and pursued sensitivity analysis to explore the impact of imputed SDs (Sensitivity analysis).

To obtain daily means for our outcomes of interest, we divided weekly means and the SD by seven.

Assessment of heterogeneity

We assessed heterogeneity between trials by visual inspection of plots of the data, the Chi^2 test for heterogeneity, and the I^2 statistic. We interpreted the I^2 statistic using the thresholds in the *Cochrane Handbook for Systematic Reviews of Interventions*, with substantial heterogeneity defined as I^2 values between 50% and 90%, and considerable heterogeneity as I^2 values more than 75% (Higgins 2022). We aimed to determine and discuss possible explanations for heterogeneity.

Assessment of reporting biases

Had sufficient data been available, we planned to assess potential publication bias using funnel plots and by performing an Egger's test when the meta-analysis included 10 studies or more (Egger 1997).

Data synthesis

The main analysis included all studies that provided data regardless of the overall risk of bias as assessed by the RoB 2 tool.

We used Review Manager 2014 for data analysis. We performed a meta-analysis if participants, interventions, comparisons, and outcomes were sufficiently similar. We pooled RRs using the Mantel-Haenszel method for dichotomous outcomes and presented MDs or SMDs using inverse variance for continuous outcomes. We used a random-effects model to perform a meta-analysis (Higgins 2022).

Subgroup analysis and investigation of heterogeneity

If data allowed, we planned to perform the following subgroup analyses.

- Heterogeneity among participants: sex and age (less than 65 years, 65 years or greater).
- Heterogeneity in treatments: intervention (face-to-face, pamphlets, ICT); types of sessions (individual versus group sessions); and duration of therapy (less than 12 weeks, 12 weeks or greater).

Sensitivity analysis

Where sufficient data are available in future updates, we plan to test the robustness of our results using the following sensitivity analyses.

- Exclusion of cross-over RCTs and cluster-RCTs.
- Exclusion of studies in which there was no imputation of missing data.
- For outcomes included in the summary of findings tables, we will include data from studies judged at low risk of bias or with some concerns for that outcome. Data from studies judged at high risk of bias for that outcome will be excluded from the analysis.

We performed a post doc sensitivity analysis to assess the robustness of results due to missing SDs in an included study (Dealing with missing data).

Summary of findings and assessment of the certainty of the evidence

We used the GRADE approach to assess the certainty of evidence related to the primary and secondary outcomes as listed in the Types of outcome measures (Schünemann 2019). We used the five GRADE considerations (study limitations, inconsistency of effect, indirectness, imprecision, and publication bias) to assess the certainty of the body of evidence for the prespecified outcomes as outlined in Appendix 3 (Guyatt 2011a).

We justified all decisions to downgrade the certainty of the evidence using footnotes. Where there was sufficient evidence, we prepared summary of findings tables for the following main comparisons as stated in the Types of interventions using GRADEpro GDT software (GRADEpro GDT).

- Bladder training versus no treatment
- Bladder training versus anticholinergics
- Bladder training versus β3-adrenoceptor agonists
- Bladder training versus PFMT

RESULTS

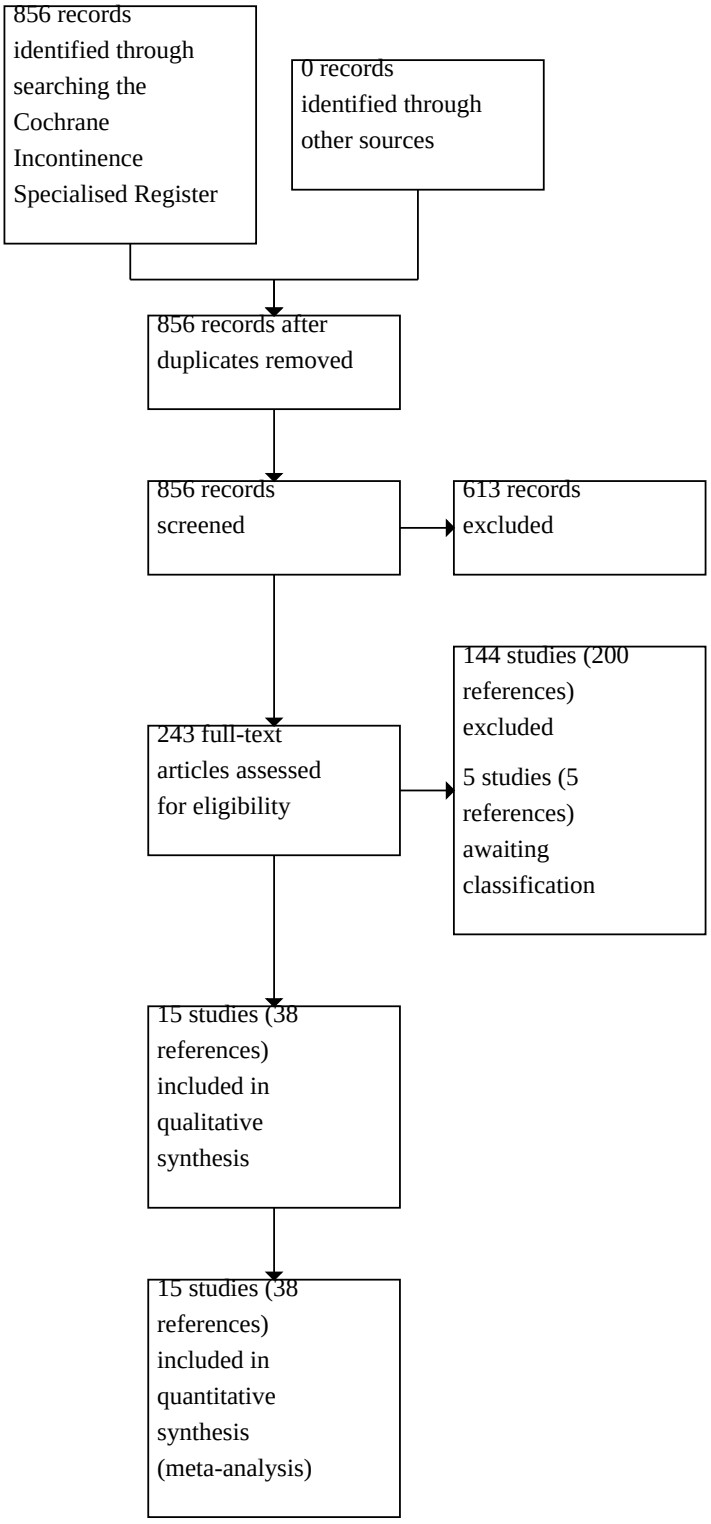
Description of studies

See: Characteristics of included studies; Characteristics of excluded studies; and Characteristics of studies awaiting classification tables.

Results of the search

We identified 856 references through our electronic and manual searches. After deduplication and title and abstract screening, we retrieved 243 references. After screening the full text, we included 15 RCTs from 38 references and excluded 144 studies from 200 references (see Figure 1).

Figure 1. PRISMA study flow diagram.



Included studies

Design

All 15 studies were parallel RCTs. Two studies had four arms (Kafri 2013; Zhang 2012), three studies had three arms (Lauti 2008; Rizvi 2018; Song 2006), and the remaining 10 were two-armed studies (Colombo 1995; Fantl 1991; Jarvis 1980; Jarvis 1981; Lagro-Janssen 1992; Lentz 1994; Mattiasson 2003; Mattiasson 2010; McCreanor 1998; Milani 1987).

Sample sizes

The studies included 2007 participants. Mattiasson 2010 had the largest study population with 643 participants randomized. Lagro-Janssen 1992 had the smallest study population as only 18/110 participants were diagnosed with DI and thus randomized to bladder training versus no treatment.

Setting

Four studies were conducted in the UK (Jarvis 1980; Jarvis 1981; Lentz 1994; McCreanor 1998), two in other European countries (Mattiasson 2003; Mattiasson 2010), two in Italy (Colombo 1995; Milani 1987), one in the USA (Fantl 1991), one in Israel (Kafri 2013), one in the Netherlands (Lagro-Janssen 1992), one in Korea (Song 2006), one in New Zealand (Lauti 2008), one in China (Zhang 2012), and one in Pakistan (Rizvi 2018).

Five studies were conducted in multiple centers (Kafri 2013; Lagro-Janssen 1992; Mattiasson 2003; Mattiasson 2010; Milani 1987), four were single-center studies (Colombo 1995; Lauti 2008; McCreanor 1998; Rizvi 2018), and six were unclear (Fantl 1991; Jarvis 1980; Jarvis 1981; Lentz 1994; Song 2006; Zhang 2012).

Participants

All participants were women except in two trials; there were 378 women and 123 men in one study (Mattiasson 2003), and 551 women and 92 men in the other study (Mattiasson 2010).

The mean or median age of participants ranged from 40 to 49 years in eight studies (Colombo 1995; Jarvis 1980; Jarvis 1981; Lagro-Janssen 1992; Lentz 1994; Milani 1987; Rizvi 2018; Song 2006), 50 to 59 years in three studies (Kafri 2013; Lauti 2008; Mattiasson 2010), 60 to 69 years in two studies (Fantl 1991; Mattiasson 2003), and unclear in two studies (McCreanor 1998; Zhang 2012).

The diagnosis was OAB by symptoms in seven studies (Lentz 1994; Mattiasson 2003; Mattiasson 2010; Milani 1987; Rizvi 2018; Song 2006; Zhang 2012), UUI by urodynamics in two studies (Colombo 1995; Lagro-Janssen 1992), UUI by symptoms in three studies (Kafri 2013; Lauti 2008; McCreanor 1998), and DI by urodynamics in three studies (Fantl 1991; Jarvis 1980; Jarvis 1981). In two of these studies, other types of incontinence (stress or mixed incontinence) were included and the results of UUI or DI were extracted from all participants (Fantl 1991; Lagro-Janssen 1992).

Interventions

Descriptions of bladder training

Twelve studies prescribed bladder training face-to-face (Colombo 1995; Fantl 1991; Jarvis 1980; Jarvis 1981; Kafri 2013; Lagro-Janssen 1992; Lentz 1994; McCreanor 1998; Milani 1987; Rizvi 2018; Song 2006; Zhang 2012), two studies by leaflet (Mattiasson 2003; Mattiasson 2010), and one study by face-to-face and leaflet (Lauti 2008).

In terms of provider, three studies used a nurse to provide bladder training (McCreanor 1998; Song 2006; Zhang 2012), one study used a general practitioner (Lagro-Janssen 1992), two studies used a physical therapist (Kafri 2013; Lauti 2008), one study used a nurse and physician (Rizvi 2018), two studies used a leaflet but personnel unknown (Mattiasson 2003; Mattiasson 2010), and six studies were unclear (Colombo 1995; Fantl 1991; Jarvis 1980; Jarvis 1981; Lentz 1994; Milani 1987). No study performed group sessions.

Three studies had a duration of therapy of less than 12 weeks (Colombo 1995; Fantl 1991; McCreanor 1998), nine studies of more than 12 weeks (Kafri 2013; Lagro-Janssen 1992; Lauti 2008; Mattiasson 2003; Mattiasson 2010; Milani 1987; Rizvi 2018; Song 2006; Zhang 2012), and three studies were unclear (Jarvis 1980; Jarvis 1981; Lentz 1994).

The details of bladder training were as follows.

- Nine studies prescribed participant education (Colombo 1995; Fantl 1991; Jarvis 1980; Kafri 2013; Lagro-Janssen 1992; Lauti 2008; Mattiasson 2003; Mattiasson 2010; Song 2006).
- Eleven studies prescribed scheduled voiding (Colombo 1995; Fantl 1991; Jarvis 1980; Kafri 2013; Lagro-Janssen 1992; Lauti 2008; Mattiasson 2003; Mattiasson 2010; Milani 1987; Rizvi 2018; Song 2006).
- Six studies prescribed positive reinforcement (Colombo 1995; Fantl 1991; Jarvis 1980; Kafri 2013; Lauti 2008; Mattiasson 2010).
- Nine studies prescribed self-monitoring (Fantl 1991; Jarvis 1980; Lagro-Janssen 1992; Kafri 2013; Mattiasson 2003; Mattiasson 2010; Milani 1987; Rizvi 2018; Song 2006).
- Three studies performed pelvic floor muscle squeeze to palliate urgency (Lauti 2008; Mattiasson 2010; Song 2006).

Description of comparators

- Bladder training versus no treatment (Fantl 1991; Jarvis 1980; Lagro-Janssen 1992): participants in the control groups received no treatment during the intervention phase.
- Bladder training versus anticholinergics (Colombo 1995; Jarvis 1981; Kafri 2013; Lauti 2008; McCreanor 1998; Milani 1987; Song 2006): four studies prescribed oxybutynin (Colombo 1995; Lauti 2008; McCreanor 1998; Milani 1987), two studies prescribed tolterodine (Kafri 2013; Song 2006), and one study prescribed flavoxate hydrochloride plus imipramine (Jarvis 1981).
- Bladder training versus β3-adrenoceptor agonists: no studies identified.
- Bladder training versus PFMT (Kafri 2013; Lentz 1994; Rizvi 2018): one study performed PFMT via vaginal cone (Lentz 1994).
- Bladder training combined with anticholinergics versus anticholinergics alone (Lauti 2008; Mattiasson 2003; Mattiasson 2010; Song 2006; Zhang 2012): four studies prescribed tolterodine (Mattiasson 2003; Song 2006; Zhang 2012), two studies prescribed oxybutynin (Lauti 2008), one study prescribed solifenacin (Mattiasson 2010).
- Bladder training combined with β3-adrenoceptor agonists versus β3-adrenoceptor agonists alone: no studies identified.
- Bladder training combined with PFMT versus PFMT: no studies identified.

Outcomes

For primary outcomes, eight studies reported participant-reported cure or improvement immediately after treatment (Colombo 1995; Fantl 1991; Jarvis 1981; Lagro-Janssen 1992; Lentz 1994; Mattiasson 2003; Milani 1987; Song 2006), and five studies more than two months after treatment (Colombo 1995; Jarvis 1980; Lagro-Janssen 1992; Lentz 1994; Milani 1987). Six studies reported symptom-related QoL immediately after treatment (Fantl 1991; Kafri 2013; Lauti 2008; Mattiasson 2010; Rizvi 2018; Zhang 2012), and three studies more than two months after treatment (Kafri 2013; Lauti 2008; Mattiasson 2010). Seven studies reported adverse events immediately after treatment (Colombo 1995; Jarvis 1981; Lauti 2008; Mattiasson 2003; Milani 1987; Rizvi 2018; Song 2006), and two studies more than two months after treatment (Lauti 2008; Mattiasson 2010).

For secondary outcomes, one study reported participant-reported satisfaction immediately after treatment and more than two months after treatment (Mattiasson 2010). Six studies reported the number of incontinence episodes immediately after treatment (Fantl 1991; Kafri 2013; Lagro-Janssen 1992; Lauti 2008; Mattiasson 2003; Mattiasson 2010), and three studies more than two months after treatment (Kafri 2013; Lauti 2008; Mattiasson 2010). Three studies reported the number of urgency episodes immediately after treatment (Lauti 2008; Mattiasson 2003; Mattiasson 2010). One study reported an urgency score, not the number of urgency episodes, that was defined as follows; 0 being no symptoms, 1 rarely, 2 occasionally, 3 often, and 4 always (Song 2006). Two studies reported the number of urgency episodes more than two months after treatment (Lauti 2008; Mattiasson 2010). Five studies reported the number of micturition episodes immediately after treatment (Kafri 2013; Lauti 2008; Mattiasson 2003; Mattiasson 2010; Song 2006), and three studies more than two months after treatment (Kafri 2013; Lauti 2008; Mattiasson 2010).

Although we contacted 18 study authors to seek unpublished/missing information and received responses from three authors, the available data were insufficient. We obtained the missing SDs in Song 2006 from those reported in a published Cochrane Review (Rai 2012). Although we contacted the authors of the Cochrane Review (Rai 2012) to ask how they obtained the missing SDs from Song 2006, we did not receive a response.

Funding sources

Nine studies reported their funding sources (Fantl 1991; Kafri 2013; Lagro-Janssen 1992; Lauti 2008; Mattiasson 2003; Mattiasson 2010; McCreanor 1998; Rizvi 2018; Zhang 2012).

Excluded studies

We excluded 144 studies (200 full-text articles), and the details were shown in the Characteristics of excluded studies table. The main reasons were non-RCTs, participants not having OAB, and irrelevant types of intervention.

Studies awaiting classification

Five studies are awaiting classification (Characteristics of studies awaiting classification table).

Ongoing studies

We identified no ongoing studies.

Risk of bias in included studies

Risk of bias assessments for each outcome, including all domain judgments and support for judgment, is located in the risk of bias section, and visually represented as traffic lights in forest plots. To access detailed risk of bias assessment data see: 10.6084/m9.figshare.21623364.

Risk of bias of outcomes across all studies was similar and predominantly of high risk of bias and none were at low risk of bias. Many studies did not report the details of randomization and allocation concealment. Due to the nature of our interventions and comparators of interest, blinding was difficult and that may cause more deviation from intervention and missing outcomes. Moreover, most studies did not perform adequate imputation for missing data. As all were participant-reported outcomes, it was difficult to ensure blinding of outcome assessors. None of the included studies reported a prespecified analysis plan with sufficient details.

Effects of interventions

See: **Summary of findings 1** Summary of findings table - Bladder training compared to no treatment for overactive bladder; **Summary of findings 2** Summary of findings table - Bladder training compared to anticholinergics for overactive bladder; **Summary of findings 3** Summary of findings table - Bladder training compared to pelvic floor muscle training (PFMT) for overactive bladder

Bladder training versus no treatment

Three studies compared bladder training versus no treatment (Fantl 1991; Jarvis 1980; Lagro-Janssen 1992). See Summary of findings 1.

Primary outcomes

Participant-reported cure or improvement

Bladder training may be more effective than no treatment in increasing cure/improvement rates immediately after treatment (RR 17.00, 95% CI 1.13 to 256.56; 1 study, 18 participants; Analysis 1.1; very low-certainty evidence) and at more than two months after the treatment (RR 3.86, 95% CI 1.99 to 7.46; 1 study, 60 participants; Analysis 1.2; very low-certainty evidence), but the evidence is very uncertain. Both results were based on one study. As the ranges of the 95% CIs were wide, the results were imprecise. We judged the certainty of the evidence to be very low immediately after treatment and more than two months after the treatment due to serious concerns regarding risk of bias and imprecision.

Symptom- and condition-related quality of life

No studies reported symptom- and condition-related QoL.

Adverse events

No studies reported adverse events.

Secondary outcomes

Participant-reported satisfaction

No studies reported participant-reported satisfaction.

Number of incontinence episodes per 24 hours

Bladder training may reduce the number of incontinence episodes per 24 hours when compared to no treatment immediately after treatment (MD −1.86, 95% CI −3.47 to −0.25; 1 study, 14 participants; Analysis 1.3; low-certainty evidence). The result was based on one study, the range of the CIs was wide, and the result was imprecise. There were no eligible trials assessing this outcome at more than two months after the treatment. Using GRADE, we judged the certainty of the evidence to be low immediately after treatment due to serious concerns regarding imprecision.

Number of urgency episodes per 24 hours

No studies reported number of urgency episodes per 24 hours.

Number of micturition episodes per 24 hours

No studies reported number of micturition episodes per 24 hours.

Bladder training versus anticholinergics

Seven studies compared bladder training versus anticholinergics (Colombo 1995; Jarvis 1981; Kafri 2013; Lauti 2008; McCreanor 1998; Milani 1987; Song 2006). See Summary of findings 2.

Primary outcomes

Participant-reported cure or improvement

Bladder training may be slightly more effective than anticholinergic therapy on cure/improvement immediately after treatment (RR 1.37, 95% CI 1.10 to 1.70; 4 studies, 258 participants; Analysis 2.1; low-certainty evidence). Bladder training may be more effective than anticholinergic therapy at more than two months after the treatment (RR 1.61, 95% CI 1.18 to 2.18; 2 studies, 150 participants; Analysis 2.2; low-certainty evidence). There was considerable heterogeneity in the early phase (I^2 = 52%), but there was no heterogeneity in the long-term effect (I^2 = 0%).

McCreanor 1998 reported "symptom score" and "VAS" (Visual Analog Scale) at eight weeks and 16 weeks; however, the outcomes data could not be extracted. The mean symptom score was higher in bladder training than in oxybutynin at week eight and lower at week 16. The mean VAS scale was lower in bladder training than in oxybutynin at week eight and equal at week 16.

Symptom- and condition-related quality of life

There may be little or no difference between bladder training and anticholinergic therapy on symptom- and condition-related QoL immediately after treatment (SMD −0.06, 95% CI −0.89 to 0.77; 2 studies, 117 participants; Analysis 2.3; very low-certainty evidence) and more than two months after the treatment (SMD 0.15, 95% CI −0.22 to 0.52; 2 studies, 112 participants; Analysis 2.4; very low-certainty evidence), but the evidence is very uncertain. There was considerable heterogeneity in the early phase (I^2 = 76%), but no evidence of heterogeneity in the long-term effect (I^2 = 0%).

Adverse events

The evidence is very uncertain about the effect of bladder training on adverse events when compared to anticholinergic therapy on adverse events immediately after treatment (RR 0.03, 95% CI 0.01 to 0.17; 3 studies, 187 participants; Analysis 2.5; very low-certainty evidence) and at more than two months after the treatment (RR 0.04, 95% CI 0.00 to 0.57; 1 study, 75 participants; Analysis 2.6; very low-certainty evidence). There was no heterogeneity in the early phase (I^2 = 0%). The range of the CIs was narrow enough that the result was precise in the early phase.

Lauti 2008 reported only all adverse events and not the number of participants with adverse events; therefore, this study was not included in our meta-analyses. The most frequently reported adverse events by Lauti 2008 were dry mouth and constipation.

Secondary outcomes

Participant-reported satisfaction

No studies reported participant-reported satisfaction.

Number of incontinence episodes per 24 hours

The evidence is very uncertain about the effect of bladder training as compared to anticholinergic therapy on incontinence episodes per 24 hours immediately after treatment (MD 0.36, 95% CI −0.27 to 1.00; 2 studies, 117 participants; Analysis 2.7; very low-certainty evidence) and at more than two months after the treatment (MD −0.22, 95% CI −0.64 to 0.20; 2 studies, 112 participants; Analysis 2.8; very low-certainty evidence). There was substantial heterogeneity in the early phase (I^2 = 84%), but there was no evidence of heterogeneity in the long-term effect (I^2 = 0%).

Number of urgency episodes per 24 hours

The evidence is very uncertain about the effect of bladder training when compared to anticholinergics on urgency episodes per 24 hours immediately after treatment (MD 0.70, 95% CI −0.62 to 2.02; 2 studies, 92 participants; Analysis 2.9; very low-certainty evidence) and at more than two months after the treatment (MD 0.40, 95% CI −1.27 to 2.07; 1 study, 29 participants; Analysis 2.10; very low-certainty evidence).

Song 2006 reported the urgency scores immediately after treatment (at 12 weeks), which were 1.4 in the bladder training group and 1.1 in the anticholinergic (tolterodine) group, without SDs.

Number of micturition episodes per 24 hours

The evidence is very uncertain about the effect of bladder training versus anticholinergic therapy on micturition immediately after treatment (MD −0.35, 95% CI −1.90 to 1.20; 3 studies, 175 participants; Analysis 2.11; very low-certainty evidence) and at more than two months after the treatment (MD 0.26, 95% CI −0.60 to 1.12; 2 studies, 112 participants; Analysis 2.12; very low-certainty evidence). There was moderate heterogeneity in the early phase (I^2 = 51%), but there was no evidence of heterogeneity in the long-term effect (I^2 = 0%). As we did not extract the SDs from the original study report of Song 2006 but instead imputed/borrowed data from a published Cochrane Review (Rai 2012), we performed a post hoc sensitivity analysis by excluding Song 2006 from Analysis 2.11 and confirmed that the results remained consistent (MD −0.51, 95% CI −2.46 to 1.44; 2 studies, 117 participants).

Bladder training versus pelvic floor muscle training

Three trials compared bladder training versus PFMT (Kafri 2013; Lentz 1994; Rizvi 2018). See Summary of findings 3.

Primary outcomes

Participant-reported cure or improvement

Lentz 1994 reported cure or improvement rates of 80% at one month and 100% at three months in the bladder training group and 78% at one month and 60% at three months among participants in the PFMT group. There were no details about the events/total number.

Symptom- and condition-related quality of life

There may be little or no difference between bladder training and PFMT on symptom- and condition-related QoL immediately after treatment (SMD 0.10, 95% CI −0.19 to 0.40; 2 studies, 178 participants; Analysis 3.1; low-certainty evidence) and at more than two months after the treatment (SMD −0.09, 95% CI −0.52 to 0.35; 1 study, 81 participants; Analysis 3.2; very low-certainty evidence). There was no evidence of heterogeneity in the early phase (I^2 = 0%).

Adverse events

There were no adverse events in the bladder training and PFMT groups immediately after treatment (1 study, 97 participants; Analysis 3.3); we judged the evidence to be of moderate certainty due to imprecision.

Secondary outcomes

Participant-reported satisfaction

No studies reported participant-reported satisfaction.

Number of incontinence episodes per 24 hours

There may be little or no difference between bladder training and PFMT on incontinence episodes immediately after treatment (MD 0.02, 95% CI −0.35 to 0.39; 1 study, 81 participants; Analysis 3.4; low-certainty evidence) and more than two months after the treatment (MD −0.20, 95% CI −2.46 to 2.06; 1 study, 81 participants; Analysis 3.5; very low-certainty evidence). Both results were based on one study. As the ranges of the CIs were wide, the results were imprecise.

Number of urgency episodes per 24 hours

No studies reported number of urgency episodes per 24 hours.

Number of micturition episodes per 24 hours

The evidence is very uncertain about the effect of bladder training as compared to PFMT on micturition episodes immediately after treatment (MD 0.10, 95% CI −1.44 to 1.64; 1 study, 81 participants; Analysis 3.6; very low-certainty evidence) and at more than two months after the treatment (MD 0.50, 95% CI −1.39 to 2.39; 1 study, 81 participants; Analysis 3.7; very low-certainty evidence). Both results were based on one study. As the ranges of the CIs were wide, the results were imprecise.

Bladder training combined with anticholinergics versus anticholinergics alone

Five trials compared bladder training combined with anticholinergics versus anticholinergics alone (Lauti 2008; Mattiasson 2003; Mattiasson 2010; Song 2006; Zhang 2012).

Primary outcomes

Participant-reported cure or improvement

There may be little or no difference between bladder training combined with anticholinergics and anticholinergics alone on cure/improvement immediately after treatment (RR 1.08, 95% CI 0.97 to 1.19; 2 studies, 564 participants; Analysis 4.1; low-certainty evidence). There was no evidence of heterogeneity (I^2 = 0%).

Symptom- and condition-related quality of life

There may be little or no difference between bladder training combined with anticholinergics and anticholinergics alone on symptom- and condition-related QoL immediately after treatment (SMD 0.07, 95% CI −0.09 to 0.22; 2 studies, 630 participants; Analysis 4.2; moderate-certainty evidence) and more than two months after the treatment (SMD 0.45, 95% CI −0.34 to 1.25; 2 studies, 627 participants; Analysis 4.3; low-certainty evidence). There was no evidence of heterogeneity in the early phase (I^2 = 0%).

Mattiasson 2010 reported QoL using the Incontinence Quality of Life (I-QoL) questionnaire more than two months after the treatment (16 weeks) (scores: 25.3 in the bladder training plus anticholinergic (solifenacin) group versus 24.5 in the anticholinergic alone group; SDs not reported).

Zhang 2012 reported the rate of increases in the participant perception of bladder condition (PPBC) was 66% in the bladder training plus anticholinergic (tolterodine) group and 53% in the anticholinergic alone group at 12 weeks.

Adverse events

There was probably little or no difference between bladder training combined with anticholinergics and anticholinergics alone on adverse events immediately after treatment (RR 0.94, 95% CI 0.83 to 1.06; 2 studies, 564 participants; Analysis 4.4; moderate-certainty evidence) and at more than two months after the treatment (RR 1.00, 95% CI 0.85 to 1.18; 1 study, 643 participants; Analysis 4.5; moderate-certainty evidence). There was no heterogeneity in the early phase (I^2 = 0%). The most frequently reported adverse events were dry mouth and constipation.

Secondary outcomes

Participant-reported satisfaction

Mattiasson 2010 reported satisfaction using a VAS immediately after treatment (eight weeks) (scores: 3.5 in the bladder training plus anticholinergic (solifenacin) group versus 3.3 in the anticholinergic alone group; SDs not reported; Analysis 4.6; moderate-certainty evidence), and at more than two months after the treatment (16 weeks) (scores: 4.18 in the bladder training plus anticholinergic group versus 3.72 in the anticholinergic alone group; SDs not reported; Analysis 4.7; moderate-certainty evidence).

Number of incontinence episodes per 24 hours

There may be little or no difference between bladder training combined with anticholinergics and anticholinergics alone on incontinence episodes immediately after treatment (MD 0.50, 95% CI 0.02 to 0.98; 3 study, 931 participants; Analysis 4.8; low-certainty evidence) and more than two months after the treatment (MD −0.10, 95% CI −0.77 to 0.57; 2 studies, 627 participants; Analysis 4.9; low-certainty evidence).

Mattiasson 2003 reported median incontinence episodes per 24 hours immediately after treatment (24 weeks) (scores: 0.3 (range 0 to 14.7) in the bladder training plus anticholinergic (tolterodine) group versus 0.3 (range 0 to 14.7) in the anticholinergic alone group; SDs not reported).

Mattiasson 2010 reported a change of incontinence episodes per 24 hours immediately after treatment (8 weeks) (scores: −1.3 in the bladder training plus anticholinergic (solifenacin) group versus −1.2 in the anticholinergic alone group; SDs not reported), and more than two months after the treatment (16 weeks) (scores: −1.5 in the bladder training plus anticholinergic group versus −1.5 in the anticholinergic alone group; SDs not reported).

Zhang 2012 reported the reduction of pad use was 71% in the bladder training plus anticholinergic (tolterodine) group versus 56% in the anticholinergic group at 12 weeks.

Number of urgency episodes per 24 hours

There may be little or no difference between bladder training combined with anticholinergics and anticholinergics alone on urgency episodes immediately after treatment (MD 0.20, 95% CI −1.25 to 1.65; 4 studies, 1177 participants; Analysis 4.10; low-certainty evidence) and more than two months after the treatment (MD 0.10, 95% CI −1.20 to 1.40; 2 studies, 627 participants; Analysis 4.11; low-certainty evidence). There was no evidence of heterogeneity in the early phase or long-term effect (I^2 = 0%).

Song 2006 reported urgency episodes per 24 hours immediately after treatment (12 weeks) (scores: 1.2 in the bladder training plus anticholinergic (tolterodine) group versus 1.1 in the anticholinergic alone group; SDs not reported).

Mattiasson 2003 reported median urgency episodes per 24 hours immediately after treatment (24 weeks) (scores: 4.0 (range 0 to 15.7) in the bladder training plus anticholinergic (tolterodine) group versus 4.0 (range 0 to 18.7) in the anticholinergic alone group; SDs not reported).

Mattiasson 2010 reported a change of urgency episodes per 24 hours immediately after treatment (eight weeks) (scores: −2.0 in the bladder training plus anticholinergic (solifenacin) group versus −2.0 in the anticholinergic alone group; SDs not reported), and more than two months after the treatment (16 weeks) (scores: −2.5 in the bladder training plus anticholinergic group versus −2.2 in the anticholinergic alone group; SDs not reported).

Zhang 2012 reported the reduction of urgency episodes was 71% in the bladder training plus anticholinergic (tolterodine) group versus 58% in the anticholinergic alone group at 12 weeks.

Number of micturition episodes per 24 hours

There may be little or no difference between bladder training combined with anticholinergics and anticholinergics alone immediately after treatment (MD 0.40, 95% CI −1.07 to 1.87; 4 studies, 1182 participants; Analysis 4.12; low-certainty evidence) and more than two months after the treatment (MD 0.80, 95% CI −0.34 to 1.94; 2 studies, 627 participants; Analysis 4.13; low-certainty evidence).

Song 2006 reported micturition episodes per 24 hours immediately after treatment (12 weeks) (scores: 7.9 in the bladder training plus anticholinergic (tolterodine) group versus 8.1 in the anticholinergic alone group; SDs not reported).

Mattiasson 2003 reported median micturition episodes per 24 hours immediately after treatment (24 weeks) (scores: 7.0 (range 3 to 15.3) in the bladder training plus anticholinergic (tolterodine) group versus 8.0 (range 3 to 25.0) in the anticholinergic group; SDs not reported).

Mattiasson 2010 reported a change of micturition episodes per 24 hours immediately after treatment (eight weeks) (scores: −2.9 in the bladder training plus anticholinergic (solifenacin) group versus −2.2 in the anticholinergic alone group; SDs not reported), and more than two months after the treatment (16 weeks) (score: −2.5 in the bladder training plus anticholinergic group versus −2.2 in the anticholinergic alone group; SDs not reported).

Subgroup analysis

There were insufficient data to perform prespecified subgroup analyses.

Sensitivity analysis

There were insufficient data to perform prespecified sensitivity analyses.

DISCUSSION

Summary of main results

We included 15 studies with 2007 participants in this review. Participants in these trials were predominantly women (89.3%). We assessed the risk of bias of results for primary and secondary outcomes, and across all studies these were similar and predominantly of high risk of bias and none were at low risk of bias. Of the results assessed as 'some concern', most studies did not treat missing data appropriately and did not perform trial registry or prespecify an analysis plan. Many studies were at high risk of bias due to deviation from intervention and measurement of outcomes due to an open-label design. Most results were judged with serious imprecision because of the small sample size or number of events. Using the GRADE method, we assessed the certainty of evidence as low to very low, with some as moderate, across measured outcomes.

Based on low- or very low-certainty evidence, bladder training may cure or improve OAB compared to no treatment. Moreover, bladder training may be more effective to cure or improve OAB than anticholinergics and there may be fewer adverse events. There may be no difference in efficacy or safety between bladder training and PFMT. When compared to anticholinergics alone, combination therapy with bladder training and anticholinergics had little or no effect on cure or improvement, symptom-related QoL, or adverse events. Three trials recruited a large sample size (Mattiasson 2003; Mattiasson 2010; Song 2006); however, they did not report SDs of the reported outcomes, and we did not receive any responses to our attempts to obtain additional information from the study authors.

Overall completeness and applicability of evidence

Although we were interested in trials examining bladder training versus β3-adrenoceptor agonists, in combination with β3-adrenoceptor agonists versus β3-adrenoceptor agonists alone, and

in combination with PFMT versus PFMT alone, we did not identify any eligible studies for these comparisons.

Even in the comparisons with eligible studies, we were unable to perform sufficient quantitative synthesis. Although two studies compared bladder training versus no treatment, they assessed only two outcomes: participant-reported cure or improvement, and number of incontinence episodes (Jarvis 1980; Lagro-Janssen 1992). In the comparison 'bladder training versus anticholinergics', seven studies reported the primary and secondary outcomes, except for participant-reported satisfaction (Colombo 1995; Jarvis 1981; Kafri 2013; Lauti 2008; McCreanor 1998; Milani 1987; Song 2006). In the comparison of bladder training versus PFMT, three trials assessed participant-reported cure/improvement, symptom-related QoL, adverse events, number of incontinence episodes, and micturition episodes (Kafri 2013; Lentz 1994; Rizvi 2018). In the comparison 'bladder training combined with anticholinergics versus anticholinergics', five trials reported all our predefined primary and secondary outcomes (Lauti 2008; Mattiasson 2003; Mattiasson 2010; Song 2006; Zhang 2012).

Quality of the evidence

We assessed the certainty of evidence using GRADE, which was rated as low and very low, with some moderate, for most outcomes and comparisons. Our judgment of the downgrade of the evidence was based on the following reasons.

- Study limitation (risk of bias): mainly high risk of bias on deviation from the intervention, missing outcome, outcome measurement. The overall bias judgments were either 'some concern' or 'high risk'.
- Inconsistency: clinically relevant heterogeneity based on high I^2 values (greater than 75%).
- Imprecision: small sample size and CIs that were wide and crossed assumed thresholds of clinically important differences.

Potential biases in the review process

We assessed the potential biases in this review process based on ROBIS (Whiting 2016). We have some concerns about the restriction of study eligibility criteria. We set relatively broad eligibility criteria, which may lead to some bias from our research question. For example, we included participants with slightly different diagnoses (OAB, UUI, DI), the contents of bladder training, and the comparisons were different among included studies.

With respect to our methods of study identification and selection, we performed a comprehensive literature search including trial registries and gray literature for unpublished studies. Two review authors independently selected and assessed trials for inclusion using prespecified criteria, extracted data, and assessed the quality of the studies to minimize potential biases in the review process. We attempted to contact study authors to obtain additional information about several studies (6 October 2020 to 13 March 2021), but we did not receive answers from them. This could lead to a potential bias with selective reporting.

Agreements and disagreements with other studies or reviews

We identified two Cochrane Reviews assessing the efficacy and safety of bladder training for OAB (Rai 2012; Wallace 2004). Compared to these, this review updated the literature search and used the RoB 2 tool for assessing risk of bias.

Wallace 2004 excluded people with OAB from the review, but UUI was overlapped with this review. The previous review suggested that bladder training may be effective to treat UI, but the result was based on variable quality and small size. Furthermore, evidence on UUI was limited.

Rai 2012 compared anticholinergic drugs versus non-drug active therapies for non-neurogenic OAB, and the review compared bladder training versus anticholinergics. The review suggested the opposite, that participants were more likely to improve when treated with anticholinergics rather than bladder training, but there were more adverse events with anticholinergics. Our review updated the literature search and added three new studies to the analysis (Kafri 2013; Rizvi 2018; Zhang 2012). The results were not in line with the previous reviews, but still with low-certainty evidence.

We identified two pairwise meta-analyses (Roe 2007; Shamliyan 2008), and one network meta-analysis (Balk 2019), exploring the effects of bladder training for UI. As Roe 2007 and Shamliyan 2008 did not classify UI into UUI, or behavioral therapy into bladder training, we cannot compare these with our results.

Limitations

First, as there is no standardized definition of bladder training, our definition may cause misclassification of bladder training and induce bias. Second, we selected the outcomes for the summary of findings tables at immediately after treatment instead of long-term follow-up. Although long-term outcomes would be more clinically relevant to treat OAB, it is difficult to evaluate the long-term effects of all the comparisons. For example, the effects of pharmacologic treatment disappear once the treatment is completed, and it is near impossible to evaluate long-term outcomes associated with interventions for OAB. Finally, we imputed the missing SDs of an included study (Song 2006) by imputing them from a published Cochrane Review (Rai 2012). We were unable to clarify data origin and methods of imputation from review authors of Rai 2012 and thus acknowledge the potential bias associated with incomplete outcome data. As recommended by the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2022), we addressed this by performing a sensitivity analysis and noted no substantial changes in the results. It is worth highlighting that all imputation techniques of SDs involve making assumptions about unknown statistics, and it is best to avoid imputation wherever possible.

AUTHORS' CONCLUSIONS

Implications for practice

The findings of this review were based on low- or very low-certainty evidence that bladder training may be beneficial in treating overactive bladder (OAB) compared to no treatment. When compared to anticholinergics, bladder training may be more effective in curing or improving OAB symptoms, and safer. There were no differences in the effects of bladder training compared to pelvic floor muscle training (PFMT) and the additive effect of bladder training on anticholinergics was unclear.

Implications for research

This review showed that the best available evidence to date is insufficient to fully explore the benefits and harms of bladder training to treat OAB, and well-designed trials are needed to reach a firm conclusion. Specifically, the target population should be clearly defined, the details of bladder training should be established, the required outcomes should be measured in the short and long time points, and the sample size should be estimated to be sufficient to evaluate the effectiveness. Furthermore, multiple trials with the same design should be conducted to synthesize the results. For bladder training, it is unclear who or what should provide it and for how long, and it is also necessary to determine the optimal bladder training delivery by comparing the effects under different conditions.

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- Managing Editor (selected peer reviewers, collated peer-reviewer comments, provided editorial comments/guidance to authors, edited the article): Joey Kwong, Cochrane Central Editorial Service
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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

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

Colombo 1995

Study characteristics	
Methods	**Study design:** 2-arm, parallel design RCT **Dates study conducted:** May 1990 to March 1993
Participants	**Number of participants:** 81 women with UUI **Setting:** outpatient, single-center, national **Country:** Italy **Method of diagnosis:** DI diagnosed by pressure flow study **Age (mean (range)):** Group I 49 (24–65) years; Group II 48 years (31–65) years **Sex:** female **Duration from onset (mean (SD)):** not reported **Prevalence of target participants (OAB, DI, or UUI):** Group I 100% (39/39); Group II 100% (42/42) **Prevalence of incontinence:** Group I 100% (39/39); Group II 100% (42/42) **Any relevant details of health status of participants:** not reported **Inclusion criteria:** symptoms of severe urge incontinence 'socially embarrassing' and urodynamic diagnosis of 'detrusor instability, low-compliance bladder or sensory bladder'

Colombo 1995 *(Continued)*

	Exclusion criteria: age > 65 years; stable bladder at cystometry; neurologic disease; co-existing GSI; genital prolapse; previous urogynecologic surgery; prior drug use for urge incontinence; postvoid residual volume > 50 mL; urethral diverticula, fistulas, urinary tract neoplasia; bladder stones; bacterial or interstitial cystitis; previous pelvic radiation therapy.
Interventions	**Group I (n = 39):** bladder training. Inpatient bladder drill. No details of the method reported or how long the participants stayed in the hospital. • Provider: not reported • Prescription: face-to-face • Individual or group: individual • Place: outpatient • Frequency: not reported • Length: not reported • Duration: not reported • Patient education: yes • Schedule voiding: yes • Positive reinforcement: yes • Self-monitoring/bladder diary: not reported • Other details: not reported **Group II (n = 42):** oxybutynin 5 mg (3 times a day) for 6 weeks. If there were 'substantial side effects', dose reduced to 2.5 mg 3 times per day; 2-weekly follow-up during treatment.
Outcomes	**Primary endpoint:** immediately after intervention (6 weeks) **Primary outcome:** not reported **Participant-reported cure or improvement:** yes, measured by a question, "cured", "improved", or "failed", immediately after intervention (6 weeks) and at 6 months **Symptom-related QoL:** not reported **Adverse events:** yes, probably during intervention (6 weeks) **Satisfaction:** not reported **Number of incontinence episodes:** not reported **Number of urgency episodes:** not reported **Number of micturition episodes:** not reported
Notes	**Funding:** not reported **COI description:** unclear

Fantl 1991

Study characteristics	
Methods	**Study design:** 2-arm, parallel design RCT **Dates study conducted:** not reported
Participants	**Number of participants:** 131 females with incontinence **Setting:** outpatient, number of centers/facilities not reported, national

Fantl 1991 *(Continued)*

	Country: USA **Method of diagnosis:** DI was diagnosed by pressure flow study **Age (mean):** Group I 66 (SD 8) years; Group II 68 (SD 9) years **Sex:** female **Duration from onset (mean):** Group I 13 (SD 11) years; Group II 8 (SD 10) years **Prevalence of target participants (OAB, DI, or UUI):** Group I 12% (7/60); Group II 11% (7/63) **Prevalence of incontinence:** Group I 100% (60/60); Group II 100% (63/63) **Any relevant details of health status of participants:** not reported **Inclusion criteria:** independent community-dwelling women; ≥ 55 years; ≥ 1 episode of involuntary urine loss a week; mentally intact (Mini-Mental State Examination score > 23); able to perform toileting independently **Exclusion criteria:** metabolic decompensation (e.g. uncontrolled diabetes mellitus); lower UTI; urinary obstruction; diverticulum; fistula; reversible cause of UI (e.g. fecal impaction); permanent indwelling catheter; not fulfilling pre-established objective urodynamic criteria for either DI or GSI (or both)
Interventions	**Group I (n = 60):** bladder training • Provider: not reported • Prescription: face-to-face • Individual or group: individual • Place: outpatient • Frequency: 6 sessions • Length: 15–20 minutes • Duration: 6 weeks • Patient education: yes • Schedule voiding: yes • Positive reinforcement: yes • Self-monitoring/bladder diary: yes • Other details: not reported **Group II (n = 63):** no further contact and asked to return in 6 weeks.
Outcomes	**Primary endpoint:** immediately after intervention (6 weeks) **Primary outcome:** number of weekly incontinent episodes **Participant-reported cure or improvement:** yes, measured by "50% or greater reduction in incontinent episodes" immediately after intervention (6 weeks). Outcomes of DI could not be extracted. **Symptom-related QoL:** yes, IIQ-R immediately after intervention (6 weeks). Outcomes of DI could not be extracted. **Adverse events:** not reported **Satisfaction:** not reported **Number of incontinence episodes:** yes, FVC immediately after intervention (6 weeks) **Number of urgency episodes:** not reported **Number of micturition episodes:** not reported

Fantl 1991 *(Continued)*

Notes	**Funding:** National Institute on Aging and National Center on Nursing Research, USA **COI description:** unclear

Jarvis 1980

Study characteristics	
Methods	**Study design:** 2-arm, parallel design RCT **Dates study conducted:** not reported
Participants	**Number of participants:** 60 incontinent women diagnosed as DI **Setting:** inpatient in Group I and at home in Group II, number of centers/facilities not reported, national **Country:** UK **Method of diagnosis:** DI was diagnosed by pressure flow study **Age (mean (range)):** Group I 49.7 (35–74) years; Group II 46.7 (27–79) years **Sex:** female **Duration from onset (mean (range)):** Group I 2.3 (0.4–10.0) years; Group II 2.7 (0.5–10.0) years **Prevalence of target participants (OAB, DI, or UUI):** Group I 100% (30/30); Group II 100% (30/30) **Prevalence of incontinence:** Group I 100% (30/30); Group II 100% (30/30) **Any relevant details of health status of participants:** not reported **Inclusion criteria:** UI due to idiopathic DI diagnosed by pressure-flow study **Exclusion criteria:** UTIs; any woman taking a drug suspected of affecting lower urinary tract function; any woman with co-existing GSI
Interventions	**Group I (n = 30):** bladder drill • Provider: unclear • Prescription: not reported • Individual or group: not reported • Place: inpatient • Frequency: not reported • Length: not reported • Duration: not reported • Patient education: yes, quote: "The rational is explained." • Schedule voiding: yes, quote: "The patient is instructed to pass urine at specific intervals during the day" • Positive reinforcement: yes, quote: "We introduce the patient to someone successfully treated by the drill." • Self-monitoring/bladder diary: yes, quote: "keep a fluid-balance chart" • Other details: not reported **Group II (n = 30):** no treatment

Jarvis 1980 *(Continued)*

	The women were advised that they should be able to hold urine for 4 hours and be continent, then sent home.
Outcomes	**Primary endpoint:** post-treatment (6 months) **Primary outcome:** not reported **Participant-reported cure or improvement:** yes, measured by "continence" or "symptom free" immediately after intervention (6 months) **Symptom-related QoL:** not reported **Adverse events:** not reported **Satisfaction:** not reported **Number of incontinence episodes:** not reported **Number of urgency episodes:** not reported **Number of micturition episodes:** not reported
Notes	**Funding:** not reported **COI description:** unclear

Jarvis 1981

Study characteristics	
Methods	**Study design:** 2-arm, parallel design RCT **Dates study conducted:** not reported
Participants	**Number of participants:** 50 incontinent women diagnosed as DI **Setting:** inpatient in Group I and at home in Group II, number of centers/facilities not reported, national **Country:** UK **Method of diagnosis:** DI diagnosed by pressure flow study **Age (mean):** Group I 47 (SD 15.4) years; Group II 46 (SD 12.8) years **Sex:** female **Duration from onset (mean):** Group I 4.3 (SD 2.7) years; Group II 5.4 (SD 3.2) years **Prevalence of target participants (OAB, DI, or UUI):** Group I 100% (25/25); Group II 100% (25/25) **Prevalence of incontinence:** Group I 100% (25/25); Group II 100% (25/25) **Any relevant details of health status of participants:** not reported **Inclusion criteria:** UI with DI diagnosed by UDS **Exclusion criteria:** co-existing GSI; neurologic abnormalities; diabetes mellitus; UTIs; woman taking a drug suspected of affecting lower urinary tract function
Interventions	**Group I (n = 25):** bladder training. Inpatient bladder drill. No details of the method given or how long the women stayed in the hospital.

Jarvis 1981 *(Continued)*

	• Provider: not reported • Prescription: not reported • Individual or group: not reported • Place: inpatient • Frequency: not reported • Length: not reported • Duration: not reported • Patient education: not reported • Schedule voiding: not reported • Positive reinforcement: not reported • Self-monitoring/bladder diary: not reported • Other details: not reported **Group II (n = 25):** flavoxate hydrochloride plus imipramine Flavoxate hydrochloride 200 mg 3 times a day plus imipramine 25 mg 3 times a day for 4 weeks
Outcomes	**Primary endpoint:** immediately after intervention (4 weeks) **Primary outcome:** not reported **Participant-reported cure or improvement:** yes, measured by "continence" or "symptom free" immediately after intervention (4 weeks) **Symptom-related QoL:** not reported **Adverse events:** yes, probably during intervention (4 weeks) Group I (n = 0/25) Group II (n = 14/25): dizziness (8), dry mouth (6), headache (6), nausea (4), drowsiness (2), vomiting (1) **Satisfaction:** not reported **Number of incontinence episodes:** not reported **Number of urgency episodes:** not reported **Number of micturition episodes:** not reported
Notes	**Funding:** not reported **COI description:** unclear

Kafri 2013

Study characteristics	
Methods	**Study design:** 4-arm, parallel design RCT **Dates study conducted:** June 2007 to January 2012
Participants	**Participants:** 164 women with UUI symptoms **Setting:** outpatient, multicenter, national **Country:** Israel

Kafri 2013 *(Continued)*

	Method of diagnosis: UUI diagnosed by healthcare professionals based on questionnaires **Age (mean):** Group I 57.2 (SD 8.2) years; Group II 57.1 (SD 9.0) years; Group III 56.4 (SD 7.1) years; Group IV 56.2 (SD 7.8) years **Sex:** female **Duration from onset (mean (SD)):** not reported **Prevalence of target participants (OAB, DI, or UUI):** Group I 100% (41/41); Group II 100% (42/42); Group III 100% (40/40); Group IV 100% (41/41) **Prevalence of incontinence:** Group I 100% (41/41); Group II 100% (42/42); Group III 100% (40/40); Group IV 100% (41/41) **Any relevant details of health status of participants:** not reported **Inclusion criteria:** women aged 45–75 years who experienced ≥ 3 episodes of UUI that were not completely explained by SUI symptoms over the previous 4 weeks; PFM contraction, Oxford Strength Scale ≥ 2; no vaginal prolapse; RU volume by ultrasound < 100 mL **Exclusion criteria:** not being independent; contraindications to drug therapy; current UTI; neurologic disease; diagnosed with psychiatric or depressive disorder; previous pelvic floor surgery; previous pelvic floor physical therapy
Interventions	**Group I (n = 41):** bladder training • Provider: physical therapist • Prescription: face-to-face • Individual or group: individual • Place: outpatient • Frequency: 4 sessions • Length: 50 minutes • Duration: 12 weeks • Patient education: yes • Schedule voiding: yes • Positive reinforcement: yes • Self-monitoring/bladder diary: yes • Other details: to ensure standardization of all study procedures, training meetings were conducted by the principal investigator for all participating therapists before and during the trial. **Group II (n = 42):** tolterodine SR 4 mg once a day for 3 months **Group III (n = 40):** PFMT. The PFMT protocol was based on the National Institute for Health and Clinical Excellence recommendations. At each appointment, the women practiced 3 sets of 8–12 slow maximal contractions sustained for 6–8 seconds in different functional body positions, progressing from lying to standing. The maximum prescribed PFMT duration progressed to 10 seconds of contractions followed by 10 seconds of relaxation. Participants then continued a daily PFMT home-based program and recorded their home exercise sessions using an exercise log. Participants were also taught to contract these muscles repeatedly to diminish urgency and prevent UI as suggested by Burgio 2008. • Provider: physical therapist • Prescription: face-to-face • Individual or group: individual • Place: outpatient • Frequency: 4 sessions • Length: 50 minutes • Duration: 12 weeks

Kafri 2013 *(Continued)*

	Group IV (n = 41): CPFR The CPFR protocol included BT, PFMT, and behavioral advice, including bowel education to avoid constipation, advising modification of fluid intake, daily activity, and ergonomic consultation. Bladder diaries were completed between appointments to record time and volumes of voids per 24 hours • Provider: physical therapist • Prescription: face-to-face • Individual or group: individual • Place: outpatient • Frequency: 4 sessions • Length: 50 minutes • Duration: 12 weeks
Outcomes	**Primary endpoint:** after treatment (12 months) **Primary outcome:** number of micturitions in a 24-hour bladder diary; number of UUI episodes by participants' reports per week **Participant-reported cure or improvement:** not reported **Symptom-related QoL:** yes, I-QOL (3 months and 12 months) **Adverse events:** not reported **Satisfaction:** not reported **Number of incontinence episodes:** yes, FVC (3 months and 12 months) **Number of urgency episodes:** yes, FVC (3 months and 12 months) **Number of micturition episodes:** yes, FVC (3 months and 12 months)
Notes	**Funding:** Maccabbi Healthcare Services, Israel **COI description:** none

Lagro-Janssen 1992

Study characteristics	
Methods	**Study design:** 2-arm, parallel design RCT (the control group received treatment after the 3 months' evaluation) **Dates study conducted:** not reported
Participants	110 incontinent women (Group I 54; Group II 56) **Setting:** outpatient, multicenter, national **Country:** Netherlands **Method of diagnosis:** DI diagnosed by pressure flow study. Of all participants, 18 were diagnosed as DI (GSI 66, DI 18, MUI 20, other 6) **Age (mean):** Group I 44.6 (SD 10.4) years; Group II 42.3 (SD 10.0) years **Sex:** female

Lagro-Janssen 1992 *(Continued)*

	Duration from onset (mean): • Group I < 2 years 35% (19/54), 2–5 years 17% (9/54), > 5 years 48% (26/54) • Group II < 2 years 36% (20/56), 2–5 years 36% (20/56), > 5 years 28% (16/56) **Prevalence of target participants (OAB, DI, or UUI):** Group I 17% (9/54); Group II 16% (9/56) **Prevalence of incontinence:** Group I 100% (54/54); Group II 100% (56/56) **Any relevant details of health status of participants:** not reported **Inclusion criteria:** incontinence was defined as the involuntary loss of urine twice or more per month **Exclusion criteria:** surgery for incontinence; neurologic diseases which may cause incontinence; UTIs
Interventions	**Group I (n = 9):** bladder training • Provider: general practitioner • Prescription: face-to-face • Individual or group: individual • Place: outpatient • Frequency: not reported • Length: not reported • Duration: 3 months • Patient education: yes • Schedule voiding: yes • Positive reinforcement: not reported • Self-monitoring/bladder diary: yes • Other details: not reported **Group II (n = 9):** no treatment The control group received bladder training after the 3-month evaluation.
Outcomes	**Primary endpoint:** immediately after intervention **Primary outcome:** not reported **Participant-reported cure or improvement:** yes, at 3 months **Symptom-related QoL:** not reported **Adverse events:** not reported **Satisfaction:** not reported **Number of incontinence episodes:** yes, at 3 months **Number of urgency episodes:** not reported **Number of micturition episodes:** not reported
Notes	**Funding:** Dutch Prevention Fund. **COI description:** unclear The outcome of UUI cannot be excluded from the original paper. However, a previous Cochrane Review searched for additional published data about UUI. Based on the review, 8 in treatment group (n = 9) and none in control group (n = 9) were cured or improved at 3 months.

Lauti 2008

Study characteristics	
Methods	**Study design:** 3-arm, parallel design RCT **Dates study conducted:** February 2003 to July 2003
Participants	**Number of participants:** 57 UUI females **Setting:** outpatient, single-center, national **Country:** New Zealand **Method of diagnosis:** no detail (eligibility was confirmed by a urogynecologist) **Age (mean):** Group I 53.8 (SD 14.8) years; Group II 63.9 years (SD 17.2) years; Group III 47.6 (SD 16.3) years **Sex:** female **Duration from onset, mean:** Group I 8.1 (SD 7.1) years; Group II 3.2 (SD 5.5) years; Group III 3.8 (SD 2.9) years **Prevalence of target participants (OAB, DI, or UUI):** Group I 100% (21/21); Group II 100% (17/17); Group III 100% (19/19) **Prevalence of incontinence:** Group I 100% (21/21); Group II 100% (17/17); Group III 100% (19/19) **Any relevant details of health status of participants:** not reported **Inclusion criteria:** predominant UUI experiencing at least monthly leakage and aged > 18 years **Exclusion criteria:** predominant SUI; contraindications to anticholinergic drugs; current UTI; neurologic disease; psychiatric disorder; untreated co-existing pelvic organ prolapse below the hymenal ring; obstructed voiding; functional–reversible cause of incontinence; inability to toilet independently; limited fluency in written or spoken (or both) English or current or recent use of either of the trial interventions
Interventions	**Group I (n = 21):** bladder training • Provider: physiotherapist • Prescription: face-to-face plus leaflet • Individual or group: individual • Place: outpatient • Frequency: initial consultation and follow-up after 2 to 3 weeks • Length: 1-hour appointment (initial consultation) and telephone/30 minutes appointment (follow-up) • Duration: 3 months • Patient education: yes • Schedule voiding: yes • Positive reinforcement: not reported • Self-monitoring/bladder diary: not reported • Other details: use of a voluntary PFM contraction to defer urge. **Group II (n = 16):** oxybutynin 2.5 mg once a day to 5 mg 3 times a day for 3 months **Group III (n = 19):** bladder training plus oxybutynin. Both were administered in the same way as the other 2 arms.
Outcomes	**Primary endpoint:** 3 months

Lauti 2008 *(Continued)*

	Primary outcome: OAB-q
	Participant-reported cure or improvement: not reported
	Symptom-related QoL: yes, OAB-q at 3 months and 12 months
	Adverse events: yes, at 3 months and 12 months
	Group I vs Group II vs Group III
	Dry mouth: 19% (3/16) vs 93% (14/15) vs 83% (10/12) at 3 months, 21% (3/14) vs 46% (5/11) vs 42% (5/12) at 12 months
	Headaches: 33% (6/18) vs 31% (4/13) vs 33% (4/12) at 3 months, 43% (6/14) vs 11% (1/9) vs 58% (7/12) at 12 months
	Dizziness–vertigo: 13% (2/16) vs 17% (2/12) vs 18% (2/11) at 3 months, 29% (4/14) vs 20% (2/10) vs 25% (3/12) at 12 months
	Constipation: 18% (3/17) vs 20% (3/12) vs 42% (5/12) at 3 months, 21% (3/14) vs 27% (3/11) vs 27% (3/11) at 12 months
	Fatigue: 28% (5/18) vs 62% (8/13) vs 25% (3/12) at 3 months, 64% (9/14) vs 46% (5/11) vs 64% (7/11) at 12 months
	Satisfaction: not reported
	Number of incontinence episodes: yes, FVC at 3 months and 12 months
	Number of urgency episodes: yes, FVC at 3 months and 12 months
	Number of micturition episodes: yes, FVC at 3 months and 12 months
Notes	**Funding:** University of Otago, Otago Research Grant
	COI description: unclear

Lentz 1994

Study characteristics	
Methods	**Study design:** 2-arm, parallel design RCT
	Dates study conducted: not reported
Participants	**Number of participants:** 22 women with OAB
	Setting: outpatient, not reported, national
	Country: UK
	Method of diagnosis: not reported
	Age (mean (range)): total: 42 (19–64) years
	Sex: female
	Duration from onset (mean (range)): total: 6.5 (1–10) years
	Prevalence of target participants (OAB, DI, or UUI): Group I 100% (11/11); Group II 100% (11/11)
	Prevalence of incontinence: not reported

Lentz 1994 *(Continued)*

	Any relevant details of health status of participants: not reported **Inclusion criteria:** frequency, urgency, urge (or a combination) incontinence were present; 1-week urinary diary confirmed > 7 voids/day **Exclusion criteria:** subtracted cystometry was abnormal; urine culture, cystoscopy and cytology were abnormal; vaginal infection
Interventions	**Group I (n = 11):** bladder training Inpatient bladder drill. No detail of the method given or how long the participants stayed in the hospital. • Provider: not reported • Prescription: face-to-face • Individual or group: individual • Place: not reported • Frequency: not reported • Length: not reported • Duration: not reported • Patient education: not reported • Schedule voiding: not reported • Positive reinforcement: not reported • Self-monitoring/bladder diary: not reported • Other details: not reported **Group II (n = 11):** PFMT provided with vaginal cones. There were no other details.
Outcomes	**Primary endpoint:** not reported **Primary outcome:** not reported **Participant-reported cure or improvement:** yes, measured by "cure" or "improvement" at 1 month and 3 months Group I: 80% at 1 month and 100% at 3 months Group II: 78% at 1 month and 60% at 3 months **Symptom-related QoL:** not reported **Adverse events:** not reported **Satisfaction:** not reported **Number of incontinence episodes:** not reported **Number of urgency episodes:** not reported **Number of micturition episodes:** not reported, only daytime micturition at 3 months
Notes	**Funding:** not reported **COI description:** unclear

Mattiasson 2003

Study characteristics

Mattiasson 2003 *(Continued)*

Methods	**Study design:** 2-arm, parallel design RCT **Dates study conducted:** October 1999 to December 2000
Participants	**Number of participants:** 501 adults with OAB **Setting:** outpatient, multicenter, international **Countries:** Sweden, Norway, Denmark **Method of diagnosis:** questionnaires **Age, median (range):** Group I 62 (19–86) years; Group II 63 (22–86) years **Sex:** • Group I: male 67 (27%); female 177 (73%) • Group II: male 56 (22%); female 201 (78%) **Duration from onset (> 5 years):** Group I 120 (49%); Group II 124 (48%) **Prevalence of target participants (OAB, DI, or UUI):** Group I 100% (244/244); Group II 100% (257/257) **Prevalence of incontinence:** Group I 59% (143/244); Group II 64% (165/257) **Any relevant details of health status of participants:** not reported **Inclusion criteria:** aged ≥ 18 years; urinary frequency (≥ 8 micturitions/24 hours on average); urgency (a strong and sudden desire to urinate); with or without urge incontinence **Exclusion criteria:** stress or mixed incontinence; contraindication to antimuscarinic therapy; use of electrostimulation therapy or BT within the previous 3 months; patients with an indwelling catheter or on intermittent catheterization; pregnancy and lactation; and use of anticholinergic agents or concomitant treatment for an OAB (other than estrogen replacement therapy started ≥ 2 months before study commencement)
Interventions	**Group I (n = 244):** bladder training + tolterodine Inpatient bladder drill. No detail of the method given or how long the participants stayed in the hospital. • Provider: leaflet • Prescription: leaflet • Individual or group: leaflet • Place: outpatient • Frequency: not reported • Length: not reported • Duration: 24 weeks • Patient education: yes • Schedule voiding: yes • Positive reinforcement: not reported • Self-monitoring/bladder diary: yes • Other details: relaxation and distraction techniques were mentioned in the leaflet • Tolterodine 2 mg 2 times a day for 24 weeks **Group II (n = 257):** tolterodine 2 mg 2 times a day for 24 weeks
Outcomes	**Primary endpoint:** immediately after intervention (24 weeks) **Primary outcome:** number of micturition per day

Mattiasson 2003 *(Continued)*

	Participant-reported cure or improvement: yes, improvement was defined as a decrease in the 6-point score of ≥ 1 point at immediately after intervention (24 weeks) **Symptom-related QoL:** not reported **Adverse events:** yes, probably during intervention (24 weeks) Group I (n = 158/244): dry mouth (76), headache (15), constipation (7) Group II (n = 177/257): dry mouth (90), headache (8), constipation (5) **Satisfaction:** not reported **Number of incontinence episodes:** yes, FVC (24 weeks) **Number of urgency episodes:** yes, FVC (24 weeks) **Number of micturition episodes:** yes, FVC (24 weeks)
Notes	**Funding:** supported by Pharmacia Corporation **COI description:** unclear

Mattiasson 2010

Study characteristics	
Methods	**Study design:** 2-arm, parallel design RCT **Dates study conducted:** May 2006 to May 2007
Participants	**Number of participants:** 643 people with OAB **Setting:** outpatient, multicenter, international **Countries**: 16 countries in Europe and Australia **Method of diagnosis:** questionnaires **Age (mean (range)):** Group I 58.6 (18–85) years; Group II 58.2 (20–87) years **Sex:** • Group I: male 13.4%, female 86.6% • Group II: male 15.2%, female 84.8% **Duration from onset, mean:** Group I 49.0 months; Group II 48.7 months **Prevalence of target participants (OAB, DI, or UUI):** Group I 100% (323/323); Group II 100% (320/320) **Prevalence of incontinence:** Group I 50.2%; Group II 50.2% **Any relevant details of health status of participants:** not reported **Inclusion criteria:** aged ≥ 18 years; ≥ 3 episodes of urgency or urgency incontinence; mean ≥ 8 micturitions/24 hours during the 3-day voiding diary period **Exclusion criteria:** BOO; postvoid residual volume > 200 mL; significant stress incontinence or mixed stress/urgency incontinence where stress was the predominant factor; evidence of UTI; bladder stones; chronic interstitial cystitis; neurologic causes of abnormal detrusor activity; previous irradiation; malignant disease (previous or current); child-bearing potential; pregnancy; lactation;

Mattiasson 2010 *(Continued)*

	conditions contraindicating use of anticholinergic medication; myasthenia gravis or diabetic neuropathy; non-drug OAB treatments (including electrostimulation therapy and pelvic floor exercise in the 4 weeks before study start); cognitive bladder training in the last 6 months or who intended to start bladder training (other than the study regimen) during the study; use of drugs intended to treat UI; concomitant use of a strong CYP3A4 inhibitor
Interventions	**Group I (n = 320):** bladder training + solifenacin • Provider: leaflet • Prescription: leaflet • Individual or group: leaflet • Place: outpatient • Frequency: leaflet • Length: leaflet • Duration: 16 weeks • Patient education: yes • Schedule voiding: yes • Positive reinforcement: yes • Self-monitoring/bladder diary: yes • Other details: PFM squeezes for preventing desire to urinate • Solifenacin 5 mg once a day for 8 weeks, solifenacin 5 mg or 10 mg once a day from 8th week to 16th week **Group II (n = 323):** solifenacin 5 mg once a day for 8 weeks, solifenacin 5 mg or 10 mg once a day from 8th week to 16th week
Outcomes	**Primary endpoint:** 8 weeks **Primary outcome:** change from baseline in the mean number of micturitions per 24 hours **Participant-reported cure or improvement:** yes, I-QOL at 8 weeks and 16 weeks **Symptom-related QoL:** not reported **Adverse events:** yes, 16 weeks **Satisfaction:** yes, VAS at 8 weeks and 16 weeks **Number of incontinence episodes:** yes, FVC at 8 weeks and 16 weeks **Number of urgency episodes:** yes, FVC at 8 weeks and 16 weeks **Number of micturition episodes:** yes, FVC at 8 weeks and 16 weeks
Notes	**Funding:** research grant from Astellas Pharma Europe Ltd **COI description:** authors declared COIs for research, consultancy, advisory work, or a combination of these.

McCreanor 1998

Study characteristics	
Methods	**Study design:** 2-arm, parallel design RCT **Dates study conducted:** unclear
Participants	**Number of participants:** 31 women with UUI

McCreanor 1998 *(Continued)*

	Setting: outpatient, single-center **Country:** UK **Method of diagnosis:** questionnaires **Exclusion criteria:** not reported **Age (mean (range)):** not reported **Sex:** female **Duration from onset (mean):** not reported **Prevalence of target participants (OAB, DI, or UUI):** Group I 100% (17/17); Group II 100% (17/17) **Prevalence of incontinence:** not reported **Any relevant details of health status of participants:** not reported **Inclusion criteria:** women aged 30–70 years, urge with or without incontinence, normal cystoscopy, sterile MSU, static UDS, RU < 100 mL **Exclusion criteria:** not reported
Interventions	**Group I (n = 17):** bladder training • Provider: 2 urology nurse specialists • Prescription: face-to-face • Individual or group: individual • Place: outpatient • Frequency: 5 sessions • Length: 30 minutes • Duration: 8 weeks • Patient education: unclear • Schedule voiding: unclear • Positive reinforcement: unclear • Self-monitoring/bladder diary: unclear • Other details: no details **Group II (n = 14):** oxybutynin 2.5–5 mg 3 times a day for 16 weeks
Outcomes	**Primary endpoint:** 8 weeks and 16 weeks **Primary outcome:** unclear **Participant-reported cure or improvement:** not reported **Symptom-related QoL:** not reported **Adverse events:** not reported **Satisfaction:** not reported **Number of incontinence episodes:** using an original score **Number of urgency episodes:** not reported **Number of micturition episodes:** not reported
Notes	**Funding:** Scottish Home and Health Department Disability and Continuing Health Care Research Grant

McCreanor 1998 *(Continued)*

	COI description: unclear

Milani 1987

Study characteristics	
Methods	**Study design:** 2-arm, parallel design RCT **Dates study conducted:** May 1983 to December 1985
Participants	**Number of participants:** 81 women with idiopathic urge syndrome **Setting:** outpatient, multicenter, national **Country:** Italy **Method of diagnosis:** not reported **Age (mean):** Group I (SD 15.4) years; Group II 46 (SD 12.8) years **Sex:** female **Duration from onset (mean):** Group I 4.3 (SD 2.7) years; Group II 5.4 (SD 3.2) years **Prevalence of target participants (OAB, DI, or UUI):** Group I 100% (39/39); Group II 100% (42/42) **Prevalence of incontinence:** not reported **Any relevant details of health status of participants:** not reported **Inclusion criteria:** women with idiopathic urge syndrome **Exclusion criteria:** aged > 65 years; previous pelvic radiotherapy; pelvic masses or malignancy; urinary tract or kidney pathology; nervous system diseases; 2nd or 3rd degree genital prolapse
Interventions	**Group I (n = 39):** bladder retraining • Provider: not reported • Prescription: face-to-face • Individual or group: individual • Place: outpatient • Frequency: not reported • Length: not reported • Duration: 12 weeks • Patient education: not reported • Schedule voiding: yes • Positive reinforcement: not reported • Self-monitoring/bladder diary: yes • Other details: not reported **Group II (n = 42):** oxybutynin 15 mg 3 times a day for 4 weeks
Outcomes	**Primary endpoint:** not reported **Primary outcome:** not reported **Participant-reported cure or improvement:** yes, at the end of therapy and 3 months' follow-up **Symptom-related QoL:** not reported

Milani 1987 *(Continued)*

	Adverse events: yes, probably during intervention (4 weeks) Group I (n = 0/39) Group II (n = 14/42): mainly dry mouth **Satisfaction:** not reported **Number of incontinence episodes:** not reported **Number of urgency episodes:** not reported **Number of micturition episodes:** not reported **Note:** the time point of collecting outcome might be different between 2 groups (the end of bladder retraining was 12 weeks and that of oxybutynin was 4 weeks).
Notes	**Funding:** not reported **COI description:** unclear

Rizvi 2018

Study characteristics	
Methods	**Study design:** 2-arm, parallel design RCT **Dates study conducted:** not reported
Participants	**Number of participants:** 150 women with OAB **Setting:** outpatient, single-center, national **Country:** Pakistan **Method of diagnosis:** questionnaires (frequency, urgency, and nocturia with or without UUI for ≥ 6 months) **Age (mean):** Group I 55.7 (SD 14.7); Group II 49.1 (SD 14.9) years; Group III 49.3 (SD 14.7) years **Sex:** female **Duration from onset (mean (SD)):** not reported **Prevalence of target participants (OAB, DI, or UUI):** Group I 100% (50/50); Group II 100% (50/50); Group III 100% (50/50) **Prevalence of incontinence:** Group I 74.0% (37/50); Group II 36.0% (18/50); Group III 72.0% (36/50) **Any relevant details of health status of participants:** not reported **Inclusion criteria:** aged 25–65 years with symptoms of OAB **Exclusion criteria:** anticholinergic or tricyclic antidepressants use; treated with pelvic floor exercises or BT; pregnancy; UTI; under current urologic care; urinary obstruction with persistent indwelling catheter; uncontrolled diabetes mellitus; neurologic disorders; history of pelvic surgery; prolapse greater than POP-Q stage 2.
Interventions	**Group I (n = 50):** bladder training • Provider: physicians and incontinence nurse • Prescription: face-to-face

Rizvi 2018 *(Continued)*

- Individual or group: individual
- Place: outpatient
- Frequency: 6 sessions
- Length: 20 minutes
- Duration: 12 weeks
- Patient education: not reported
- Schedule voiding: yes, "urge suppression technique"
- Positive reinforcement: not reported
- Self-monitoring/bladder diary: yes
- Other details: lifestyle modification

Group II (n = 50): PFMT
They were instructed to hold submaximal to maximal PFM contractions for 6 seconds, 5 times and to perform 10 fast contractions per session. All participants were instructed to practice this regimen at home ≥ 3 times daily in the lying, standing, or sitting position and were assessed for any improvement during subsequent visits.

Group III (n = 50): PFMT + biofeedback

Each participant was instructed to contract or relax her PFMs following the audiovisual signals. The PERFECT scheme was used to assess muscle strength both before and after sessions.

Outcomes	**Primary endpoint:** immediately after intervention (12 weeks) **Primary outcome:** QoL using scores of UDI-SF6/IIQ-SF7 and urgency scores for these treatment modalities **Participant-reported cure or improvement:** not reported **Symptom-related QoL:** yes, UDI-SF6/IIQ-SF7 (12 weeks) **Adverse events:** yes (12 weeks) Group I (n = 0/47) Group II (n = 0/50) Group III (n = 1/50): unspecified pelvic pain (1) **Satisfaction:** not reported **Number of incontinence episodes:** yes, but only figure, no available data (12 weeks) **Number of urgency episodes:** yes, but only figure, no available data (12 weeks) **Number of micturition episodes:** yes, but only figure, no available data (12 weeks)
Notes	**Funding:** the first author received financial support from Women and Health Alliance USA (WAHA), International. This extramural grant was approved by clinical trial unit of AKU (P-15928). **COI:** none

Song 2006

Study characteristics	
Methods	**Study design:** 3-arm, parallel design RCT **Dates study conducted:** May 2001 to April 2002

Song 2006 *(Continued)*

Participants	**Number of participants:** 139 OAB females **Setting:** outpatient, number of centers/facilities not reported, national **Country:** Korea **Method of diagnosis:** questionnaires **Age (mean):** Group I 45.7 (SD 12.7) years; Group II 48.4 (SD 9.4) years; Group III 45.4 (SD 9.5) years **Sex:** female **Duration from onset (mean):** Group I 6.4 (SD 6.8) years; Group II 4.5 (SD 5.2) years; Group III 4.1 (SD 4.0) years **Prevalence of target participants (OAB, DI, or UUI):** Group I 100% (46/46); Group II 100% (47/47); Group III 100% (47/47) **Prevalence of incontinence:** not reported **Any relevant details of health status of participants:** not reported **Inclusion criteria:** aged > 18 years; > 8 urination frequency per day; urge symptoms with or without incontinence; symptom duration > 3 months; no prior history of treatment for OAB **Exclusion criteria:** UTI; SUI; BOO, interstitial cystitis, glaucoma, or megacolon; maximal urine flow rate < 10 mL/second; postvoid RU amount that was more than 30% of the total amount voided on uroflowmetry
Interventions	**Group I (n = 46):** bladder training • Provider: nurse specialist • Prescription: face-to-face • Individual or group: individual • Place: outpatient • Frequency: not reported, telephone every 2 weeks • Length: not reported • Duration: 12 weeks • Patient education: yes • Schedule voiding: yes • Positive reinforcement: not reported • Self-monitoring/bladder diary: yes • Other details: Kegel exercises for symptom alleviation **Group II (n = 47):** tolterodine 2 mg (twice a day) for 12 weeks **Group III (n = 46):** bladder training + tolterodine for 12 weeks. Both administered in the same way as the other 2 arms
Outcomes	**Primary endpoint:** immediately after intervention (12 weeks) **Primary outcome:** not reported **Participant-reported cure or improvement:** yes, measured by "satisfaction score". A change of ≥ 2 points was considered symptom improvement at 12 weeks **Symptom-related QOL:** not reported **Adverse events:** yes Group I (n = 0/26)

Song 2006 *(Continued)*

	Group II (n = 13/32): dry mouth (7), constipation (2), headache (1), hesitancy (3)
	Group III (n = 12/31): dry mouth (9), constipation (2), hesitancy (2)
	Satisfaction: not reported
	Number of incontinence episodes: not reported
	Number of urgency episodes: yes, FVC (12 weeks)
	Number of micturition episodes: yes, FVC (12 weeks)
Notes	**Funding:** not reported
	COI description: unclear

Zhang 2012

Study characteristics	
Methods	**Study design:** 4-arm, parallel design RCT
	Dates study conducted: March 2011 to February 2012
Participants	**Number of participants:** 165 women with OAB
	Setting: outpatient, number of centers/facilities not reported, national
	Country: China
	Method of diagnosis: questionnaires
	Age (mean (SD)): not reported
	Sex: female
	Duration from onset, mean (SD): not reported
	Prevalence of target participants (OAB, DI, or UUI): Group I 100% (47/47); Group II 100% (41/41); Group III 100% (41/41); Group IV 100% (34/34)
	Prevalence of incontinence: not reported
	Any relevant details of health status of participants: postmenopausal
	Inclusion criteria: presenting with symptoms of urgency and frequency, with or without urge incontinence
	Exclusion criteria: not reported
Interventions	**Group I (n = 47):** bladder training + anticholinergics. Tolterodine 4 mg once a day for 12 weeks • Provider: nurse specialist • Prescription: face-to-face • Individual or group: individual • Place: inpatient • Frequency: not reported • Length: not reported • Duration: 12 weeks • Patient education: not reported

Zhang 2012 *(Continued)*

	• Schedule voiding: not reported • Positive reinforcement: not reported • Self-monitoring/bladder diary: not reported • Other details: not reported **Group II (n = 41):** anticholinergics. Tolterodine 4 mg once a day for 12 weeks **Group III (n = 43):** tolterodine 4 mg for 12 weeks + low-dose vaginal estrogen treatment (vaginal conjugated equine estrogen 0.625 mg locally applied twice a week) **Group IV (n = 34):** Tolterodine 4 mg for 12 weeks + low-dose vaginal estrogen treatment (vaginal conjugated equine estrogen 0.625 mg locally applied twice a week) + bladder training (same as Group I)
Outcomes	**Primary endpoint:** not reported **Primary outcome:** 12 weeks **Participant-reported cure or improvement:** yes, measured by the median percentage increases of PPBC immediately after intervention (12 weeks) 66% (Group I) vs 53% (Group II) vs 50% (Group III) vs 82% (Group IV) **Symptom-related QoL:** yes, PPBC at 12 weeks **Adverse events:** not reported **Satisfaction:** not reported **Number of incontinence episodes:** yes, median percentage reductions of pads usage 71% (Group I) vs 56% (Group II) vs 60% (Group III) vs 78% (Group IV) **Number of urgency episodes:** yes, median percentage reductions of urgency episodes 71% (Group I) vs 58% (Group II) vs 60% (Group III) vs 87% (Group IV) **Number of micturition episodes:** not reported
Notes	**Funding:** The Pujiang Talent Plan of the Shanghai Municipal Government (PJ14027) **COI description:** unclear

BOO: bladder outlet obstruction; COI: conflict of interest; CPFR: combined pelvic floor rehabilitation; DI: detrusor instability; FVC: frequency volume chart; GSI: genuine stress incontinence; IIQ-SF7: Incontinence Impact Questionnaire, Short Form; IIQ-R: Incontinence Impact Questionnaire – Revised; MSU: midstream urine; MUI: mixed urinary incontinence; n: number of participants; I-QOL: Urinary Incontinence Quality of Life Scale; QoL: quality of life; PERFECT: Power (or Pressure), Endurance, Repetition, Fast contraction, and Every Contraction Timed; PFM: pelvic floor muscle; PFMT: pelvic floor muscle training; PPBC: participant perception of bladder condition; POP-Q: Pelvic Organ Prolapse Quantification; OAB: overactive bladder; OAB-q: overactive bladder questionnaire; RCT: randomized controlled trial; RU: residual urine; SD: standard deviation; SR: slow release; SUI: stress urinary incontinence; UDI: Urogenital Distress Inventory; UDI-SF6: Urinary Distress Inventory, Short Form; UDS: urodynamic study; UI: urinary incontinence; UTI: urinary tract infection; UUI: urge urinary incontinence; VAS: Visual Analog Scale.

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

Study	Reason for exclusion
ACTRN12606000511538	Poststroke/neurogenic OAB
Andrade 2015	Intervention not relevant

Study	Reason for exclusion
Aslan 2008	Intervention not relevant
Assassa 2010	Intervention not relevant
Azizi 2020	Intervention not relevant
Barber 2002	Not an RCT
Barber 2009	Not OAB or UUI
Bell-Kotwall 2003	Intervention not relevant
Berghmans 2002	Intervention not relevant
Borrie 2002	Intervention not relevant
Breyer 2018	Intervention not relevant
Brown 2009	Not OAB or UUI
Brubaker 2009	Intervention not relevant
Burgio 2000	Intervention not relevant
Burgio 2003	Review paper
Burgio 2006	Review paper
Burgio 2008	Intervention not relevant
Burgio 2010	Intervention not relevant
Burgio 2011	Intervention not relevant
Burgio 2020	Intervention not relevant
Burgio 2002	Intervention not relevant
Castleden 1986	Intervention not relevant
Castleden 1987	Intervention not relevant
Chanfreau-Rona 1984	Not an RCT
Chanfreau-Rona 1986	Not an RCT
Chesworth 2015	Poststroke/neurogenic OAB
Cho 2016	Intervention not relevant
Chu 2019	Intervention not relevant
Colling 1992	Quasi-RCT
Colling 2003	Quasi-RCT

Study	Reason for exclusion
Davila 1998	Intervention not relevant
Diokno 2004	Intervention not relevant. Not OAB or UUI
Diokno 2010	Intervention not relevant
Diokno 2018	Intervention not relevant
Dougherty 2002	Intervention not relevant
Dowd 2000	Intervention not relevant
Dyer 2011	Intervention not relevant
Elser 1995	Not OAB or UUI
Engberg 2002	Intervention not relevant
Fonda 1994	Intervention not relevant
Frost 2019	Not OAB or UUI
Gezginci 2018	Intervention not relevant
Glazener 2010	Postsurgery
Golmakani 2014	Not OAB or UUI
Gonzalez 2015	Intervention not relevant
Goode 2002	Intervention not relevant
Goode 2003	Intervention not relevant
Goode 2004	Not an RCT
Griebling 2018	Intervention not relevant
Ha 2008	Intervention not relevant
Haywood 2008	Not an RCT
Henalla 1991	Intervention not relevant
Herschorn 2004	Intervention not relevant
Hill 2007	Intervention not relevant
Hines 2007	Intervention not relevant
Holtedahl 2000	Intervention not relevant
Hu 1989	Not OAB or UUI
Huang 2012	Intervention not relevant

Study	Reason for exclusion
Hui 2006	Intervention not relevant
ISRCTN62679410	Intervention not relevant
ISRCTN62722772	Intervention not relevant
Janssen 2001	Intervention not relevant
Jirovec 2001	Not OAB or UUI
Johnson 2005	Intervention not relevant
Kafri 2008	Intervention not relevant
Kangchai 2002	Quasi-RCT
Kaya 2011	Intervention not relevant
Kaya 2015	Intervention not relevant
Kilinc 2019	Intervention not relevant
Kim 2001	Intervention not relevant
Kim 2008	Intervention not relevant
Kincade 2007	Intervention not relevant
Klarskov 1984	Intervention not relevant
Kobayashi 2009	Intervention not relevant
Komesu 2011	Intervention not relevant
Komesu 2017	Intervention not relevant
Komesu 2020	Intervention not relevant
Kraus 2007	Intervention not relevant
Kumari 2008	Intervention not relevant
Lai 2017	Intervention not relevant
Lee 2005	Intervention not relevant
Lee 2018	Intervention not relevant
Leong 2014	Intervention not relevant
Linn 1995	Not OAB or UUI
Locher 2002	Intervention not relevant
Loohuis 2019	Intervention not relevant

Study	Reason for exclusion
Macaulay 1988	No separate data available for DI
Madersbacher 2004	Intervention not relevant
Margolis 2009	Intervention not relevant
McAdam 2013	Poststroke/neurogenic OAB
McDowell 1996	Not an RCT
McFall 2000	Intervention not relevant
Messer 2006	Aim was to prevent UI
NCT00821184	Intervention not relevant
NCT01032265	Intervention not relevant
NCT01187082	Intervention not relevant
NCT02107820	Intervention not relevant
NCT02202031	Intervention not relevant
NCT02206958	Intervention not relevant
NCT02505607	Intervention not relevant
NCT02511314	Intervention not relevant
NCT03176901	Intervention not relevant
NCT03797365	Intervention not relevant
NCT04068025	Intervention not relevant
NCT04237753	Intervention not relevant
Nikoletti 2004	Intervention not relevant
NL2075	Intervention not relevant
O'Brien 1991	Intervention not relevant
O'Sullivan 2000	Intervention not relevant
Oh-Oka 2007	Intervention not relevant
Ouslander 1988	Intervention not relevant
Ouslander 1995	Intervention not relevant
Pahwa 2016	Intervention not relevant
Ramsay 1996	Intervention not relevant

Study	Reason for exclusion
RBR-64wczh	Intervention not relevant
Sackley 2008	Intervention not relevant
Sale 1994	Not an RCT
Saltmarche 1991	Intervention not relevant
Sampselle 2017	Intervention not relevant
Schnelle 1983	Not OAB or UUI
Schnelle 1990	Not OAB or UUI
Schnelle 1995	Not OAB or UUI
Schnelle 2003	Intervention not relevant
Seers 2018	Not OAB or UUI
Sereika 2003	Not OAB or UUI
Sherburn 2011	Not OAB or UUI
Shirreff 2020	Intervention not relevant
Sran 2016	Intervention not relevant
Subak 2002	Intervention not relevant
Sung 2015	Intervention not relevant
Surdy 1992	Intervention not relevant
Suzuki 2019	Intervention not relevant
Szonyi 1995	Intervention not relevant
Tak 2012	Intervention not relevant. Not OAB or UUI
Tobin 1986	Intervention not relevant
Tomlinson 1999	Not an RCT
Voorham 2017	Intervention not relevant
Wadensten 2019	Intervention not relevant
Wagg 2007	Intervention not relevant
Williams 2005	Intervention not relevant
Wiseman 1991	Intervention not relevant
Wyman 1998	No separate data available for DI

Study	Reason for exclusion
Yoon 2003	Not OAB or UUI
Yu 1991	Intervention not relevant

DI: detrusor instability; OAB: overactive bladder; RCT: randomized controlled trial; UI: urinary incontinence; UUI: urge urinary incontinence.

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

ChiCTR-TRC-14004921

Methods	**Study design:** 2-arm, parallel design RCT **Dates study conducted:** 2 June 2014 to 31 December 2015
Participants	**Participants:** 94 participants with OAB **Setting:** not reported **Country:** China **Method of diagnosis:** not reported **Age (mean (SD)):** not reported **Sex:** male or female **Duration from onset (mean (SD)):** not reported **Prevalence of target participants (OAB, DI, or UUI):** not reported **Prevalence of incontinence:** not reported **Any relevant details of health status of participants:** not reported **Inclusion criteria:** adults aged > 18 years; symptoms of OAB (including urgency, urinary frequency, nocturnal enuresis, with or without urge incontinence); within the last week, OABSS > 3 points and the Urgency Score > 2 points; capable of understanding research questions; written informed consent has been obtained. **Exclusion criteria:** current urinary infection; associated with neurologic disease such as Parkinson disease and spinal cord injury; pelvic organ prolapse or pelvic surgery; prostate cancer and bladder cancer; end-stage renal disease; pregnancy; had received similar behavioral intervention in the past year.
Interventions	Cognitive behavioral intervention. No other details reported
Outcomes	**Primary endpoint:** not reported **Primary outcome:** OABSS, IUSS **Participant-reported cure or improvement:** not stated **Symptom-related QoL:** yes, PPBC **Adverse events:** not stated **Satisfaction:** not stated **Number of incontinence episodes:** yes, FVC **Number of urgency episodes:** yes, FVC

ChiCTR-TRC-14004921 *(Continued)*

	Number of micturition episodes: yes, FVC
Notes	**Funding:** not reported **COI description:** unclear There is only registration.

Lee 1995

Methods	**Study design:** 2-arm, parallel design RCT **Dates study conducted:** not reported
Participants	**Participants:** 101 women with UI **Setting:** not reported **Country:** Canada **Method of diagnosis:** not reported **Age (mean):** 67.4 (SD 15.0) years **Sex:** female **Duration from onset (mean (SD)):** not reported **Prevalence of target participants (OAB, DI, or UUI):** 37.6% **Prevalence of incontinence:** 100% **Any relevant details of health status of participants:** not reported **Inclusion criteria:** ≥ 2 episodes of urinary incontinence per week; no other acute conditions requiring medical treatment (e.g. urinary tract infection, urinary obstruction, residual urine > 150 mL, medication adverse effects); neither language nor cognitive barriers to the treatment intervention **Exclusion criteria:** not reported
Interventions	**Group I:** behavioral techniques to self-manage one's incontinence with monthly follow-up **Group II:** no treatment
Outcomes	**Primary endpoint:** after treatment (3 months) **Primary outcome:** evaluation of subjective cure **Participant-reported cure or improvement:** yes **Symptom-related QoL:** yes, IIQ **Adverse events:** not stated **Satisfaction:** not stated **Number of incontinence episodes:** yes, FVC **Number of urgency episodes:** not stated **Number of micturition episodes:** not stated

Lee 1995 *(Continued)*

Notes	**Funding:** not reported **COI description:** unclear No detail about intervention (behavioral techniques)

NCT03331081

Methods	**Study design:** 3-arm, parallel design RCT **Dates study conducted:** November 2017 to December 2018
Participants	**Participants:** 45 women with OAB **Setting:** not reported **Country:** Brazil **Method of diagnosis:** not reported **Age (mean (SD)):** not reported **Sex:** female **Duration from onset (mean (SD)):** not reported **Prevalence of target participants (OAB, DI, or UUI):** not reported **Prevalence of incontinence:** not reported **Any relevant details of health status of participants:** not reported **Inclusion criteria:** women aged 18–80 years with IUU or IUM (or both) with a predominance of urinary urgency, capable of contracting MAPs adequately, and who agree to participate in the study, signing the informed consent form. **Exclusion criteria:** women with a diagnosis of glaucoma, myasthenia gravis, urinary tract obstruction, neurologic and chronic-degenerative diseases, people with decompensated diabetes and people with complete denervation of the pelvic floor, pregnancy, abnormal genital bleeding, impairment of cognition, inability to fill in the diary voiding, genital dystopias beyond the vaginal introitus and urethral sphincter defect. Used or had used anticholinergics, tricyclic antidepressants, or local hormone therapy within the 6 months prior to the study.
Interventions	**Group I:** bladder training **Group II:** pelvic floor muscle training **Group III:** bladder training + pelvic floor muscle training
Outcomes	**Primary endpoint:** after treatment (3 months) **Primary outcome:** evaluation of subjective cure **Participant-reported cure or improvement:** yes **Symptom-related QoL:** yes, I-QOL **Adverse events:** not stated **Satisfaction:** not stated **Number of incontinence episodes:** yes, FVC

NCT03331081 *(Continued)*

	Number of urgency episodes: yes, FVC
	Number of micturition episodes: yes, FVC
Notes	**Funding:** not reported
	COI description: unclear
	There is only a registration.

Rajeev 2017

Methods	**Study design:** not reported
	Dates study conducted: from May 2017
Participants	**Participants:** 196 women with UI
	Setting: not reported
	Country: India
	Method of diagnosis: not reported
	Age (mean (SD)): not reported
	Sex: female
	Duration from onset (mean (SD)): not reported
	Prevalence of target participants (OAB, DI, or UUI): not reported
	Prevalence of incontinence: not reported
	Any relevant details of health status of participants: not reported
	Inclusion criteria: women aged 40–60 years diagnosed with urinary incontinence; who are likely to attend follow-up; able to practice the intervention as per the guideline
	Exclusion criteria: undergone surgical intervention for urinary incontinence; aged > 60 years; not attending follow-up clinic; with severe medical illness and on treatment
Interventions	Pelvic floor exercise, bladder retraining program, combined method. No details about intervention groups.
Outcomes	**Primary endpoint:** 2 years
	Primary outcome: reduction in symptoms of urinary incontinence
	Participant-reported cure or improvement: not stated
	Symptom-related QOL: not stated
	Adverse events: not stated
	Satisfaction: not stated
	Number of incontinence: not stated
	Number of urgency: not stated
	Number of micturition: not stated

Rajeev 2017 *(Continued)*

Notes	**Funding:** not reported **COI description:** unclear

Teo 2008

Methods	**Study design:** 3-arm, parallel design RCT **Dates study conducted:** November 2017 to December 2018
Participants	**Number of participants:** 92 people with OAB **Setting:** not stated **Country:** Singapore **Method of diagnosis:** not stated **Age (mean (range)):** not stated **Sex:** not stated **Duration from onset (mean (SD)):** not stated **Prevalence of target participants (OAB, DI, or UUI):** 100% (92/92) **Prevalence of incontinence:** not reported **Any relevant details of health status of participants:** not reported **Inclusion criteria:** not reported **Exclusion criteria:** not reported
Interventions	**Group I:** multicomponent behavioral training **Group II:** Detrusitol **Group III:** combination of bladder training and Detrusitol
Outcomes	**Primary endpoint:** 12 week **Primary outcome:** not stated **Participant-reported cure or improvement:** not stated **Symptom-related QoL:** yes, BFLUTS, KHQ **Adverse events:** not stated **Satisfaction:** not stated **Number of incontinence episodes:** yes, FVC **Number of urgency episodes:** yes, FVC **Number of micturition episodes:** yes, FVC
Notes	**Funding:** no funding **COI description:** unclear

Teo 2008 *(Continued)*

No details about intervention.

BFLUTS: Bristol Female Lower Urinary Tract Symptoms; COI: conflict of interest; DI: detrusor instability; FVC: frequency volume chart; I-QOL: Urinary Incontinence Quality of Life Scale; IUM: incontinencia urinaria mixta; IUSS: Indevus Urgency Severity Scale; KHQ: King's Health Questionnaire; MAPS: men after prostate surgery; OAB: overactive bladder; OABSS: Overactive Bladder Symptom Score; PPBC: participant perception of bladder condition; QoL: quality of life; SD: standard deviation; UUI: urge urinary incontinence.

RISK OF BIAS

Legend: ✓ Low risk of bias ✗ High risk of bias ~ Some concerns

Risk of bias for analysis 1.1 Participant-reported cure or improvement: immediately after treatment

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Lagro-Janssen 1992	~	✓	✓	✗	~	✗

Risk of bias for analysis 1.2 Participant-reported cure or improvement: long-term effect (> 2 months after treatment)

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Jarvis 1980	~	✓	✓	✗	~	✗

Risk of bias for analysis 1.3 Number of incontinence episodes per 24 hours: immediately after treatment

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Fantl 1991	~	✓	✓	✓	~	~

Risk of bias for analysis 2.1 Participant-reported cure or improvement: immediately after treatment

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Colombo 1995	~	✓	✓	~	~	~
Jarvis 1981	~	✓	✓	~	~	~
Milani 1987	~	✓	✓	✗	~	✗
Song 2006	~	✗	✗	~	~	✗

Risk of bias for analysis 2.2 Participant-reported cure or improvement: long-term effect (> 2 months after treatment)

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Colombo 1995	~	✓	✓	~	~	~
Milani 1987	~	✓	✓	✗	~	✗

Risk of bias for analysis 2.3 Symptom-related quality of life (QoL): immediately after treatment

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Kafri 2013	✓	✗	✗	~	~	✗
Lauti 2008	✓	✓	✗	~	~	✗

Risk of bias for analysis 2.4 Symptom-related QoL: long-term effect (> 2 months after treatment)

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Kafri 2013	✓	✗	✗	~	~	✗
Lauti 2008	✓	✓	✗	~	~	✗

Risk of bias for analysis 2.5 Adverse events: immediately after treatment

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Colombo 1995	~	✓	✓	✗	~	~
Jarvis 1981	~	✓	✓	✗	~	✗
Song 2006	~	✗	✗	✗	~	✗

Risk of bias for analysis 2.6 Adverse events: long-term effect (> 2 months after treatment)

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Milani 1987	~	✓	✓	✗	~	✗

Risk of bias for analysis 2.7 Number of incontinence episodes per 24 hours: immediately after treatment

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Kafri 2013	✓	✗	✗	✓	~	✗

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Lauti 2008	✓	✓	✗	✓	~	✗

Risk of bias for analysis 2.8 Number of incontinence episodes per 24 hours: long-term effect (> 2 months after treatment)

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Kafri 2013	✓	✗	✗	✓	~	✗
Lauti 2008	✓	✓	✗	✓	~	✗

Risk of bias for analysis 2.9 Number of urgency episodes per 24 hours: immediately after treatment

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Lauti 2008	✓	✓	✗	✓	~	✗
Song 2006	~	✗	✗	✓	~	✗

Risk of bias for analysis 2.10 Number of urgency episodes per 24 hours: long-term effect (> 2 months after treatment)

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Lauti 2008	✓	✓	✗	✓	~	✗

Risk of bias for analysis 2.11 Number of micturition episodes per 24 hours: immediately after treatment

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Kafri 2013	✓	✗	✗	✓	~	✗
Lauti 2008	✓	✓	✗	✓	~	✗
Song 2006	~	✗	✗	✓	~	✗

Risk of bias for analysis 2.12 Number of micturition episodes per 24 hours: long-term effect (> 2 months after treatment)

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Kafri 2013	✓	✗	✗	✓	~	✗
Lauti 2008	✓	✓	✗	✓	~	✗

Risk of bias for analysis 3.1 Symptom-related quality of life (QoL): immediately after treatment

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Kafri 2013	✓	✓	✗	~	~	✗
Rizvi 2018	✓	✓	✓	~	~	~

Risk of bias for analysis 3.2 Symptom-related QoL: long-term effect (> 2 months after treatment)

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Kafri 2013	✓	✓	✗	~	~	✗

Risk of bias for analysis 3.3 Adverse events: immediately after treatment

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Rizvi 2018	✓	✓	✓	~	~	~

Risk of bias for analysis 3.4 Number of incontinence episodes per 24 hours: immediately after treatment

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Kafri 2013	✓	✓	✗	✓	~	✗

Risk of bias for analysis 3.5 Number of incontinence episodes per 24 hours: long-term effect (> 2 months after treatment)

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Kafri 2013	✓	✓	✗	✓	~	✗

Risk of bias for analysis 3.6 Number of micturition episodes per 24 hours: immediately after treatment

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Kafri 2013	✓	✓	✗	✓	~	✗

Risk of bias for analysis 3.7 Number of micturition episodes per 24 hours: long-term effect (> 2 months after treatment)

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Kafri 2013	✓	✓	✗	✓	~	✗

Risk of bias for analysis 4.1 Participant-reported cure or improvement: immediately after treatment

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Mattiasson 2003	✓	✓	✗	~	~	✗
Song 2006	~	✗	✗	~	~	✗

Risk of bias for analysis 4.2 Symptom-related quality of life (QoL): immediately after treatment

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Lauti 2008	✓	✓	✗	~	~	✗
Mattiasson 2010	~	✓	~	~	~	~

Risk of bias for analysis 4.3 Symptom-related QOL: long-term effect (> 2 months after treatment)

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Lauti 2008	✓	✓	✗	~	~	✗
Mattiasson 2010	~	✓	~	~	~	~

Risk of bias for analysis 4.4 Adverse events: immediately after treatment

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Mattiasson 2003	✓	✓	✓	~	~	~
Song 2006	~	✗	✗	~	~	✗

Risk of bias for analysis 4.5 Adverse events: long-term effect (> 2 months after treatment)

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Mattiasson 2010	~	✓	✓	~	~	~

Risk of bias for analysis 4.6 Participant-reported satisfaction: immediately after treatment

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Mattiasson 2010	~	✓	~	~	~	~

Risk of bias for analysis 4.7 Participant-reported satisfaction: long-term effect (> 2 months after treatment)

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Mattiasson 2010	~	✓	~	~	~	~

Risk of bias for analysis 4.8 Number of incontinence episodes per 24 hours: immediately after treatment

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Lauti 2008	✓	✓	✗	✓	~	✗
Mattiasson 2003	✓	✓	✗	✓	~	✗
Mattiasson 2010	~	✓	~	✓	~	~

Risk of bias for analysis 4.9 Number of incontinence episodes per 24 hours: long-term effect (> 2 months after treatment)

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Lauti 2008	✓	✓	✗	✓	~	✗
Mattiasson 2010	~	✓	~	✓	~	~

Risk of bias for analysis 4.10 Number of urgency episodes per 24 hours: immediately after treatment

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Lauti 2008	✓	✓	✗	✓	~	✗

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Mattiasson 2003	✓	✓	✗	✓	~	✗
Mattiasson 2010	~	✓	~	✓	~	~
Song 2006	~	✗	✗	✓	~	✗

Risk of bias for analysis 4.11 Number of urgency episodes per 24 hours: long-term effect (> 2 months after treatment)

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Lauti 2008	✓	✓	✗	✓	~	✗
Mattiasson 2010	~	✓	~	✓	~	~

Risk of bias for analysis 4.12 Number of micturition episodes per 24 hours: immediately after treatment

	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Lauti 2008	✓	✓	✗	✓	~	✗
Mattiasson 2003	✓	✓	✗	✓	~	✗
Mattiasson 2010	~	✓	~	✓	~	~
Song 2006	~	✗	✗	✓	~	✗

Risk of bias for analysis 4.13 Number of micturition episodes per 24 hours: long-term effect (> 2 months after treatment)

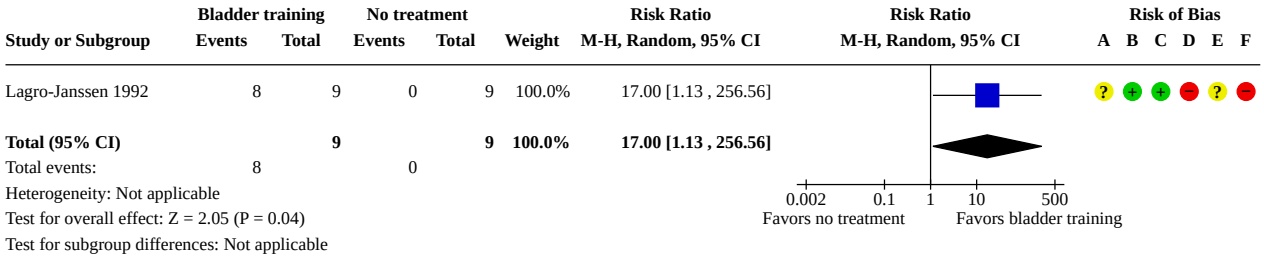
	Bias					
Study	**Randomisation process**	**Deviations from intended interventions**	**Missing outcome data**	**Measurement of the outcome**	**Selection of the reported results**	**Overall**
Lauti 2008	✓	✓	✗	✓	~	✗
Mattiasson 2010	~	✓	~	✓	~	~

DATA AND ANALYSES

Comparison 1. Bladder training versus no treatment

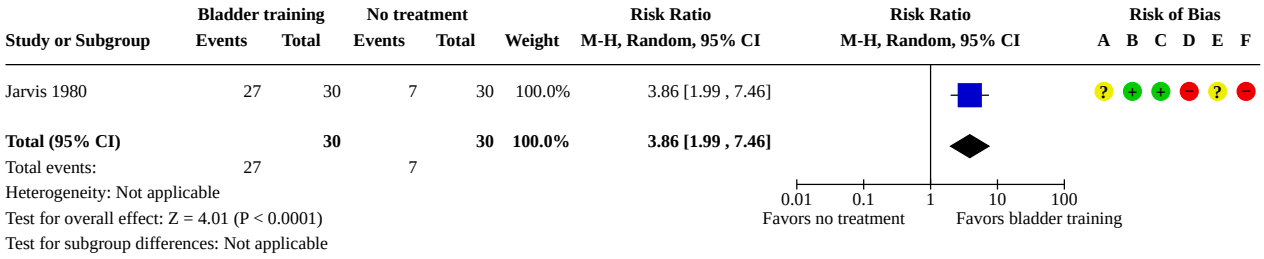
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1.1 Participant-reported cure or improvement: immediately after treatment	1	18	Risk Ratio (M-H, Random, 95% CI)	17.00 [1.13, 256.56]
1.2 Participant-reported cure or improvement: long-term effect (> 2 months after treatment)	1	60	Risk Ratio (M-H, Random, 95% CI)	3.86 [1.99, 7.46]
1.3 Number of incontinence episodes per 24 hours: immediately after treatment	1	14	Mean Difference (IV, Random, 95% CI)	-1.86 [-3.47, -0.25]

Analysis 1.1. Comparison 1: Bladder training versus no treatment, Outcome 1: Participant-reported cure or improvement: immediately after treatment



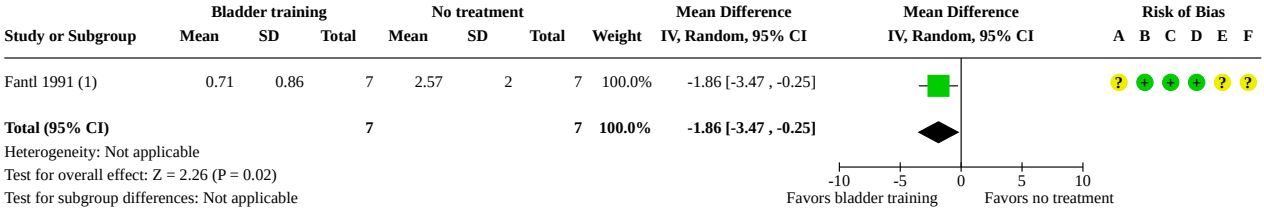
Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 1.2. Comparison 1: Bladder training versus no treatment, Outcome 2: Participant-reported cure or improvement: long-term effect (> 2 months after treatment)



Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 1.3. Comparison 1: Bladder training versus no treatment, Outcome 3: Number of incontinence episodes per 24 hours: immediately after treatment



Footnotes
(1) The weekly mean and the SD were transformed to the daily mean and SD.

Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Comparison 2. Bladder training versus anticholinergics

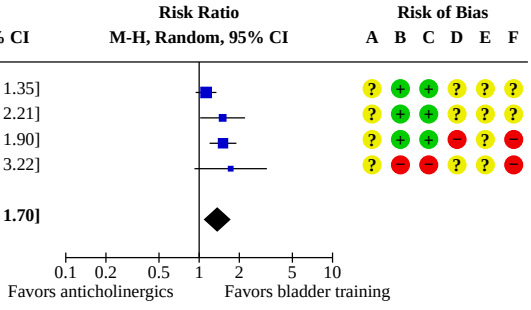
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
2.1 Participant-reported cure or improvement: immediately after treatment	4	258	Risk Ratio (M-H, Random, 95% CI)	1.37 [1.10, 1.70]
2.2 Participant-reported cure or improvement: long-term effect (> 2 months after treatment)	2	150	Risk Ratio (M-H, Random, 95% CI)	1.61 [1.18, 2.18]
2.3 Symptom-related quality of life (QoL): immediately after treatment	2	117	Std. Mean Difference (IV, Random, 95% CI)	-0.06 [-0.89, 0.77]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
2.4 Symptom-related QoL: long-term effect (> 2 months after treatment)	2	112	Std. Mean Difference (IV, Random, 95% CI)	0.15 [-0.22, 0.52]
2.5 Adverse events: immediately after treatment	3	187	Risk Ratio (M-H, Random, 95% CI)	0.03 [0.01, 0.17]
2.6 Adverse events: long-term effect (> 2 months after treatment)	1	75	Risk Ratio (M-H, Random, 95% CI)	0.04 [0.00, 0.57]
2.7 Number of incontinence episodes per 24 hours: immediately after treatment	2	117	Mean Difference (IV, Random, 95% CI)	0.36 [-0.27, 1.00]
2.8 Number of incontinence episodes per 24 hours: long-term effect (> 2 months after treatment)	2	112	Mean Difference (IV, Random, 95% CI)	-0.22 [-0.64, 0.20]
2.9 Number of urgency episodes per 24 hours: immediately after treatment	2	92	Mean Difference (IV, Random, 95% CI)	0.70 [-0.62, 2.02]
2.10 Number of urgency episodes per 24 hours: long-term effect (> 2 months after treatment)	1	29	Mean Difference (IV, Random, 95% CI)	0.40 [-1.27, 2.07]
2.11 Number of micturition episodes per 24 hours: immediately after treatment	3	175	Mean Difference (IV, Random, 95% CI)	-0.35 [-1.90, 1.20]
2.12 Number of micturition episodes per 24 hours: long-term effect (> 2 months after treatment)	2	112	Mean Difference (IV, Random, 95% CI)	0.26 [-0.60, 1.12]

Analysis 2.1. Comparison 2: Bladder training versus anticholinergics, Outcome 1: Participant-reported cure or improvement: immediately after treatment

Study or Subgroup	Bladder training Events	Total	Anticholinergics Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
Colombo 1995	34	37	31	38	38.2%	1.13 [0.94 , 1.35]
Jarvis 1981	21	25	14	25	19.5%	1.50 [1.02 , 2.21]
Milani 1987	37	37	25	38	32.5%	1.51 [1.20 , 1.90]
Song 2006	14	26	10	32	9.7%	1.72 [0.92 , 3.22]
Total (95% CI)		**125**		**133**	**100.0%**	**1.37 [1.10 , 1.70]**
Total events:	106		80			

Heterogeneity: Tau² = 0.02; Chi² = 6.25, df = 3 (P = 0.10); I² = 52%
Test for overall effect: Z = 2.82 (P = 0.005)
Test for subgroup differences: Not applicable

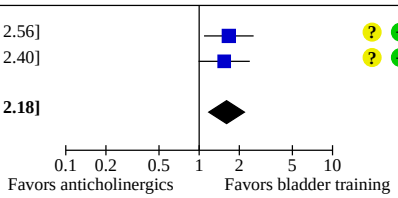


Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 2.2. Comparison 2: Bladder training versus anticholinergics, Outcome 2: Participant-reported cure or improvement: long-term effect (> 2 months after treatment)

Study or Subgroup	Bladder training Events	Total	Anticholinergics Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
Colombo 1995	26	37	16	38	51.6%	1.67 [1.09 , 2.56]
Milani 1987	24	37	16	38	48.4%	1.54 [0.99 , 2.40]
Total (95% CI)		**74**		**76**	**100.0%**	**1.61 [1.18 , 2.18]**
Total events:	50		32			

Heterogeneity: Tau² = 0.00; Chi² = 0.07, df = 1 (P = 0.80); I² = 0%
Test for overall effect: Z = 3.02 (P = 0.003)
Test for subgroup differences: Not applicable

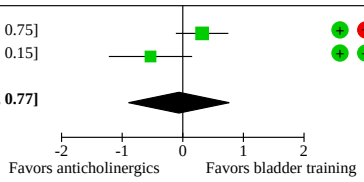


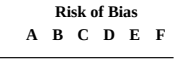
Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 2.3. Comparison 2: Bladder training versus anticholinergics, Outcome 3: Symptom-related quality of life (QoL): immediately after treatment

Study or Subgroup	Bladder training Mean	SD	Total	Anticholinergics Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Kafri 2013	89.6	21	41	82.5	23.1	42	55.1%	0.32 [-0.11 , 0.75]
Lauti 2008	82.3	16.1	18	89.6	9.4	16	44.9%	-0.53 [-1.22 , 0.15]
Total (95% CI)			**59**			**58**	**100.0%**	**-0.06 [-0.89 , 0.77]**

Heterogeneity: Tau² = 0.28; Chi² = 4.22, df = 1 (P = 0.04); I² = 76%
Test for overall effect: Z = 0.15 (P = 0.88)
Test for subgroup differences: Not applicable



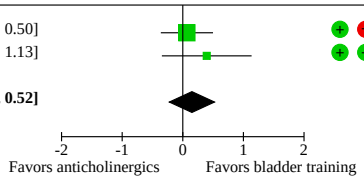


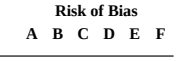
Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 2.4. Comparison 2: Bladder training versus anticholinergics, Outcome 4: Symptom-related QoL: long-term effect (> 2 months after treatment)

Study or Subgroup	Bladder training Mean	SD	Total	Anticholinergics Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Kafri 2013	88.1	24.3	41	86.5	22.3	42	74.7%	0.07 [-0.36 , 0.50]
Lauti 2008	87.9	11.6	16	81.6	19.3	13	25.3%	0.40 [-0.34 , 1.13]
Total (95% CI)			**57**			**55**	**100.0%**	**0.15 [-0.22 , 0.52]**

Heterogeneity: Tau² = 0.00; Chi² = 0.56, df = 1 (P = 0.45); I² = 0%
Test for overall effect: Z = 0.79 (P = 0.43)
Test for subgroup differences: Not applicable



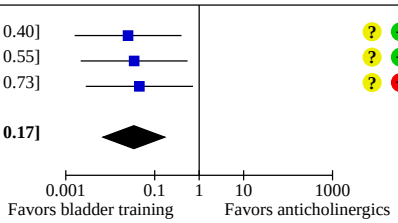


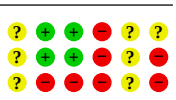
Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 2.5. Comparison 2: Bladder training versus anticholinergics, Outcome 5: Adverse events: immediately after treatment

Study or Subgroup	Bladder training Events	Total	Anticholinergics Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
Colombo 1995	0	37	22	42	33.4%	0.03 [0.00 , 0.40]
Jarvis 1981	0	25	14	25	33.4%	0.03 [0.00 , 0.55]
Song 2006	0	26	13	32	33.2%	0.05 [0.00 , 0.73]
Total (95% CI)		**88**		**99**	**100.0%**	**0.03 [0.01 , 0.17]**
Total events:	0		49			

Heterogeneity: Tau² = 0.00; Chi² = 0.09, df = 2 (P = 0.96); I² = 0%
Test for overall effect: Z = 4.14 (P < 0.0001)
Test for subgroup differences: Not applicable



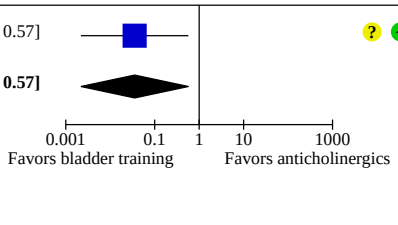


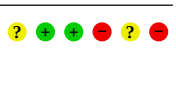
Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 2.6. Comparison 2: Bladder training versus anticholinergics, Outcome 6: Adverse events: long-term effect (> 2 months after treatment)

Study or Subgroup	Bladder training Events	Total	Anticholinergics Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
Milani 1987	0	37	14	38	100.0%	0.04 [0.00 , 0.57]
Total (95% CI)		**37**		**38**	**100.0%**	**0.04 [0.00 , 0.57]**
Total events:	0		14			

Heterogeneity: Not applicable
Test for overall effect: Z = 2.35 (P = 0.02)
Test for subgroup differences: Not applicable



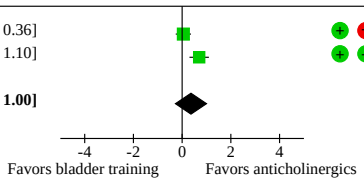


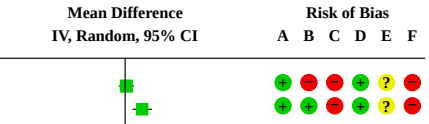
Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 2.7. Comparison 2: Bladder training versus anticholinergics, Outcome 7: Number of incontinence episodes per 24 hours: immediately after treatment

Study or Subgroup	Bladder training Mean	SD	Total	Anticholinergics Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Kafri 2013 (1)	0.56	0.74	41	0.51	0.71	42	51.9%	0.05 [-0.26 , 0.36]
Lauti 2008	0.8	0.8	18	0.1	0.3	16	48.1%	0.70 [0.30 , 1.10]
Total (95% CI)			**59**			**58**	**100.0%**	**0.36 [-0.27 , 1.00]**

Heterogeneity: Tau² = 0.18; Chi² = 6.35, df = 1 (P = 0.01); I² = 84%
Test for overall effect: Z = 1.12 (P = 0.26)
Test for subgroup differences: Not applicable





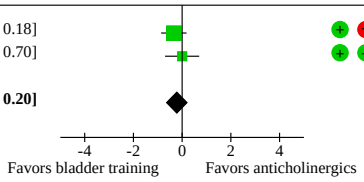
Footnotes
(1) The weekly mean and the SD were transformed to the daily mean and SD.

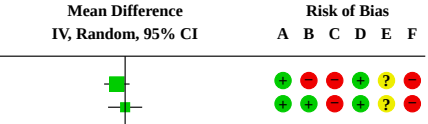
Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 2.8. Comparison 2: Bladder training versus anticholinergics, Outcome 8: Number of incontinence episodes per 24 hours: long-term effect (> 2 months after treatment)

Study or Subgroup	Bladder training Mean	SD	Total	Anticholinergics Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Kafri 2013 (1)	0.4	0.56	41	0.74	1.63	42	64.3%	-0.34 [-0.86 , 0.18]
Lauti 2008	0.9	0.9	16	0.9	1	13	35.7%	0.00 [-0.70 , 0.70]
Total (95% CI)			**57**			**55**	**100.0%**	**-0.22 [-0.64 , 0.20]**

Heterogeneity: Tau² = 0.00; Chi² = 0.58, df = 1 (P = 0.45); I² = 0%
Test for overall effect: Z = 1.02 (P = 0.31)
Test for subgroup differences: Not applicable





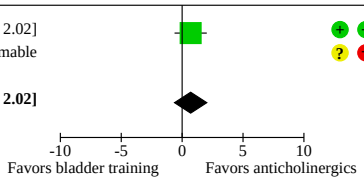
Footnotes
(1) The weekly mean and the SD were transformed to the daily mean and SD.

Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 2.9. Comparison 2: Bladder training versus anticholinergics, Outcome 9: Number of urgency episodes per 24 hours: immediately after treatment

Study or Subgroup	Bladder training Mean	SD	Total	Anticholinergics Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Lauti 2008	2.2	1.8	18	1.5	2.1	16	100.0%	0.70 [-0.62 , 2.02]
Song 2006 (1)	1.4	0	26	1.1	0	32		Not estimable
Total (95% CI)			**44**			**48**	**100.0%**	**0.70 [-0.62 , 2.02]**

Heterogeneity: Not applicable
Test for overall effect: Z = 1.04 (P = 0.30)
Test for subgroup differences: Not applicable



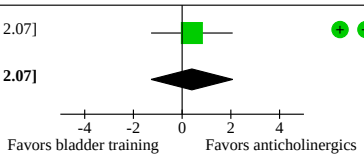
Footnotes
(1) This was defined as an urgency score, with 0 being no symptoms, 1 rarely, 2 occasionally, 3 often, and 4 always. SDs were not reported.

Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 2.10. Comparison 2: Bladder training versus anticholinergics, Outcome 10: Number of urgency episodes per 24 hours: long-term effect (> 2 months after treatment)

Study or Subgroup	Bladder training Mean	SD	Total	Anticholinergics Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Lauti 2008	2.3	2.5	16	1.9	2.1	13	100.0%	0.40 [-1.27 , 2.07]
Total (95% CI)			**16**			**13**	**100.0%**	**0.40 [-1.27 , 2.07]**

Heterogeneity: Not applicable
Test for overall effect: Z = 0.47 (P = 0.64)
Test for subgroup differences: Not applicable

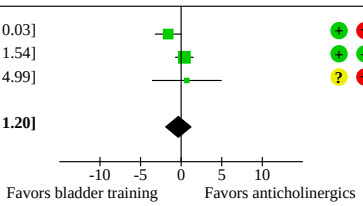


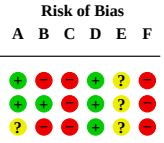
Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 2.11. Comparison 2: Bladder training versus anticholinergics, Outcome 11: Number of micturition episodes per 24 hours: immediately after treatment

Study or Subgroup	Bladder training Mean	SD	Total	Anticholinergics Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Kafri 2013	9.7	3.1	41	11.3	4.4	42	39.0%	-1.60 [-3.23 , 0.03]
Lauti 2008	6.7	1.8	18	6.3	1.6	16	50.0%	0.40 [-0.74 , 1.54]
Song 2006 (1)	-2.8	6.93	26	-3.5	9.71	32	11.0%	0.70 [-3.59 , 4.99]
Total (95% CI)			**85**			**90**	**100.0%**	**-0.35 [-1.90 , 1.20]**

Heterogeneity: Tau² = 0.91; Chi² = 4.05, df = 2 (P = 0.13); I² = 51%
Test for overall effect: Z = 0.44 (P = 0.66)
Test for subgroup differences: Not applicable





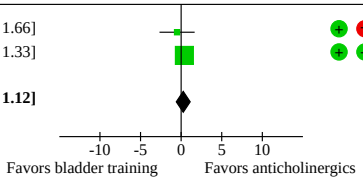
Footnotes
(1) The SDs of Song 2006 were imputed/extracted from a published Cochrane review (Rai 2012), not from the original study report.

Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 2.12. Comparison 2: Bladder training versus anticholinergics, Outcome 12: Number of micturition episodes per 24 hours: long-term effect (> 2 months after treatment)

Study or Subgroup	Bladder training Mean	SD	Total	Anticholinergics Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Kafri 2013	10	4.4	41	10.5	5.6	42	15.7%	-0.50 [-2.66 , 1.66]
Lauti 2008	7.2	1.1	16	6.8	1.4	13	84.3%	0.40 [-0.53 , 1.33]
Total (95% CI)			**57**			**55**	**100.0%**	**0.26 [-0.60 , 1.12]**

Heterogeneity: Tau² = 0.00; Chi² = 0.56, df = 1 (P = 0.45); I² = 0%
Test for overall effect: Z = 0.59 (P = 0.55)
Test for subgroup differences: Not applicable



Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Comparison 3. Bladder training versus pelvic floor muscle training (PFMT)

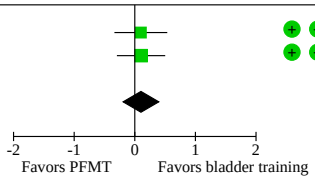
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
3.1 Symptom-related quality of life (QoL): immediately after treatment	2	178	Std. Mean Difference (IV, Random, 95% CI)	0.10 [-0.19, 0.40]
3.2 Symptom-related QoL: long-term effect (> 2 months after treatment)	1	81	Std. Mean Difference (IV, Random, 95% CI)	-0.09 [-0.52, 0.35]
3.3 Adverse events: immediately after treatment	1	97	Risk Ratio (M-H, Random, 95% CI)	Not estimable
3.4 Number of incontinence episodes per 24 hours: immediately after treatment	1	81	Mean Difference (IV, Random, 95% CI)	0.02 [-0.35, 0.39]

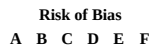
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
3.5 Number of incontinence episodes per 24 hours: long-term effect (> 2 months after treatment)	1	81	Mean Difference (IV, Random, 95% CI)	-0.20 [-2.46, 2.06]
3.6 Number of micturition episodes per 24 hours: immediately after treatment	1	81	Mean Difference (IV, Random, 95% CI)	0.10 [-1.44, 1.64]
3.7 Number of micturition episodes per 24 hours: long-term effect (> 2 months after treatment)	1	81	Mean Difference (IV, Random, 95% CI)	0.50 [-1.39, 2.39]

Analysis 3.1. Comparison 3: Bladder training versus pelvic floor muscle training (PFMT), Outcome 1: Symptom-related quality of life (QoL): immediately after treatment

Study or Subgroup	Bladder training Mean	SD	Total	PFMT Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Kafri 2013	89.6	21	41	87.4	22.6	40	45.5%	0.10 [-0.34 , 0.54]
Rizvi 2018	-4.77	5.5	47	-5.44	7.2	50	54.5%	0.10 [-0.30 , 0.50]
Total (95% CI)			**88**			**90**	**100.0%**	**0.10 [-0.19 , 0.40]**

Heterogeneity: Tau² = 0.00; Chi² = 0.00, df = 1 (P = 0.99); I² = 0%
Test for overall effect: Z = 0.68 (P = 0.50)
Test for subgroup differences: Not applicable



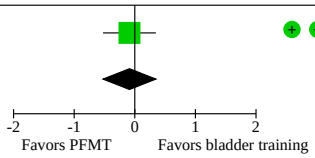


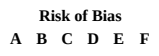
Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 3.2. Comparison 3: Bladder training versus pelvic floor muscle training (PFMT), Outcome 2: Symptom-related QoL: long-term effect (> 2 months after treatment)

Study or Subgroup	Bladder training Mean	SD	Total	PFMT Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Kafri 2013	88.1	24.3	41	90.1	20.6	40	100.0%	-0.09 [-0.52 , 0.35]
Total (95% CI)			**41**			**40**	**100.0%**	**-0.09 [-0.52 , 0.35]**

Heterogeneity: Not applicable
Test for overall effect: Z = 0.40 (P = 0.69)
Test for subgroup differences: Not applicable



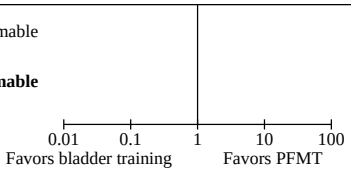


Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 3.3. Comparison 3: Bladder training versus pelvic floor muscle training (PFMT), Outcome 3: Adverse events: immediately after treatment

Study or Subgroup	Bladder training Events	Total	PFMT Events	Total	Weight	Risk Ratio M-H, Random, 95% CI	Risk of Bias A B C D E F
Rizvi 2018	0	47	0	50		Not estimable	+ + + ? ? ?
Total (95% CI)		**47**		**50**		**Not estimable**	
Total events:	0		0				

Heterogeneity: Not applicable
Test for overall effect: Not applicable
Test for subgroup differences: Not applicable

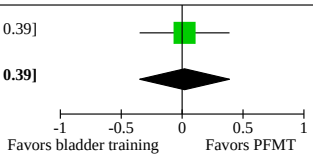


Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 3.4. Comparison 3: Bladder training versus pelvic floor muscle training (PFMT), Outcome 4: Number of incontinence episodes per 24 hours: immediately after treatment

Study or Subgroup	Bladder training Mean	SD	Total	PFMT Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI	Risk of Bias A B C D E F
Kafri 2013 (1)	0.56	0.74	41	0.54	0.94	40	100.0%	0.02 [-0.35 , 0.39]	+ + − + ? −
Total (95% CI)			**41**			**40**	**100.0%**	**0.02 [-0.35 , 0.39]**	

Heterogeneity: Not applicable
Test for overall effect: Z = 0.11 (P = 0.92)
Test for subgroup differences: Not applicable



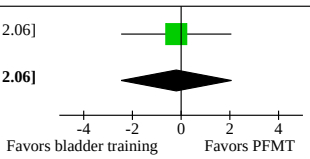
Footnotes
(1) The weekly mean and the SD were transformed to the daily mean and SD.

Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 3.5. Comparison 3: Bladder training versus pelvic floor muscle training (PFMT), Outcome 5: Number of incontinence episodes per 24 hours: long-term effect (> 2 months after treatment)

Study or Subgroup	Bladder training Mean	SD	Total	PFMT Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI	Risk of Bias A B C D E F
Kafri 2013 (1)	2.8	3.9	41	3	6.2	40	100.0%	-0.20 [-2.46 , 2.06]	+ + − + ? −
Total (95% CI)			**41**			**40**	**100.0%**	**-0.20 [-2.46 , 2.06]**	

Heterogeneity: Not applicable
Test for overall effect: Z = 0.17 (P = 0.86)
Test for subgroup differences: Not applicable



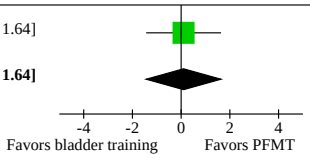
Footnotes
(1) The weekly mean and the SD were transformed to the daily mean and SD.

Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 3.6. Comparison 3: Bladder training versus pelvic floor muscle training (PFMT), Outcome 6: Number of micturition episodes per 24 hours: immediately after treatment

Study or Subgroup	Bladder training Mean	SD	Total	PFMT Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI	Risk of Bias A B C D E F
Kafri 2013	9.7	3.1	41	9.6	3.9	40	100.0%	0.10 [-1.44 , 1.64]	+ + − + ? −
Total (95% CI)			**41**			**40**	**100.0%**	**0.10 [-1.44 , 1.64]**	

Heterogeneity: Not applicable
Test for overall effect: Z = 0.13 (P = 0.90)
Test for subgroup differences: Not applicable

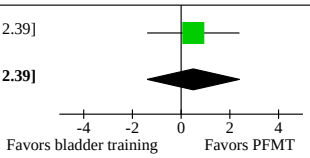


Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 3.7. Comparison 3: Bladder training versus pelvic floor muscle training (PFMT), Outcome 7: Number of micturition episodes per 24 hours: long-term effect (> 2 months after treatment)

Study or Subgroup	Bladder training Mean	SD	Total	PFMT Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI	Risk of Bias A B C D E F
Kafri 2013	10	4.4	41	9.5	4.3	40	100.0%	0.50 [-1.39 , 2.39]	+ + − + ? −
Total (95% CI)			**41**			**40**	**100.0%**	**0.50 [-1.39 , 2.39]**	

Heterogeneity: Not applicable
Test for overall effect: Z = 0.52 (P = 0.60)
Test for subgroup differences: Not applicable



Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

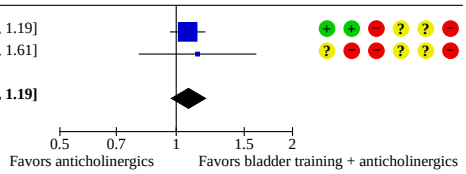
Comparison 4. Bladder training plus anticholinergics versus anticholinergics alone

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
4.1 Participant-reported cure or improvement: immediately after treatment	2	564	Risk Ratio (M-H, Random, 95% CI)	1.08 [0.97, 1.19]
4.2 Symptom-related quality of life (QoL): immediately after treatment	2	630	Std. Mean Difference (IV, Random, 95% CI)	0.07 [-0.09, 0.22]
4.3 Symptom-related QOL: long-term effect (> 2 months after treatment)	2	627	Std. Mean Difference (IV, Random, 95% CI)	0.45 [-0.34, 1.25]
4.4 Adverse events: immediately after treatment	2	564	Risk Ratio (M-H, Random, 95% CI)	0.94 [0.83, 1.06]
4.5 Adverse events: long-term effect (> 2 months after treatment)	1	643	Risk Ratio (M-H, Random, 95% CI)	1.00 [0.85, 1.18]
4.6 Participant-reported satisfaction: immediately after treatment	1	602	Std. Mean Difference (IV, Random, 95% CI)	Not estimable
4.7 Participant-reported satisfaction: long-term effect (> 2 months after treatment)	1	602	Std. Mean Difference (IV, Random, 95% CI)	Not estimable
4.8 Number of incontinence episodes per 24 hours: immediately after treatment	3	931	Mean Difference (IV, Random, 95% CI)	0.50 [0.02, 0.98]
4.9 Number of incontinence episodes per 24 hours: long-term effect (> 2 months after treatment)	2	627	Mean Difference (IV, Random, 95% CI)	-0.10 [-0.77, 0.57]
4.10 Number of urgency episodes per 24 hours: immediately after treatment	4	1177	Mean Difference (IV, Random, 95% CI)	0.20 [-1.25, 1.65]
4.11 Number of urgency episodes per 24 hours: long-term effect (> 2 months after treatment)	2	627	Mean Difference (IV, Random, 95% CI)	0.10 [-1.20, 1.40]
4.12 Number of micturition episodes per 24 hours: immediately after treatment	4	1182	Mean Difference (IV, Random, 95% CI)	0.40 [-1.07, 1.87]
4.13 Number of micturition episodes per 24 hours: long-term effect (> 2 months after treatment)	2	627	Mean Difference (IV, Random, 95% CI)	0.80 [-0.34, 1.94]

Analysis 4.1. Comparison 4: Bladder training plus anticholinergics versus anticholinergics alone, Outcome 1: Participant-reported cure or improvement: immediately after treatment

Study or Subgroup	Bladder training + anticholinergics Events	Total	Anticholinergics Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
Mattiasson 2003	185	244	182	257	91.7%	1.07 [0.96 , 1.19]
Song 2006	22	31	20	32	8.3%	1.14 [0.80 , 1.61]
Total (95% CI)		**275**		**289**	**100.0%**	**1.08 [0.97 , 1.19]**
Total events:	207		202			

Heterogeneity: Tau² = 0.00; Chi² = 0.10, df = 1 (P = 0.75); I² = 0%
Test for overall effect: Z = 1.42 (P = 0.16)
Test for subgroup differences: Not applicable

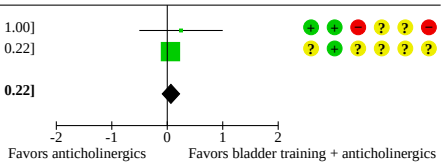


Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 4.2. Comparison 4: Bladder training plus anticholinergics versus anticholinergics alone, Outcome 2: Symptom-related quality of life (QoL): immediately after treatment

Study or Subgroup	Bladder training + anticholinergics Mean	SD	Total	Anticholinergics Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Lauti 2008	91.8	7.4	12	89.6	9.4	16	4.3%	0.25 [-0.50 , 1.00]
Mattiasson 2010	-19.68	16.8	297	-20.65	16.8	305	95.7%	0.06 [-0.10 , 0.22]
Total (95% CI)		**309**				**321**	**100.0%**	**0.07 [-0.09 , 0.22]**

Heterogeneity: Tau² = 0.00; Chi² = 0.24, df = 1 (P = 0.63); I² = 0%
Test for overall effect: Z = 0.83 (P = 0.41)
Test for subgroup differences: Not applicable

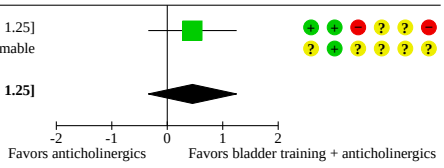


Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 4.3. Comparison 4: Bladder training plus anticholinergics versus anticholinergics alone, Outcome 3: Symptom-related QOL: long-term effect (> 2 months after treatment)

Study or Subgroup	Bladder training + anticholinergics Mean	SD	Total	Anticholinergics Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Lauti 2008	88.9	9.9	12	81.6	19.3	13	100.0%	0.45 [-0.34 , 1.25]
Mattiasson 2010 (1)	25.34	0	297	24.51	0	305		Not estimable
Total (95% CI)		**309**				**318**	**100.0%**	**0.45 [-0.34 , 1.25]**

Heterogeneity: Not applicable
Test for overall effect: Z = 1.12 (P = 0.26)
Test for subgroup differences: Not applicable



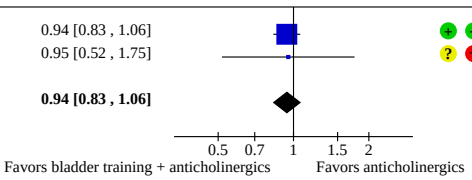
Footnotes
(1) SDs not reported.

Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 4.4. Comparison 4: Bladder training plus anticholinergics versus anticholinergics alone, Outcome 4: Adverse events: immediately after treatment

Study or Subgroup	Bladder training + anticholinergics Events	Total	Anticholinergics Events	Total	Weight	Risk Ratio M-H, Random, 95% CI	Risk of Bias A B C D E F
Mattiasson 2003	158	244	177	257	96.0%	0.94 [0.83 , 1.06]	+ + + ? ? ?
Song 2006	12	31	13	32	4.0%	0.95 [0.52 , 1.75]	? − − ? ? −
Total (95% CI)		**275**		**289**	**100.0%**	**0.94 [0.83 , 1.06]**	
Total events:	170		190				

Heterogeneity: Tau² = 0.00; Chi² = 0.00, df = 1 (P = 0.97); I² = 0%
Test for overall effect: Z = 0.99 (P = 0.32)
Test for subgroup differences: Not applicable

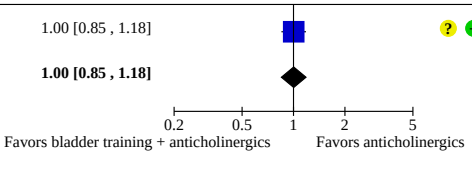


Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 4.5. Comparison 4: Bladder training plus anticholinergics versus anticholinergics alone, Outcome 5: Adverse events: long-term effect (> 2 months after treatment)

Study or Subgroup	Bladder training + anticholinergics Events	Total	Anticholinergics Events	Total	Weight	Risk Ratio M-H, Random, 95% CI	Risk of Bias A B C D E F
Mattiasson 2010	149	320	150	323	100.0%	1.00 [0.85 , 1.18]	? + + ? ? ?
Total (95% CI)		**320**		**323**	**100.0%**	**1.00 [0.85 , 1.18]**	
Total events:	149		150				

Heterogeneity: Not applicable
Test for overall effect: Z = 0.03 (P = 0.98)
Test for subgroup differences: Not applicable

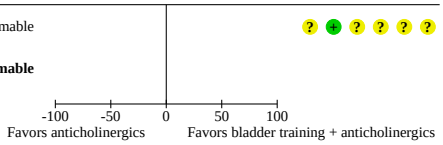


Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 4.6. Comparison 4: Bladder training plus anticholinergics versus anticholinergics alone, Outcome 6: Participant-reported satisfaction: immediately after treatment

Study or Subgroup	Bladder training + anticholinergics Mean	SD	Total	Anticholinergics Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI	Risk of Bias A B C D E F
Mattiasson 2010 (1)	3.5	0	297	3.32	0	305		Not estimable	? + ? ? ? ?
Total (95% CI)			**297**			**305**		**Not estimable**	

Heterogeneity: Not applicable
Test for overall effect: Not applicable
Test for subgroup differences: Not applicable



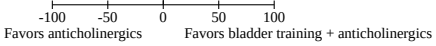
Footnotes
(1) SDs not reported.

Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 4.7. Comparison 4: Bladder training plus anticholinergics versus anticholinergics alone, Outcome 7: Participant-reported satisfaction: long-term effect (> 2 months after treatment)

Study or Subgroup	Bladder training + anticholinergics Mean	SD	Total	Anticholinergics Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI	Std. Mean Difference IV, Random, 95% CI	Risk of Bias A B C D E F
Mattiasson 2010 (1)	4.18	0	297	3.72	0	305		Not estimable		? + ? ? ? ?
Total (95% CI)			**297**			**305**		**Not estimable**		

Heterogeneity: Not applicable
Test for overall effect: Not applicable
Test for subgroup differences: Not applicable



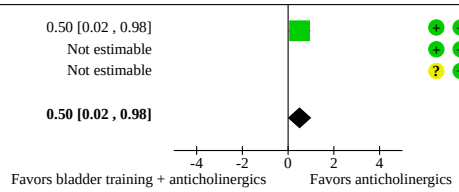
Footnotes
(1) SDs not reported.

Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 4.8. Comparison 4: Bladder training plus anticholinergics versus anticholinergics alone, Outcome 8: Number of incontinence episodes per 24 hours: immediately after treatment

Study or Subgroup	Bladder training + anticholinergics Mean	SD	Total	Anticholinergics Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI	Mean Difference IV, Random, 95% CI	Risk of Bias A B C D E F
Lauti 2008	0.6	0.8	12	0.1	0.3	16	100.0%	0.50 [0.02 , 0.98]		+ + − + ? −
Mattiasson 2003 (1)	0.3	0	141	0.3	0	160		Not estimable		+ + − + ? −
Mattiasson 2010 (1)	-1.3	0	297	-1.21	0	305		Not estimable		? + ? + ? ?
Total (95% CI)			**450**			**481**	**100.0%**	**0.50 [0.02 , 0.98]**		

Heterogeneity: Not applicable
Test for overall effect: Z = 2.06 (P = 0.04)
Test for subgroup differences: Not applicable



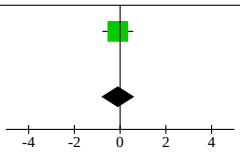
Footnotes
(1) SDs not reported.

Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 4.9. Comparison 4: Bladder training plus anticholinergics versus anticholinergics alone, Outcome 9: Number of incontinence episodes per 24 hours: long-term effect (> 2 months after treatment)

Study or Subgroup	Bladder training + anticholinergics Mean	SD	Total	Anticholinergics Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI	Mean Difference IV, Random, 95% CI	Risk of Bias A B C D E F
Lauti 2008	0.8	0.7	12	0.9	1	13	100.0%	-0.10 [-0.77 , 0.57]		+ + − + ? −
Mattiasson 2010 (1)	-1.48	0	297	-1.45	0	305		Not estimable		? + ? + ? ?
Total (95% CI)			**309**			**318**	**100.0%**	**-0.10 [-0.77 , 0.57]**		

Heterogeneity: Not applicable
Test for overall effect: Z = 0.29 (P = 0.77)
Test for subgroup differences: Not applicable



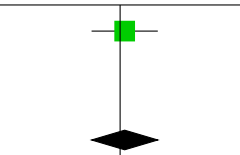
Footnotes
(1) SDs not reported.

Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 4.10. Comparison 4: Bladder training plus anticholinergics versus anticholinergics alone, Outcome 10: Number of urgency episodes per 24 hours: immediately after treatment

Study or Subgroup	Bladder training + anticholinergics Mean	SD	Total	Anticholinergics Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI	Mean Difference IV, Random, 95% CI	Risk of Bias A B C D E F
Lauti 2008	1.7	1.8	12	1.5	2.1	16	100.0%	0.20 [-1.25 , 1.65]		+ + − + ? −
Mattiasson 2003 (1)	4	0	236	4	0	248		Not estimable		+ + − + ? −
Mattiasson 2010 (1)	-1.98	0	297	-1.99	0	305		Not estimable		? + ? + ? ?
Song 2006 (2)	1.2	0	31	1.1	0	32		Not estimable		? − − + ? −
Total (95% CI)			**576**			**601**	**100.0%**	**0.20 [-1.25 , 1.65]**		

Heterogeneity: Not applicable
Test for overall effect: Z = 0.27 (P = 0.79)
Test for subgroup differences: Not applicable



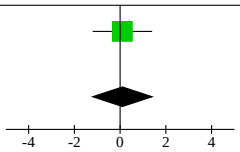
Footnotes
(1) SDs not reported.
(2) This was defined as an urgency score, with 0 being no symptoms, 1 rarely, 2 occasionally, 3 often, and 4 always. SDs not reported.

Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 4.11. Comparison 4: Bladder training plus anticholinergics versus anticholinergics alone, Outcome 11: Number of urgency episodes per 24 hours: long-term effect (> 2 months after treatment)

Study or Subgroup	Bladder training + anticholinergics Mean	SD	Total	Anticholinergics Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI	Risk of Bias A B C D E F
Lauti 2008	2	1.1	12	1.9	2.1	13	100.0%	0.10 [-1.20 , 1.40]	+ + − + ? −
Mattiasson 2010 (1)	-2.5	0	297	-2.2	0	305		Not estimable	? + ? + ? ?
Total (95% CI)			**309**			**318**	**100.0%**	**0.10 [-1.20 , 1.40]**	

Heterogeneity: Not applicable
Test for overall effect: Z = 0.15 (P = 0.88)
Test for subgroup differences: Not applicable



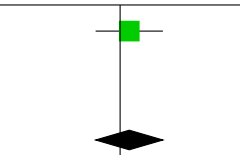
Footnotes
(1) SDs not reported.

Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 4.12. Comparison 4: Bladder training plus anticholinergics versus anticholinergics alone, Outcome 12: Number of micturition episodes per 24 hours: immediately after treatment

Study or Subgroup	Bladder training + anticholinergics Mean	SD	Total	Anticholinergics Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI	Risk of Bias A B C D E F
Lauti 2008	6.7	2.2	12	6.3	1.6	16	100.0%	0.40 [-1.07 , 1.87]	+ + − + ? −
Mattiasson 2003 (1)	7	0	239	8	0	250		Not estimable	+ + − + ? −
Mattiasson 2010 (1)	-2.87	0	297	-2.18	0	305		Not estimable	? + ? + ? ?
Song 2006 (1)	-4	0	31	-3.5	0	32		Not estimable	? − − + ? −
Total (95% CI)			**579**			**603**	**100.0%**	**0.40 [-1.07 , 1.87]**	

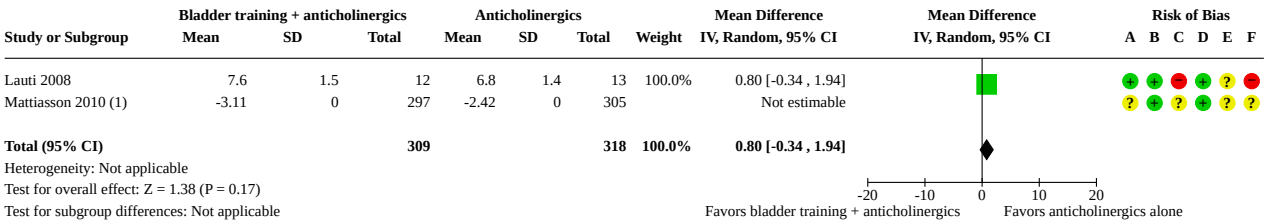
Heterogeneity: Not applicable
Test for overall effect: Z = 0.53 (P = 0.59)
Test for subgroup differences: Not applicable



Footnotes
(1) SDs not reported.

Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

Analysis 4.13. Comparison 4: Bladder training plus anticholinergics versus anticholinergics alone, Outcome 13: Number of micturition episodes per 24 hours: long-term effect (> 2 months after treatment)



Footnotes
(1) SDs not reported.

Risk of bias legend
(A) Bias arising from the randomization process
(B) Bias due to deviations from intended interventions
(C) Bias due to missing outcome data
(D) Bias in measurement of the outcome
(E) Bias in selection of the reported result
(F) Overall bias

APPENDICES

Appendix 1. Glossary of terms

Neurogenic detrusor overactivity: detrusor muscle contractions occur during filling cystometry in the setting of a clinically relevant neurologic disorder.

Nocturia: the act of waking up in the night to pass urine. Having woken to pass urine for the first time, each urination must be followed by sleep or the intention to sleep. This should be quantified using a bladder diary.

Overactive bladder (OAB): urinary urgency, usually accompanied by increased daytime frequency or nocturia, or both, with urinary incontinence (OAB-wet) or without (OAB-dry), in the absence of urinary tract infection or other detectable disease.

Appendix 2. Cochrane Incontinence Specialised Register search strategy

We used the following search terms to search the Cochrane Incontinence Specialised Register of clinical effects:

((design.cct*) OR (design.rct*))
AND
((topic.urine.incon*) OR (topic.urine.overactive*))
AND
((intvent.psych.bladdrill*) OR (intvent.psych.behav*))

All searches were of the keywords field of EndNote (EndNote 2018).

The date of the most recent search of the Specialised Register for this review was on 6 November 2022. At the time of this updated search the Cochrane Incontinence Specialised Register had been updated to 1 November 2022.

The Cochrane Incontinence Specialised Register search does not include a search of Embase as the Cochrane Centralised Search Service includes Embase in its search for records to be included in CENTRAL. During informal testing for a number of our Cochrane reviews we have found that additional searches of Embase do not locate additional relevant records for our Cochrane reviews.

Appendix 3. GRADE assessment

Study limitations (risk of bias)

- **Not serious**: overall risk of bias is 'low' in more than half of included studies and no 'high' in the included studies.
- **Serious**: overall risk of bias is 'high' in at least one study but less than half of the included studies.
- **Very serious**: overall risk of bias is 'high' in half or more than half of included studies.

Inconsistency

- **Not serious**: no visual and no statistical (I^2 greater than 75%) heterogeneity are present.

- **Serious**: visual or statistical (I^2 greater than 75%) heterogeneity is present.
- **Very serious**: visual and statistical (I^2 greater than 75%) heterogeneity are present.

Indirectness

- **Not serious**: no difference in PICO (patient/population, intervention, comparison, and outcomes)/setting from those of interest.
- **Serious**: one or a slight difference in PICO/setting from those of interest.
- **Very serious**: more than two or serious differences in PICO/setting from those of interest.

Imprecision

- **Not serious**: enough sample size (more than 400 events in dichotomous data or more than 400 participants in continuous data) and clinical importance of 95% CI (e.g. 'the upper 95% CI of RR is smaller than 0.75', 'the lower 95% CI is larger than 1.25', or 'the lower 95% CI is larger than 0.75 and the upper is smaller than 1.25').
- **Serious**: small sample size (less than 400 events in dichotomous data or less than 400 participants in continuous data) or not clinical important 95% CI (the lower 95% CI is below 0.75 while the upper is larger than 1.25.).
- **Very serious**: small sample size (less than 400 events in dichotomous data or less than 400 participants in continuous data) and not clinical important CI ('the upper CI is smaller than 0.75', 'the lower CI is larger than 1.25', or the lower CI is larger than 0.75 and the upper CI is smaller than 1.25').

Publication bias

- **Not serious**: none of the following examples is met.
- **Serious**: one of the following examples is met.
- **Very serious**: more than two of the following examples is met.
- There are study protocols in a trial registry, but no subsequent publications.
- Meta-analysis includes small studies consistently showing different effects than the larger studies.
- Small studies were funded by people who could gain from the results.

Adapted from Guyatt 2011a; Guyatt 2011b; Schünemann 2013.

HISTORY

Protocol first published: Issue 4, 2020

CONTRIBUTIONS OF AUTHORS

SF completed title and abstract screening, full-text review, risk of bias assessments, data extraction and GRADE, analyzed the data and wrote the manuscript.

TY completed title and abstract screening, full-text review, risk of bias assessments, and data extraction.

YL completed title and abstract screening, full-text review, risk of bias assessments, and data extraction.

AS reviewed and provided feedback on the draft version of the manuscript.

SA gave specialist clinical insight into the literature and population with OAB.

NW reviewed and provided feedback on the draft version of the manuscript.

DECLARATIONS OF INTEREST

SF: KDDI Foundation (grant/contract); Ministry of Education, Culture, Sports, Science and Technology (grant/contract).

TY: Japan Society for the Promotion of Science (grant/contract); National Cancer Center (grant/contract); The Japanese Society of Urolithiasis Research (grant/contract); works as a medical doctor (urologist) in Abiko Toho Hospital, Japan.

YL: Japan Society for the Promotion of Science (grant/contract).

AS: none.

SA: Astellas Pharma (honoraria, grant/contract); AstraZeneca (honoraria, grant/contract); Janssen Pharmaceuticals (honoraria); Tosoh (grant/contract); Urologic Surgeon at Kyoto University Hospital.

NW: no relevant interests; works as a health professional at Soseikai General Hospital.

SOURCES OF SUPPORT

Internal sources

- No, Other

  This project was not internally supported.

External sources

- National Institute for Health Research (NIHR), UK

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DIFFERENCES BETWEEN PROTOCOL AND REVIEW

Criteria for considering studies for this review: we included participants with urge urinary incontinence (UUI) and detrusor instability (DI) as well as OAB because the three are not clearly distinguishable disease concepts and overlap with each other.

Data collection and analysis: to calculate the daily mean of frequency-volume chart frequencies, we divided the weekly mean and standard deviation (SD) by seven. We also imputed missing SDs in Song 2006 from a published Cochrane Review (Rai 2012); we conducted a post hoc sensitivity analysis to explore the impact of imputed SDs.

GRADE: although we did not prespecify in the protocol, we set the standard of evaluating each domain of the GRADE system as outlined in Appendix 3. The GRADE system is the most widely adopted tool for grading the certainty of evidence and for making recommendations (Guyatt 2011a).

Brief economics commentary: due to time constraints, we omitted our plans to conduct a brief economics commentary in this area. Should capacity allow, we will include this in future versions of this review.

INDEX TERMS

Medical Subject Headings (MeSH)

Cholinergic Antagonists [therapeutic use]; *Electric Stimulation Therapy [methods]; Pelvic Floor; Quality of Life; Receptors, Adrenergic; Urinary Bladder; *Urinary Bladder, Overactive [therapy]; *Urinary Incontinence [therapy]

MeSH check words

Adult; Female; Humans; Male