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Conservative treatment of urge urinary incontinence in women: a systematic review of randomized clinical trials

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Objective To assess the efficacy of physical therapies for first-line use in the treatment of urge urinary incontinence (UUI) in women, using a systematic review of randomized clinical trials (RCTs).

Materials and methods A computer-aided and manual search was carried out for RCTs published between 1980 and 1999 investigating the treatment of UUI defined by the keywords 'physical therapies', e.g. bladder (re)training (including 'behavioural' treatment), pelvic floor muscle (PFM) exercises, with or without biofeedback and/or electrical stimulation. The methodological quality of the included trials was assessed using methodological criteria, based on generally accepted principles of interventional research.

Results Fifteen RCTs were identified; the methodological quality of the studies was moderate, with a median (range) score of 6 (3–8.5) (maximum possible 10). Eight RCTs were considered of sufficient quality, i.e. an internal validity score of $\geqslant 5.5$ points on a scale of 0–10, and were included in a further analysis. Based on levels-of-evidence criteria, there is weak evidence to suggest that bladder (re)training is more effective than no treatment (controls), and that bladder (re)training is better than drug therapy. Stimulation types and parameters in the studies of electrical stimulation were heterogeneous. There is insufficient evidence that electrical stimulation is more effective than sham electrical simulation. To date there are too few studies to evaluate effects of PFM exercise with or without biofeedback, and of toilet training for women with UUI.

Conclusion Although almost all studies included reported positive results in favour of physical therapies for the treatment of UUI, more research of high methodological quality is required to evaluate the effects of each method in the range of physical therapies.

Keywords Lower urinary tract, systematic review, urinary urge incontinence, physical therapy, overactive, biofeedback, electrical stimulation

Introduction

Urinary incontinence (UI) is defined as the involuntary loss of urine, which is objectively demonstrable, with such a degree of severity that it is a social or hygienic problem [1]. UI is a highly prevalent disorder that affects millions of people worldwide. UI affects ≈15% of the ambulatory adult population and is frequently accompanied by depression, stigmatization and a significantly worse perceived quality of life than in healthy individuals [2]. However, a large proportion of individuals do not report this health problem to their physicians, perhaps because of embarrassment or because of the mistaken notion that no effective treatment is available [3].

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Even though UI is a common condition and the object of intensive research, there is still a considerable lack of consistency among epidemiologists about the prevalence, risk factors and natural history of this condition [4]. There are different types of urinary incontinence. The most common type in women is stress urinary incontinence (SUI), with an estimated prevalence of 8–33% [4–6]. According to the ICS terminology, SUI is the 'involuntary urethral loss of urine when the intravesical pressure exceeds the maximum urethral pressure but in the absence of detrusor activity' [1]. Reviewing the literature, Hampel *et al.* [4] stated that nearly half of the women with UI suffered from symptoms of SUI (49%). The second most common type of symptoms related to UI, i.e. urge urinary incontinence (UUI), accounted for 22% of UI in women and is symptomatically described as the

involuntary loss of urine associated with a strong desire to void (urgency) [4,7]. Urgency as a symptom of strong desire to void may be associated with two possible dysfunctions; either related to bladder overactivity (motor urgency) or hypersensitivity (sensory urge) [1,4]. From urodynamic studies including urethral pressure measurement there is a strong indication that sensory urgency is strongly related to urethral relaxation [8]. The moments of occurrence are mostly unpredictable, in contrast to SUI, causing a greater effect on quality of life [9].

Clinical experience has shown that an overactive bladder function with associated UUI is not amenable to surgical correction [10,11]. Therefore it is important to find another satisfactory treatment modality for patients with this problem. Pharmaceutical agents in general lead to disappointing results, with success rates of only 30–45% for any single agent. Although combination therapy is claimed to be more successful, the use of drugs produces many side-effects, inevitably compromising compliance and causing the recurrence of incontinence [10,12].

In the USA, the Clinical Guideline Panel [13] stated that in general the least invasive and least dangerous procedure that is appropriate for diagnosis and treatment of a patient with urinary incontinence should be the first option. Conservative treatments, as physical therapy, report limited side-effects and do not exclude future options. These techniques can improve and eventually restore pelvic floor function and bladder function control [13]. Additionally, physical therapy can increase the patients' understanding of lower urinary tract (dys)function.

The theoretical basis of how physical therapy for the treatment of UUI works remains unclear. Is it the *change* in pelvic floor muscle (PFM) activity during exercises that automatically inhibits or better prevents detrusor overactivity? Is it *learning* that makes the patient aware of contracting the PFM during urge to inhibit involuntary detrusor contraction (reciprocal inhibition)? Will an increase in the *strength* of the PFM provide more inhibition of the overactivity of the bladder [14]? The different physiotherapeutic treatment modalities are therefore still based on hypotheses for the underlying pathologies causing bladder overactivity. However, clinical experience has shown that different physical therapy treatment modalities generally will provide some progress in most individuals with bladder overactivity. Bladder control can be improved even in the cognitively impaired individual [15–18].

The different physical therapy modalities for the treatment of bladder overactivity consist of toilet training, bladder (re)training, PFM exercises with or without treatment adjuncts such as biofeedback or electrical stimulation (ES), and ES alone. Toilet training is most feasible in an institutionalized population with lower urinary tract dysfunction. In that environment, not only will a reduction in the loss of urine per individual be important, but so will the lower cost for absorption materials and of incontinence-related care by healthcare providers.

Bladder training generally consists of a 'behavioural' intervention, a programme of patient education addressing lower urinary tract function and a schedule of voluntary micturition. The educational programme emphasizes the neurological (cerebral) control of lower urinary tract function. The voiding schedule involves training to inhibit the sensation of urgency and postpone voiding, and to urinate according to a timetable. The goal is to attain a longer interval between consecutive voids with larger voided volumes. It is essential that the therapist encourages the patient to succeed [13,19]. The training of selective contraction of the PFMs influences and probably restores or facilitates the detrusor-inhibition reflex, which may restore normal function [19].

For bladder overactivity, PFM exercises may be combined with biofeedback and/or ES [20,21]. Moreover, some authors suggested that ES can be applied as a sole therapy [22–24]. Biofeedback can support PFM exercises by providing the patient with information about (mostly) unconscious physiological processes. This information comprises the basis for active self-control over the processes which are being monitored.

Electrical stimulation of the PFMs is suggested to induce a reflex contraction of the striated para- and periurethral muscles, accompanied by a simultaneous reflex inhibition of the detrusor muscle. This reciprocal response depends on a preserved reflex arc through the sacral micturition reflex centre. To obtain a therapeutic effect of pelvic floor stimulation in women with detrusor overactivity, peripheral innervation of the PFMs must at least be partly intact [23]. Electrical stimulation therapy alone, both external or internal, is suggested to permit an effective reduction or inhibition of detrusor activity by stimulating afferents of the pudendal nerve [22,23,25]. Electrical stimulation is generally administered with a removable device through vaginal or anal stimulation.

Because the value in terms of efficacy of conservative treatment of UUI in women is unknown, we systematically reviewed published reports to determine the efficacy of these treatments.

Materials and methods

Literature search strategy

The following computerized bibliographic databases were searched (1980–1999): Medline, Excerpta Medica, the

database of the Dutch National Institute of Allied Health Professions, and the database of the Cochrane Rehabilitation and Related Therapies Field at Maastricht University. Keywords representing impairments and disabilities were incontinence, urinary incontinence, detrusor instability, UUI, motor urgency and motor urge incontinence, frequency, and nocturia. Keywords representing the intervention were conservative management, conservative treatment, surgical and nonsurgical treatment, bladder (re)training, behavioural modification, behavioural treatment, physiotherapy, PGM exercises, and all specific modalities (biofeedback, myofeedback and ES). Keywords for the design were randomized controlled trials (RCTs), controlled trials, evaluation, effectiveness, efficacy and outcome studies. Citation tracking and review of the proceedings of ICS meetings from 1980 to 1998 were undertaken. Several databases not on computer were also screened (e.g. Physiotherapy Index), with those physiotherapy journals not covered by Medline. Finally, experts in this field were consulted for additional information.

Selection criteria

Studies were included after confirming the following criteria: (i) design: explanatory (placebo or no-treatment comparison) or pragmatic (experimental intervention compared with a standard/active intervention) randomized trial; (ii) results in women with UUI were reported, either exclusively or separately; the study investigated conservative management for the treatment of UUI; (iii) interventions included bladder training or PFM exercises, biofeedback and/or ES; (iv) reliable and clinically relevant outcome measures were used of the problem under investigation; (v) the trial report was published in English, German or Dutch. Unpublished studies and abstracts were excluded.

Methodological quality of the studies

Two independent reviewers (L.B., H.H.) assessed all RCTs for inclusion and methodological quality. Disagreements were resolved by consensus and when required a third reviewer (R.dB.) made the final decision. Other reviews [25,26] were consulted to validate the list of studies included. The quality of studies was assessed using a modified list of predefined methodological criteria [27–29], based on generally accepted principles of interventional research [30–32]. These criteria assess internal and external validity and statistical power (Table 1). A score of one point (+) was given to each criterion fulfilled, and zero (–) if not. Criteria were graded as 0.5 points ($\pm$) if the description was unclear, or if criteria were incompletely fulfilled. The maximum methodological quality score (MQS) was 10 points. After assessment, a hierarchical MQS list was generated; a higher MQS indicates that a study has a higher methodological quality.

Levels of evidence

The results of the methodological assessment and the data extraction were combined in a level-of-evidence synthesis. that allows systematic conclusions about the efficacy of physiotherapeutic interventions for UUI. Several methods for best-evidence synthesis are reported; the present method is partly based on previous work from Brønfort [33] and Van Tulder *et al.* [34]. The available evidence was evaluated according to the internal validity of the reviewed trials, the statistical significance of the results and the ratio of positive and negative studies. Studies reaching an internal validity score of $\geqslant 5.5$ points were regarded as being of sufficient methodological quality, whereas the remainder were considered to have inadequate methodological quality. Consequently, studies were ranked according to the levels-of-evidence principle, in which studies with sufficient methodological quality and statistically significant or clinically relevant results in a 3 : 1 ratio were considered to deliver strong evidence for effectiveness.

To distinguish levels of evidence the following decision rules were applied:

(i) To conclude there is *strong evidence for or against* a physiotherapeutic intervention for UUI at least three high-quality studies, i.e. studies with an internal validity score of $\geqslant 5.5$ points, with consistent results in favour of or opposing the intervention, were needed. Such results were considered consistent when the pooled-effect estimate showed a clinically relevant or a statistically significant result in favour of the intervention or opposing it for at least one outcome measure, *or* when at least 75% of the included studies were categorized as positive or negative, respectively. A study was considered respectively positive or negative when it showed a clinically important or a statistically significant result in favour of or opposing the intervention for at least one outcome measure.

(ii) To conclude there is *weak evidence for* a physiotherapeutic intervention for UUI at least three high-quality studies with inconsistent results, *or* at least three low-quality studies with consistent results in favour of intervention were needed. Results were considered inconsistent across studies when 25–75% of them were considered positive.

(iii) To conclude there is *weak evidence against* a physiotherapeutic intervention for UUI at least three low-quality studies with consistent results against the intervention were needed. Such results were considered

Table 1 Criteria for assessing the methods in RCTs of conservative treatment for (motor) urge urinary incontinence in women. Adapted from [28,29]

Code	*Criterion*
A	Well-described inclusion criteria (diagnostic criteria, duration and severity of disease, and previous treatment)
B	At least 50 patients per group
C	Prestratification (prognostic variables)
D	Random allocation procedure described
E	Presentation of relevant baseline characteristics
F	$<10\%$ withdrawals and withdrawals described
G	'Blinding' (of patients, therapist, observer) (0/3 = 0 points; 1/3 = 0.5 points; 2/3 = 1 point)
H	Interventions well described (nature, number, duration of treatments)
I	Effect/outcome measurements relevant and well described
J	Analysis and presentation of the results so that the analysis can be assessed (intention to treat, depending on the outcome measurement at least the mean, SD, SEM, or CI per group, or, if rates or proportions used, the number of patients with a certain outcome

consistent when the pooled-effect estimate showed a clinically important or a statistically significant result against the intervention for at least one outcome measure, *or* when $\leqslant 25\%$ of these studies were considered positive.

There was *insufficient evidence* for the intervention when there were low-quality studies with inconsistent results *or* with fewer than three studies of whatever quality.

Results

The literature search yielded 81 publications, of which 16 were abstracts. A total of 15 RCTs met all the inclusion criteria [35–49]. In four studies only participants having UUI arising from detrusor instability were allowed to enter the study [35–38]. The remaining 11 papers reported the inclusion of subgroups having UUI from detrusor instability or having mixed UI. All RCTs reported the outcomes of various conservative interventions for the treatment of UUI (Table 2). Eight of the 15 RCTs [36–41,47,48] were considered to be explanatory, and seven were 'pragmatic' [35,42–46,49].

Methodological quality and outcome of the studies

Table 2 shows the hierarchical order according to the MQS of all 15 included studies. The median (range) was 6 (3–8.5) from a maximum of 10 points. Of the 10 methodological quality criteria, four (B, C, D, G) had a total score of $\leqslant 7.5$ points from the maximum possible score of 15 points. Small sample sizes, lack of prestratification on prognostic determinants, lack of description of random allocation procedure, and (sub)optimal blinding were the main methodological shortcomings of the included trials. Eight of the 15 trials (53%) scored $\geqslant 5.5$ points and were therefore classified as of 'sufficient' methodological quality. All remaining trials scored < 5.5 points and were therefore classified as of 'low' methodological quality. Table 3 summarizes each of the included trials, giving a brief description of the participants. Description of outcomes, results and follow-up are complex and full details of these studies can be obtained from the first author on request.

The efficacy of conservative interventions for the treatment of UUI

Four trials compared bladder (re)training with no treatment (controls) [36,39–41]; two of these trials [39,40] were of sufficient methodological quality (both with a MQS of 7). With two RCTs of sufficient methodological quality and two low-quality studies reporting results in favour of bladder (re)training, there is weak evidence that bladder (re)training is more effective than no treatment (controls).

Two RCTs of sufficient methodological quality [42,45] with a MQS of 6.5 points and 8.5 points, respectively, and one RCT of low methodological quality [35] compared bladder (re)training with drug therapy (oxybutynin in the first two trials and a combination of flavoxate hydrochloride and imipramine in the last). In all three trials it was reported that bladder (re)training was superior to drug therapy. There is weak evidence that bladder (re)training is more effective than drug therapy.

Only one RCT of low quality [37] was identified that compared bladder (re)training and drug therapy (terodiline) with bladder (re)training and placebo. There is insufficient evidence that a combination of bladder (re)training and drug therapy is more effective than bladder (re)training combined with a placebo.

In a low-quality RCT [43] bladder (re)training with prior urodynamics was compared with bladder (re)train-

Table 2 The methodological scores assigned to the RCTs on the efficacy of conservative treatment (n = 15) of UUI, in order of methodological score

	Scores for methodological criteria												
Reference	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*Total* (of 10)*	*Method†*	*Experimental vs reference group‡*
[45]	+	+	+	+	+	±	±	+	±	+	8.5	B1/ITA	BT+IA-B (BlT) vs DT vs sham DT
[39]	+	–	+	±	+	+	–	±	+	+	7	–	BlT vs controls (no treatment)
[47]	+	±	+	+	+	–	+	±	±	±	7	B2	IV-ES vs sham IV-ES
[40]	+	–	+	±	+	+	–	±	+	+	7	–	BlT vs controls (no treatment)
[38]	+	–	–	–	+	+	±	+	+	+	6.5	B1	IA-ES vs sham IA-ES
[42]	+	–	±	+	±	+	–	+	+	±	6.5	–	BlT vs DT
[46]	+	–	–	±	+	+	–	+	+	+	6.5	–	BT vs usual incontinence-related care
[44]	+	–	+	±	+	±	±	±	±	±	6	–	PFME +IV-B vs BlT vs CT
[49]	±	–	–	±	±	+	±	+	±	±	5	–	IV-ES vs DT
[41]	+	–	+	–	+	+	–	±	±	–	5	B1	BlT vs controls (no treatment)
[37]	±	–	–	±	±	+	+	±	±	±	5	B2	BlT+DT vs BlT+ sham DT
[43]	±	±	±	±	±	–	–	±	+	+	5	–	BlT (after urodynamics) vs BlT
[35]	±	±	–	±	±	±	–	±	±	±	4	–	BlT vs DT
[36]	±	±	–	–	±	+	–	–	±	±	3.5	–	BlT vs controls (no treatment)
[48]	±	–	±	±	–	–	±	+	–	–	3	B1-	IV-ES vs sham IV-ES
Total (max 15)	12	3	7.5	7.5	11	10.5	4.5	10	10	9.5			

*Item score; + 1 point, ± partly scored, 0.5 point, – no points. †B, blinded, 1 single, 2 double; ITA, intention-to-treat analysis; ‡IA, intra-anal; PFME, pelvic floor muscle exercise; IV, intravaginal; EV, extravaginal; BF, biofeedback; ES, electrical stimulation; BlT, bladder (re)training; BT, behavioural techniques; DT, drug therapy; CT, combination therapy; UUI, urge urinary incontinence.

ing with no urodynamics. There was no significant difference for any variable between the groups. With only one RCT of low methodological quality, evidence for the efficacy of bladder (re)training with prior urodynamics over bladder (re)training alone is insufficient.

There was one trial of sufficient methodological quality (MQS 6 points) comparing bladder (re)training with biofeedback-assisted PFM exercises and with combination therapy [39]. Although the combined therapy was the most effective immediately after treatment, each of the three interventions had a similar effect 3 months after treatment. Because only one such trial could be identified, the evidence in favour of one of the three interventions compared with the other two is insufficient.

There was one trial comparing bladder (re)training (biofeedback-assisted 'behavioural' treatment) with placebo drug therapy [45]. This trial was of sufficient methodological quality (8.5 points). Biofeedback-assisted bladder (re)training was reported to be significantly more effective than placebo drug therapy. However, with only one such RCT, there is insufficient evidence that (biofeedback-assisted) bladder (re)training is better than placebo drug therapy.

In one trial of sufficient methodological quality (MQS 6.5 points) [46] the efficacy of 'behavioural' treatment (a programme of hourly checking and prompting of individuals to urinate) was compared with routine incontinence-related care. Although the results were in favour of 'behavioural' treatment, because only one relevant RCT was identified there is insufficient evidence that 'behavioural' treatment is better then routine incontinence-related care.

Three RCTs were identified comparing (intravaginal or intra-anal) ES with sham ES [38,47,48]. One trial comparing intravaginal ES with sham intravaginal ES had a MQS of 7 points and was considered to be of sufficient methodological quality. Another trial comparing intra-anal ES with sham intra-anal ES had a MQS of 6.5 points. A third RCT comparing intravaginal ES vs. sham intravaginal ES was of low quality (MQS 3 points). The two trials of sufficient methodological quality reported results in favour of ES, whereas the low-quality study reported that ES was no more effective than sham ES [48]. Combined results of the three RCTs showed insufficient evidence in favour of ES as a treatment modality for UUI. Moreover, there was no consistency between the trials in terms of types and parameters of ES.

In one trial of low methodological quality (MQS 5 points), intravaginal ES was compared with drug therapy (propantheline bromide) [49]. It was concluded that ES is at least as effective as anticholinergic therapy in the treatment of UUI. With only one such RCT, there is insufficient evidence for the efficacy of ES compared to drug therapy.

Table 3 Brief details of the RCTs included (full details of treatments and outcome may be obtained from the first author on request)

Ref	*Sample size: age range or mean (SD), years*	*Duration of complaint(s) (years + SD) TG1/(TG2...)/CG (%)*	*Severity mild/moderate/severe (%)*	*Treatment duration (months)*
[45]	197 (55–92)	BT (9.4) (33)/DT (9.8) (34)/CG (12.7) (33)	BT + DT + CG (18/29/53)	2
[39]	35 (55–90)	BlT (13±11) (43)/CG (8±10) (57)	–	1.5
[47]	28 DI; 33 MI (44–70)	–	–	2
[40]	35 (58–77)	BlT (13±11)/CG (8±10)-	–	1.5
[38]	94 (5–17)		–	1–2
[42]	27 (24–65)		–/–/100	1.5
[46]	38 (78–93)		–	3
[44]	59 (50–72)	BlT (9±8)(33)/PFME (8±9) (34)/CT (8±8) (33)	–	3
[49]	38 (44–82)		–	4
[41]	18 UUI; 20 MI (32–55)	<2 (35/36); 2–5 (17/36); >5 (48/28)	BlT 9/54/37; CG 4/57/39	12
[37]	37 (70–89)		–	1.5
[43]	43		–	3
[35]	50 (17–78)	BlT (4±3) (50)/DT (5±3) (50)-	–	1
[36]	60 (27–79)	BlT (0.4–10) (50)/CG (0.5–10) (50)	–	3
[48]	26 UUI; 39 MI		–	1*

*One single therapy session; TG1, therapy group 1; TG2, therapy group 2; CG, control group; BT, behavioural techniques; DT, drug therapy; PFME, pelvic floor muscle exercises; CT combination therapy; DI, detrusor instability; UUI, urge urinary incontinence; MI, mixed incontinence. Other abbreviations as Table 2.

A summary of the levels of evidence for the efficacy of physical therapies in the treatment of UUI in women is presented in Table 4.

Discussion

The most important methodological aspects of the studies reviewed are only outlined briefly here; the methodological problems and pitfalls related to such reports are discussed more extensively elsewhere [27]. There are various conservative treatment modalities for the management of bladder overactivity. Unfortunately, many of the reports do not comply with the criteria for a well-conducted RCT. Assessing the results of the treatments shows a lack of consistency in the criteria for evaluation and the methodology used in these reviewed studies. Additionally, the assessor is usually the healthcare provider and therefore may be biased.

In the present review, a rating system was used that considered three levels of scientific evidence, based on the methodological quality and outcomes of the selected RCTs. There was large variability in the quality of included studies and the use of different measures of effect in most of the trials under review hampered comparisons between studies. The results should therefore be interpreted with caution. Several other aspects should be considered when interpreting the cited studies. First, UUI is only one of the functional disorders caused by bladder overactivity. The underlying pathology can be of various origins and is only partly understood. Secondly, the ICS has introduced several descriptive terms like 'a disorder of the filling/storage phase', 'involuntary bladder contractions, while the patient is attempting to inhibit', 'detrusor hyper-reflexia' or 'detrusor instability', which illustrate the current confusion in clinical practice [1]. This is partly understandable because the diagnostic assessment is typically aimed at the function of the lower urinary tract (storage and emptying), while the underlying pathology, which needs to be treated, is often characterized as idiopathic. A diagnosis based on previous terms is in principle qualitative. Third, in research, when attempting to confirm the efficacy of therapy and to compare different therapeutic modalities, there is a demand for quantitative validated assessments of bladder overactivity. Particularly in those patients with symptoms indicative of mixed incontinence, a quantitative measure is also clinically important to optimize the therapeutic programme, defining whether the 'urge' or 'stress' component is more profound. Finally, existing conventional diagnostic tools lack sensitivity and specificity for the overactive bladder [50]. We suggest that these aspects must have caused a diversity within patient groups, possibly leading to an underestimation of the efficacy of physical therapeutic modalities.

If the future investigation of conservative therapies is to be improved we suggest the following definition is used for bladder overactivity, describing the dysfunction of the bladder, which is related to symptoms of urgency, frequency and urinary incontinence: 'Bladder overactivity is a dysfunction of the bladder in which a subject has no or decreased control over sudden contractions of

Table 4 Levels of evidence of efficacy of different conservative treatment modalities

Level	*Efficacy*
Conservative treatment	
Strong	BlT is more effective than no treatment (controls)
Weak	BlT is more effective than drug therapy
Insufficient	Combination of BlT and drug therapy is more effective than BlT with placebo
	BlT with prior urodynamics is more effective than BlT alone
	Combination of BlT and biofeedback-assisted PFME is more effective than BlT or PFME alone
	Biofeedback-assisted 'behavioural' treatment is more effective than drug therapy or placebo
	'Behavioural' treatment is more effective than usual incontinence-related care
	ES is more effective than sham ES not found
	ES is more (or less) effective than drug therapy

Abbreviations as Table 2.

the detrusor muscle, so that this leads to premature leakage of urine' [50].

To meet the demand for a quantitative assessment of this dysfunction, a highly sensitive and specific diagnostic tool with a validated quantitative outcome measure is necessary [50]. Because GPs currently have no adequate diagnostic tools, it is very difficult for them to adequately specify the diagnosis of urge incontinence (or overactive bladder). On the other hand, only a few patients with symptoms of frequency, urgency and/or urge incontinence will be referred by the GP to the urologist immediately after the first consultation; most patients will initially be referred to a physiotherapist. This implies that many patients who probably have urge incontinence (a mostly heterogeneous group) will receive physiotherapy. The lack of adequate criteria for easily selecting patients may diminish the rate of success of the physiotherapeutic treatment, or vice versa. Using urodynamics, the urologist has more chance of correctly diagnosing patients with UUI. Several studies have shown that often no bladder overactivity can be detected in these patients, despite their obvious symptoms and signs of urgency, frequency and urge incontinence [51–53]. Other studies have shown that ambulatory urodynamic monitoring is far better than conventional filling cystometry if bladder overactivity is involved [52,54]. However, none of the studies in the present analysis used ambulatory urodynamics.

Physical therapies, when provided by knowledgeable physiotherapists, generally provide some measure of improvement in most individuals with an overactive bladder. They have few reported side-effects [13] and do not preclude future treatments; however, the relative increase in efficacy and costs is still debated. Also, physical therapy requires that both the patient and therapist are highly motivated. A possible explanation for the moderate success rate could be that there is large variation among the treatment series and training programmes in the parameters for stimulation, the frequency and duration of treatments.

From the published reports, there is no consistent terminology for the different treatment modalities for UUI. The term 'behavioural' treatment is particularly confusing. In the trial by Burgio *et al.* [45] the term 'behavioural' treatment is used for a bladder (re)training programme. The 'behaviour' treatment programme implemented in the study of Hu *et al.* [46] was based on hourly checking and prompting of individuals to void. In UUI, behavioural treatment is only one aspect of bladder (re)training. We think that within a physical therapy, behavioural treatment is not a full treatment modality, but only part of a larger treatment. Physiotherapists use it to teach and motivate patients to change their behaviour. In bladder (re)training, physiotherapists also try to change the pathophysiological aspects of the health problem as a result of UUI, by reducing/restoring impairments, disabilities and/or handicaps.

Previously, bladder (re)training has been used in an attempt to increase central inhibition. Jeffcoate and Francis [55] used bladder training in which patients were asked to void 'by the clock' and instructed to maintain continence at all costs. This method was very controversial, because the anxiety caused by trying to force such behaviour led many patients to withdraw. Frewen [56] reported positive results in patients with urge incontinence by using daily voiding charts as a method of bladder training. In Frewen's first series no urodynamics were used, but later he reported similar results in an uncontrolled study with cystometric results [57]. In an American review the reported efficacy of bladder training was 47–100% [26] but most of the studies in that review were case series; the only RCT was that by Jarvis [35]. In another review, bladder training was strongly recommended for managing UUI from detrusor overactivity

[13]. Fantl *et al.* [40] conducted a RCT in 131 women with sphincteric incompetence and unstable detrusor function. Patients were treated with a bladder-training programme that included strategies to decrease urge and educate the patient, and a voiding schedule. In the treatment group, 12% became dry and 75% at least halved the number of incontinent episodes. The effect of bladder training was maintained after 6 months [13]. A disadvantage of this treatment modality is that it is not applicable in cognitively impaired patients and may not be successful in the frail elderly [13]. To our knowledge, currently there is no evidence of a direct relationship between any urodynamic variable and observed beneficial clinical effects.

In an uncontrolled pilot study of community-resident elderly persons, Flynn [58] reported that PFM exercises were essentially as effective in reducing UUI as they were in reducing combined SUI/UUI. Additionally, PFM exercises resulted in a significant increase in the time between voiding, thus significantly reducing urinary frequency. PFM exercises are recommended in patients in conjunction with bladder training for UUI [13]; they can reduce urgency and prevent UUI [59–64]. A disadvantage is that patients usually require repeated guidance over a long period to derive optimal benefit from PFM exercises [13]. Further RCTs are needed to determine the optimal programme of PFM exercises in patients with UUI and whether the exercises should be augmented by biofeedback therapy. It is important to identify those patients who will benefit most from PFM exercises alone or combined with other treatment modalities such as biofeedback or ES.

Among various series and devices, the parameters for ES and the frequency and duration of treatments vary considerably [3]. Electrical stimulation may be useful for UUI [13], but further research is needed to determine whether ES should be used alone or combined with other therapies. Standardizing the parameters of the techniques used will allow further comparison of study results.

In conclusion, the methodological quality of the studies included in the present review was moderate. There is weak evidence that bladder (re)training is more effective than no treatment (controls), and that bladder (re)training is better than drug therapy. There is insufficient evidence for the efficacy of biofeedback-assisted PFM exercises, exercises alone, toilet training and electrical simulation for women with UUI. Despite almost all the included studies reporting positive results in favour of physical therapies for the treatment of UUI in women, more research of optimal methodological quality is required. Therefore, future researchers are recommended to use a well-established methodological criteria list when designing and conducting trials.

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