

## Effectiveness of Physiotherapy Treatment for Urinary Incontinence in Women: A Systematic Review

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### Abstract

**Background:** Urinary incontinence (UI) may be defined as involuntary urine loss, which can be diagnosed based on patient-reported measures and is a hygiene and social problem in those who have it, affecting their quality of life negatively.

**Objective:** The study aimed to determine the effectiveness of distinct physiotherapy techniques used in the treatment of UI in women through a systematic review of the existing literature. The scales and instruments used for the assessment and follow-up of UI were described.

**Methods:** On searching the PubMed, Dialnet, PEDro, and SciELO databases, 16 articles, with information on 1220 patients that comply with the inclusion criteria and conform to the proposed objectives were obtained, limiting the publication period to 2007–2016. The PRISMA statement was adopted.

**Results:** The “Pad Test” is a commonly used diagnostic test and bladder diaries on paper; the Oxford scale was used in the assessment of pelvic floor muscle strength. Distinct protocols and techniques have been described in the treatment of UI in women, namely, pelvic floor exercises, vaginal cones, biofeedback, and electrostimulation. Upon analysis of the content of the articles, the quality of the included clinical trials was determined using the PEDro scale.

**Conclusions:** Studies included in this work propose that physiotherapy treatment may improve UI, the patients' quality of life, and social relations in women. It is necessary to establish group treatment protocols for women with UI, supervised by a physiotherapist to reduce the financial burden incurred from this health problem.

**Keywords:** urinary incontinence, women, pelvic floor muscle, physiotherapy

### Introduction

URINARY INCONTINENCE (UI), ACCORDING TO the International Continence Society, may be defined as the involuntary loss of urine due to a pelvic floor dysfunction and results in hygienic and social problems for those who have it; it can be diagnosed based on patient-reported measures.<sup>1–3</sup> It is a major health problem that impacts the quality of life, affecting 25% of the world population and up to 45% of the female population in some countries.<sup>4–6</sup>

The prevalence of UI in middle-aged or elderly women varies between 30% and 60% and increases with age.<sup>7</sup> However, this incidence is not objective, given that some of the affected women do not solicit professional assistance due

to embarrassment, ignorance regarding the existence of possible treatments, or because they consider this to be a natural process in aging or following childbirth. This may result in UI being considered an underdiagnosed condition.<sup>8–10</sup>

The primary goal of UI interventions is to improve continence by reducing the frequency of UI episodes. Conservative and nonpharmacological interventions are mostly preferred and the basis of UI management for patients with mild UI. Among these conservative treatments and according to the World Health Organization, physiotherapy is considered to be the first-line treatment in women with UI.<sup>9,11</sup>

Physiotherapy treatments for stress UI (SUI) include pelvic floor muscle training (PFMT), bladder training, habit

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retraining, lifestyle and behavioral therapy, and timed or prompted voiding. Theoretically, it is considered that strengthening the pelvic floor muscle (PFM) by specific training would prevent SUI and pelvic organ prolapse.<sup>12</sup>

To ensure success, it is necessary to identify and initiate early treatment following a complete and adequate assessment.<sup>13</sup> Pharmacological treatment also makes up a part of conservative treatment and consists of taking drugs that favor urinary continence (anticholinergic, muscle relaxant drugs, *etc.*). In SUI, the use of local estrogens is effective, although they are not usually prescribed as initial treatment due to their adverse effects.<sup>7,14</sup> Surgical treatment may be used in severe cases of UI and when conservative treatment proves ineffective. Currently, the tension-free vaginal tape and trans-obturator tape are used, which are simple, effective, and less complicated techniques compared with the classical ones.<sup>7</sup>

There is no adequate evidence-based rationale indicating which treatment or combination is a better choice for UI in women, reducing resource use and time and avoiding extra cost for added benefit or improved adherence. Thus, considerable doubt exists about the real and potential therapeutic effectiveness of the described physiotherapy treatments. Therefore, there is a compelling need for a systematic review of the existing trial-based evidence.<sup>15</sup>

The objective of this study was to describe the effectiveness of the distinct physiotherapy techniques used in the treatment of UI in women and the scales and instruments used for the assessment and follow-up of UI, based on a systematic scientific literature review.

## Materials and Methods

A systematic review of the articles published over the past 10 years was conducted, from PubMed, Dialnet, PEDro and SciELO databases, in February of 2017, according to the PRISMA guidelines.<sup>16</sup>

The following inclusion criteria were used for the selection of the articles:

- They contain the English keywords “urinary incontinence,” “pelvic floor,” “physical therapy,” “conservative treatment,” “Kegel exercises,” “biofeedback,” “electrical stimulation,” and “rehabilitation/methods” and the Spanish keywords “incontinencia urinaria,” “fisioterapia,” “disfunción suelo pélvico,” “tratamiento conservador,” and “rehabilitación.” The search strategy in the distinct databases is described in Table 1.
- The articles were written in Spanish, English, or French.
- The specific type of treatment techniques used for UI should be described.

The exclusion criteria were as follows:

- Articles on male patients, children, and pregnant women or those with postpartum UI, those who had been previously treated surgically, those having prolapse, those taking medications for UI, or those with neurological illnesses.
- Articles referring to acupuncture or electroacupuncture as treatment for UI (as acupuncture is not always practiced by physiotherapist in all countries).

- Articles in which urine loss was not the main cause of treatment.
- Systematic reviews.

A total of 612 articles were selected based on this search strategy. They were analyzed based on the title and abstract (Fig. 1).

After an initial screening of the studies that were considered to be potentially relevant (41 articles), an essential full-text reading was carried out for the said studies, paying special attention to the intervention used in each (population, treatment type, number of sessions and duration, and other factors). Finally, a total of 16 selected articles were found to comply with the previously proposed criteria and be in line with the objective proposed for this review. The quality of the randomized controlled trials (RCTs) was assessed using the PEDro scale.<sup>17</sup>

## Results

The selected articles contain information on 1220 patients. Table 2 includes a summary of the information, specifying the study type and scales and instruments used for the assessment and follow-up. In addition, treatment techniques and study results are presented. The effects of treatments are applicable to women with SUI or urge or mixed UI.

Considering the study types, 87.5% ( $n = 14$ ) of the articles were of experimental or quasiexperimental design,<sup>4,18–30</sup> and 12.5% ( $n = 2$ ) were of descriptive or observational design.<sup>31,32</sup>

The main treatment techniques were PFMT or Kegel exercises<sup>4,18–20,25–27,29,31,32</sup> (program of repeated voluntary PFM contraction),<sup>33</sup> electrostimulation<sup>21,22,24,25,28,30,32</sup> (to improve PFM or inhibit detrusor overactivity), bladder training<sup>4,19,27</sup> (to increase the time interval between voiding and prompted voiding, which teaches dependent individuals when and how to initiate their own toileting), and biofeedback<sup>21,23,30</sup> (helpful for women who have difficulty isolating their PFM during training).

In the studies that were included, distinct scales and instruments were used, such as the “Pad Test,”<sup>21–26,31,32</sup> one of the most commonly used diagnostic tests, as it permits the assessment of urine loss and of the outcomes of treatment. This test involves weighing a dry pad that the patient wears upon ingesting 500 mL of water within a period of 15 minutes. After half an hour, the patient should perform specific tests (sitting and standing up 10 times or coughing forcefully 10 times). After completing these tests, the pad is reweighed to determine urine loss.

Bladder diaries (on paper) were kept<sup>19,21,25,31</sup> to record aspects related to urination and urinary symptoms, obtaining information on the frequency of urination, quantity and type of liquids ingested, *etc.*

As for the assessment of PFM strength, the Oxford scale<sup>18,25–27,29</sup> was most often used. Moreover, in some studies, a perineometer was used to measure the strength of the voluntary contractions of the perineal muscle.<sup>22,26,28,32</sup>

To assess the repercussions of UI on a physical, psychological, and social level, quality-of-life questionnaires, such as the King’s Health Questionnaire (KHQ),<sup>23,24,26,27,30</sup> International Consultation on Incontinence Questionnaire-Short Form (ICIQ-SF),<sup>30</sup> Incontinence Quality-of-Life Questionnaire

TABLE 1. DISTINCT DATABASE SEARCH STRATEGIES

Databases and search terms	Results	Selection
PubMed		
1. "Pelvic floor" AND "physical therapy" AND "urinary incontinence"	1.026	Ong et al. <sup>18</sup>
2. "Urinary incontinence" AND "conservative treatment"	854	Leong and Mok <sup>19</sup>
3. "Urinary incontinence" AND "electrical stimulation"	230	Tajiri et al. <sup>20</sup>
		Terlikowski et al. <sup>21</sup>
		Alves et al. <sup>22</sup>
		Simard and Tu <sup>31</sup>
		Huebner et al. <sup>23</sup>
		Gilling et al. <sup>24</sup>
		Castro et al. <sup>25</sup>
		Eder <sup>32</sup>
Dialnet		
1. Urinary incontinence and physiotherapy	8	Nascimento-Correia et al. <sup>26</sup>
PEDro		
1. Urinary incontinence AND physiotherapy	84	Pereira et al. <sup>27</sup>
2. Urinary incontinence and (conservative treatment or physiotherapy)	22	Lamb et al. <sup>4</sup>
3. Pelvic floor and physical therapy	11	
Scielo		
1. Pelvic floor and physical therapy	113	Knorst et al. <sup>28</sup>
2. Urinary incontinence and biofeedback	69	Kashanian et al. <sup>29</sup>
3. Urinary incontinence and treatment	125	Lorenzo Gómez et al. <sup>30</sup>
4. Dysfunction of pelvic floor and conservative treatment	89	

(IQoLQ),<sup>4,24,25,29</sup> and Incontinence Impact Questionnaire (IIQ),<sup>19,29</sup> were used.

To assess the symptoms and severity of the UI, in some studies, the Urogenital Distress Inventory (UDI),<sup>29</sup> Questionnaire for Urinary Incontinence Diagnosis (QUID),<sup>32</sup> and Australian Pelvic Floor Questionnaire (APFQ)<sup>18</sup> were used.

The level of evidence of the included clinical trials was assessed using the PEDro scale (Table 3).<sup>17</sup> The quality of most of the RCTs, assessed with the PEDro scale, was good, in spite of the heterogeneity among studies; external validity and randomization was adequate, participants were not excluded from the analysis of outcomes, and there was enough statistical data to consider results as interpretable (criteria

10–11). On the other hand, criteria 5, 6, and 7 were not satisfied in the majority of the studies: there was no blinding of all the participating subjects, the therapists who administered the therapy, or the assessors who measured at least one key outcome.

## Discussion

Over recent years, the number of studies on the physiotherapeutic treatment of UI in women has significantly increased, given that this has become an essential health problem in a society that advocates quality of life and well-being.<sup>34,35</sup>

FIG. 1. Phases used in the selection of articles for the study.

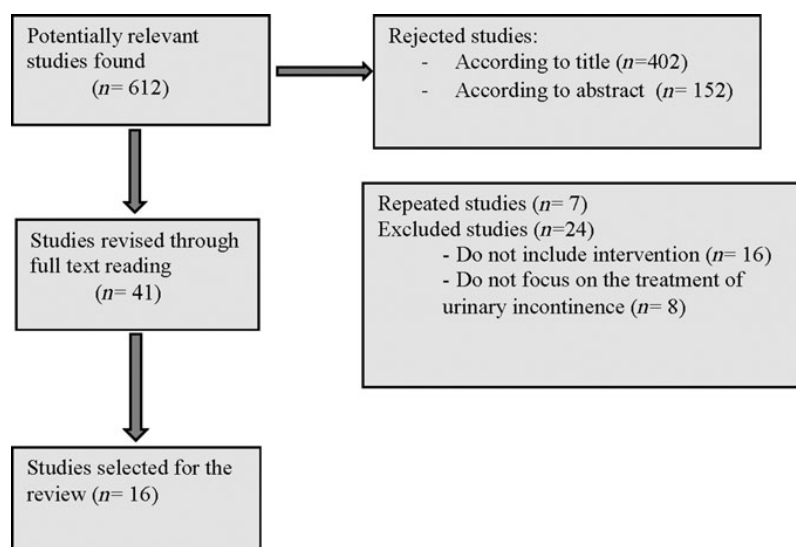


TABLE 2. DESCRIPTION OF THE ARTICLES SELECTED FOR THE REVIEW

Author, year	Design and sample	Intervention and follow-up	Results, limitations, and strengths
Leong and Mok <sup>19</sup>	<p>A controlled trial. N=55 women with mild-to-moderate UI. IG: n=27. Education about UI, PFMT with manual palpation and verbal feedback, and behavioral therapy. CC: n=28. Advice and an educational pamphlet on UI.</p>	<p>Program for 12 weeks. IG: Individual supervised sessions of 30 minutes/once a week for 1 month and then once biweekly for the remaining 8 weeks. CG: One follow-up visit at 12 weeks. Total: 5 patients abandoned. Information for UI was collected at baseline and then weekly until the end of the program (12 weeks).</p>	<p>There was significant improvement in urinary symptoms in the IG, especially in the first 5 weeks. The result suggested a complex interaction between subject's health condition, exercise compliance, and treatment effectiveness, which warrant further investigation. Limitations: (1) potential selection bias due to use of convenience sampling, (2) absence of assessor blinding, (3) possibility of overreporting, and (4) the use of the modified IIQ-7 Chinese (Taiwan) version. Strengths: A standardized urinary continence program consisting of education, supervised PFMT with palpation, and behavioral therapy is an effective first-line management for various types of UI in a community setting.</p>
Ong et al. <sup>18</sup>	<p>A pilot prospective randomized trial. N=40 women with UI. CG: n=21 pelvic floor training. IG: n=19 pelvic floor exercises with BFB.</p>	<p>Individual sessions, 20 minutes of treatment for 16 weeks. They were assessed at the start of treatment, after 4 weeks, and at the end (16 weeks). Three patients dropped out for the CG.</p>	<p>Using BFB resulted in significant early improvement in SUI scores at week 4. However, there was no significant difference between the groups' SUI scores at week 16. Pelvic muscle strength had improved significantly by the end of the study. The subjective cure rate was similar in both groups at week 16. Limitations: Further studies should be performed to reach a definite conclusion about its efficacy. Strengths: BFB is a good complement to PFMT.</p>
Tajiri et al. <sup>20</sup>	<p>Randomized controlled trial. N=15 in middle-aged women with SUI. IG: n=9 program of TA and PFM co-contraction exercises. CC: n=6 no treatment.</p>	<p>IG: One session three times a week. 8-week TA, and PFM co-contraction training program: 40 repetitions (2 sets of 20 repetitions) of a 3-seconds co-contraction of both the TA and PFM. CG: Do not undergo treatment at home. Assessed before the intervention, at 4 and 8 weeks after intervention.</p>	<p>In the exercise group, the cure rates of SUI were 55.6% (5/9) after 4 weeks of the intervention and 88.9% (8/9) after 8 weeks intervention; the CG showed no change. The study does not describe limitations. Strengths: The TA and PFM co-contraction exercise intervention increases the thickness of the TA and may be recommended to improve SUI in middle-aged women.</p>

(continued)

TABLE 2. (CONTINUED)

<i>Author, year</i>	<i>Design and sample</i>	<i>Intervention and follow-up</i>	<i>Results, limitations, and strengths</i>
Knorst et al. <sup>28</sup>	Quasiexperimental before-and-after study. N=82 women with UI. The intervention consisted of trans-VES and pelvic floor kinesiotherapy.	Up to 15 sessions (one per week) using trans-VES and perineal exercises with elastic band or ball. ES for 10 minutes, reaching a maximum current of 60 mA using a device connected to an electrode inserted into the vagina. One woman abandoned. Three stages: initial evaluation, intervention, and final evaluation	Increase in the function of the PFM, improvement in urinary continence, and satisfaction with treatment in the majority of cases. Limitations: Although the reproducibility was not examined because of its design, the correlation coefficients obtained were similar ( $0.57 > r < 0.59$ ). Strengths: The physical therapy treatments proposed could easily be implemented within the primary health care system, given its low complexity, the low cost of the bidigital test and treatment, and the high success rate reached.
Kashanian et al. <sup>29</sup>	A randomized clinical trial. N=91 women with UI. G1: n=41 Assisted PFMT with the Kegelmaster device. G2: n=50 PFMT with Kegel exercises.	G1: In this group, after complete training, Kegelmaster device were used twice daily for 15 minutes each session, for a total duration of 12 weeks. G2: In the group after complete training, Kegel exercises were done (including perineal muscle contractions for 6–8 seconds with 6 seconds rest in between), twice daily for 15 minutes each session, 12 weeks. Assessed before, after, 1 and 3 months after treatment. Six women abandoned.	PFMT with or without the Kegelmaster device does not result in differences between them; in both groups UI improved. Limitations: Women in this study found some of these methods difficult, and reported some adverse effects. It seems that more studies should be performed to compare this device with the other assisted methods and PFMT alone. Strengths: This is the first study using this device.
Alves et al. <sup>22</sup>	A RCT. N=24 women with UI. G1: n=10. NMES with medium-frequency current. G2: n=10. NMES with low-frequency current.	Twelve 20-minute sessions for 6 weeks. They were assessed before the 1st session and after the 4th, 6th, 8th, 10th, and 12th session. Four abandoned.	No significant differences were found between groups for any of the variable assessed. Significant differences in the amount of urine lost, the discomfort caused by UI, and perineal pressure for both treatment groups. Limitations: Lack of follow-up to access whether the improvements achieved with the different parameters of electrical stimulation would last in the long term. Strengths: In this study, NMES was well received by the volunteers.

(continued)

TABLE 2. (CONTINUED)

<i>Author, year</i>	<i>Design and sample</i>	<i>Intervention and follow-up</i>	<i>Results, limitations, and strengths</i>
Pereira et al. <sup>27</sup>	A randomized controlled pilot study. N=49 women with UI. GA: n = 17 PFMT in group treatment session (8–10 women). GB: n = 17 individual PFM treatment session. CG: n = 15 no treatment.	Subjects on IGs were treated with the same PFMT protocol for 6 weeks, with two 1-hour weekly sessions. The difficulty progressively increased in terms of position, number of repetitions, and time of holding the contraction. Assessed before and after the intervention. Four abandoned.	The results indicated similar improvement in clinical variables and in satisfaction with the treatment between GA and GB. They are effective for the treatment of UI. Limitations: The therapist was not blinded and this could have influenced the results. The small sample size. Strengths: There were no complaints of adverse effects due to treatment from either group. The group treatment should be more applied in clinical practice, especially within public health service, as it seems to be a way to carry out a high-quality treatment with lower investment.
Huebner et al. <sup>25</sup>	A RCT. N = 108 women with UI. GA: n = 36 EMG BFB-assisted PFMT and conventional ES. GB: n = 36 EMG BFB-assisted PFMT and dynamic ES. CG: n = 36 EMG BFB-assisted PFMT.	15 minutes, twice a day, for 3 months. They are assessed once a month. The study lasted 12 weeks and included five visits in the clinic. Twenty subjects abandoned treatment.	Improves the QOL after 12 weeks of treatment in the three groups, but without differences between groups. Additional ES showed no benefit for patients with SUI, capable of voluntary pelvic floor contraction. Limitations: This study did not include a surgical trial arm for comparison. Strengths: Regularly supervised and monitored BFB-assisted PFMT significantly improved subjective and objective SUI in women with the ability to identify their PFM and perform voluntary contraction, with no extra benefit from additional conventional or dynamical ES.
Lamb et al. <sup>4</sup>	A RCT. N = 174 women with SUI. Treatment from a physiotherapist delivered in a group or individual setting. IG: n = 111 group education, advice, and pelvic floor exercises. CG: n = 63 same treatment. Individual.	Three hour-long sessions over a 3-week period. Assessments were made before treatment (baseline), and then at 6 weeks and 5 months after randomization. Twenty-eight women from the treatment group passed on to individual treatment. Seven abandoned treatment.	Over 85% of women reported a subjective benefit of treatment, with a slightly higher rating in the individual compared with the group setting. When all health care costs were considered, average cost per patient was lower for group sessions. Favorable UI results in both the individual and group treatment, without significant differences between them. Similar assistance. Limitations: The sample size was calculated a priori, without accounting for any potential clustering or therapist effects. Future studies should have longer periods of follow-up.

(continued)

TABLE 2. (CONTINUED)

Author, year	Design and sample	Intervention and follow-up	Results, limitations, and strengths
Castro et al. <sup>25</sup>	Randomized controlled clinical trial. N=118 women with UI. IG: n=88. A (n=31). Pelvic floor exercises. B (n=30) ES C (n=27). Vaginal cones. CG: n=30. No treatment.	IG received treatment three times a week for 6 months. A: 45 minutes/session. B: 20 minutes/session. C: 45 minutes/session. CG: Did not receive treatment, only a monthly telephone call. Evaluated before and after completion of 6 months of treatment. Seventeen women abandoned.	Pelvic floor exercises, electrical stimulation, and vaginal cones are equally effective treatments and are far superior to no treatment in women with UI. Limitations: The difficulty in analyzing this study lies in determining the true clinical behavior of the patients who improved after using pelvic floor exercises. Strengths: This study supports the idea that PFM exercise should be offered as the first choice of treatment. Electrical stimulation and vaginal cones should be offered to patients who cannot contract their PFM.
Lorenzo Gómez et al. <sup>30</sup>	Quasiexperimental design. N=85 women with UI. G1: n=50. Treatment with BFB with electromyography with superficial electrodes. G2: n=35. PFMT plus VES	Two sessions per week (of 30 minutes each one) during 10 weeks. Assessed at the start of the study, at 4 and 10 weeks.	In both groups there was an improvement in UI, but without differences between the two treatment types. In Group 1, 50% of patients in the 4th week and 84% in the 10th week were cured. In Group 2, 71.42% of patients in the 4th week and 80% in the 10th week were cured. In Group 2, eight patients (22.85%) complained side effects. Both groups improved the QOL similarly. Limitations: VES may cause local discomfort. Strengths: Both conservative treatments are effective and feasible.
Eder <sup>32</sup>	Prospective, open-label, multicenter, single-arm study. N=83. EmbaGYN™ PFM stimulator in addition to Kegel exercises.	Treatment once a day at home for 12 weeks. Assessed at 4, 8, and 12 weeks. One abandoned treatment.	EmbaGYN with Kegel exercises resulted in significant reductions in urine loss, incontinence pad use, and improved incontinence-related QOL, but did not have a significant effect on incontinence episodes/day. Limitations: Aside from the single-arm, unblinded design, a limitation of this study is that it is not possible to distinguish the effects of the EmbaGYN Pelvic Floor Exerciser from those of Kegel exercises. Strengths: Compliance with the study protocol was high at each study visit. There were no serious adverse events.
Gilling et al. <sup>24</sup>	Randomized controlled trial. Compare the efficacy of extracorporeal ES of the pelvic floor for treating SUI vs. sham ES. N=70 women with UI. IG: n=35 active ES. CG: n=35 sham ES.	Three sessions per week for 6 weeks. ES: 10 minutes of stimulation at 10 Hz, 3 minutes rest, and 10 minutes at 50 Hz. Assessed pre- and posttreatment. Patients were fully re-evaluated 8 weeks after treatment, and the bladder diary, pad-test, and questionnaires were repeated at 6 months.	ES was no more effective overall than sham treatment in this patient group. However, in those women who were unable to generate adequate PFM contractions, there was an objective improvement in provocative pad testing when compared with sham treatment. Limitations: The long-term outcome of this technique remains unclear and is the subject of ongoing research. Strengths: Used several subjective and objective outcome measures to provide as complete a picture as possible of the effects of ES.

(continued)

TABLE 2. (CONTINUED)

<i>Author, year</i>	<i>Design and sample</i>	<i>Intervention and follow-up</i>	<i>Results, limitations, and strengths</i>
Nascimento-Correia et al. <sup>26</sup>	Randomized clinical trial. N=35 women with urinary loss. IG: n=20 Exercises to strengthen the PFM. CG: n=15 did not receive any treatment.	IG: 12 1-hour sessions with exercises to strengthen PFM and information for UI, once a week. Treatment in groups of 8–10 individuals. CG: Received no treatment. Evaluated, before and after 12 weeks of treatment. Five women abandoned.	Nine out of 15 women in the IG regained bladder control. Group exercises to strengthen PFM were effective in urinary loss, PFM function and pressure, and in some domains of QOL (incontinence impact, limitations of daily activities, sleep and disposition, and gravity domains). No differences were found in the CG. Limitations: It was not possible to carry out urodynamic exams. Strengths: Despite the small sample size, the calculation of effect size showed that the treatment had a large effect on clinical variables.
Simard and Tu <sup>31</sup>	Retrospective chart review. N=93 women with UI. PFM physiotherapy for UI.	Eight sessions for 15 weeks. Telephone surveys were conducted at 2 months, 6 months, and 1 to 5 years after physiotherapy, on adherence and frequency of carrying out the PFM exercises at home. 89 completed treatment. 40 women were followed up after 5 years.	PFM rehabilitation for UI remains highly effective for up to 5 years in older women. Most women continue to perform PFM exercises 5 years after completing their physiotherapy education sessions. Therapeutic success depends on adherence to exercises. Limitations: High percentage of patients lost to follow-up from the initial cohort of patients. Multiple external factors could not be controlled in this long-term study. Strengths: More than 70% of patients were still performing PFM exercises after 5 years, and all of them had improved or stable clinical status.
Terlikowski et al. <sup>21</sup>	Randomized controlled trial. N=102 women with UI. IG: n=68 trans-VES with surface electromyography-assisted BFB. CG: n=34 placebo.	20 minutes treatment, two times a day for 8 weeks. IG: Parameters of muscle stimulation were adapted for each participant: frequency ranged from 10 to 40 Hz, impulse width from 200 to 250 $\mu$ s, and runtime/decontraction in configuration of 15/30 seconds for 20 minutes. sEMG BFB was used in the clinic and for home application. The CG received a placebo without physiological effects. Assessed before, after, at 8, and 16 weeks after treatment. Four women in the IG and five in the CG abandoned treatment.	The study showed that VES+sEMG is a trustworthy method of treatment in premenopausal women with SUI. No significant difference was found between groups in urodynamic data before and after treatment. VES with sEMG increased muscle strength most during the first 2 months of treatment and was well preserved at month 4. Limitations: Additional studies are necessary to determine its reliability. Strengths: Treatment is well tolerated and there are few adverse effects. A physiotherapist supervised all sessions in the clinic and increased the intensity of electrical impulses. This engagement was probably responsible for the high rate of compliance with treatment and the favorable outcomes based on subjective and objective measures.

BFB, biofeedback; CG, control group; EMG, electromyography; ES, electromagnetic stimulation; GA, group A; GB, group B; IG, intervention group; IIQ, Incontinence Impact Questionnaire; UI, urinary incontinence; N, Sample; NMES, neuromuscular electrical stimulation; PFM, pelvic floor muscle; PFMT, pelvic floor muscle training; QOL, quality of life; RCTs, randomized controlled trials; sEMG, stimulation with surface electromyography-assisted biofeedback; SUI, stress urinary incontinence; TA, transverse abdominal muscle; UI, urinary incontinence; VES, vaginal electrical stimulation.

TABLE 3. SUMMARY OF THE QUALITY OF THE RANDOMIZED CLINICAL TRIALS INCLUDED IN THIS REVIEW BASED ON THE PEDRO SCALE

Item (PEDro scale)	1	2	3	4	5	6	7	8	9	10	11	Total score
Ong et al. <sup>18</sup>	X	X	N	X	N	N	N	X	X	X	X	7
Leong and Mok <sup>19</sup>	X	X	X	X	X	N	N	X	X	X	X	9
Tajiri et al. <sup>20</sup>	N	X	N	X	N	N	N	X	X	X	N	5
Terlikowski et al. <sup>21</sup>	X	X	N	X	X	X	X	X	X	X	X	10
Alves et al. <sup>22</sup>	X	X	N	X	N	N	N	X	X	X	N	6
Nascimento-Correia et al. <sup>26</sup>	X	X	X	X	X	N	N	X	X	X	X	9
Huebner et al. <sup>23</sup>	X	X	N	X	N	N	N	X	X	X	N	6
Pereira et al. <sup>27</sup>	X	X	X	X	N	N	N	X	X	X	X	8
Kashanian et al. <sup>29</sup>	X	X	N	X	X	N	N	N	X	X	X	7
Lamb et al. <sup>4</sup>	X	X	X	X	N	N	X	X	X	X	N	8
Castro et al. <sup>25</sup>	X	X	X	X	X	N	X	X	X	X	N	9
Gilling et al. <sup>24</sup>	X	X	X	X	X	X	X	X	X	X	N	10

N, The criterion is not satisfied; X, The criterion is satisfied.

Most reviewed articles<sup>25–27,29</sup> indicate that pelvic floor or Kegel exercises are effective in treating PFM alteration and do not have adverse effects, as previously indicated in another systematic review.<sup>36</sup> Shamliyan's systematic review<sup>37</sup> in 96 RCTs, 10 years ago, showed moderate levels of evidence on PFMT and bladder training in the management of UI; however, the effects of electrostimulation were inconsistent. In a review article, Ghaderi and Oskouei<sup>12</sup> presented interventions of physiotherapy that also included PFM exercise with or without biofeedback and/or electrostimulation to improve the strength and coordination of this muscle, stabilization exercises to strengthen abdominal and/or lumbar muscles, and patient education with recommendations for bladder and/or bowel training, fluid management, and diet modification in women with SUI.

Nascimento-Correia et al.<sup>26</sup> reported an improvement in urine loss and muscle strength, as well as quality of life. At the end of the treatment, 60% of women had urinary continence, and it is suspected that some residual complaints regarding urine loss were probably due to insufficient treatment time. Castro et al.<sup>25</sup> assessed the strength of the PFM in women subjected to group treatment with four distinct protocols (Kegel exercises, electrostimulation, vaginal cones, and control group). Although Kegel exercises, electrostimulation, and vaginal cones proved effective for UI treatment in comparison to the control group, muscle training with Kegel exercises produced greater muscle strength. It was also suggested that electrostimulation and vaginal cones are interesting alternatives for women who are unable to voluntarily contract their PFM. This has been corroborated by Gilling et al.<sup>24</sup> in a study that revealed that electrostimulation is no more effective than simulated treatment for the control group; however, this may be beneficial to women who are unable to correctly and voluntarily contract their PFM.

Two studies used biofeedback devices in PFMT to treat UI.<sup>18,29</sup> Ong et al.<sup>18</sup> reported that the use of biofeedback is a good complement to pelvic floor exercises, allowing appropriate contractions of the PFM; furthermore, it relies on a small, portable device that is easy to clean and does not have adverse effects. In their study, Kashanian et al.<sup>29</sup> also referred to the use of biofeedback using a new device (Kegelmaster), comparing isolated PFMT with combined

training with this device. However, the results of this study do not reveal an increased effectiveness on UI from treatment using this device, and some adverse effects were even reported.

Leong and Mok<sup>19</sup> suggested the effectiveness of a 12-week physiotherapy program of progressive PFM and bladder training. Knorst et al.<sup>28</sup> suggested a training protocol that is based on transvaginal electrostimulation and pelvic floor exercises, demonstrating that satisfactory results may also be obtained by conducting short and less frequent sessions.

Given that the pelvic floor is part of the so-called "manometric abdominal cavity," which is limited and shaped by the pelvic diaphragm, thoracic diaphragm, lumbar spine, and abdominal wall, all related to each other, Tajiri et al.<sup>20</sup> proposed transverse abdominal muscle contraction exercises together with PFMT for the treatment of UI.

With respect to electrostimulation, Alves et al.<sup>22</sup> proposed two electrostimulation protocols (low and medium frequency) for the treatment of UI. Both protocols were effective, generating an increase in perineal pressure and reducing urine losses and symptoms, but one limitation was that their long-term effectiveness was not assessed. In contrast, Huebner et al.<sup>23</sup> compared PFMT using biofeedback with the use of conventional or dynamic electrostimulation. After 12 weeks of follow-up, they concluded that, although some improvement was found in UI in all cases, electrostimulation did not reveal any benefits compared with isolated training of the PFM with biofeedback. On the contrary, Eder<sup>32</sup> proposed the use of an electrostimulation device (EmbaGYN) in combination with Kegel exercises, instead of using biofeedback, given that this device not only permits women to recognize the PFM, but also passively strengthens the said muscle.

Various studies included in this review refer to the use of biofeedback with electrostimulation.<sup>21,30</sup> Lorenzo Gómez et al.<sup>30</sup> analyzed the results of UI treatment through biofeedback with surface electrodes without electrostimulation as compared with the re-education of the PFM with vaginal electrostimulation, concluding that both treatments are effective and harmless, although electrostimulation may cause certain discomforts. Terlikowski et al.<sup>21</sup> proposed the use of transvaginal electrostimulation with biofeedback for the treatment of SUI, creating a safe method that should be

carried out on a daily basis for 3–6 months to maintain improved PFM strength.

In general, there is some controversy regarding the use of group or individual treatment. Some of the articles cited in this review propose that group treatment is a good option and reduces health care costs due to this situation.<sup>25,26</sup> Pereira et al.<sup>27</sup> compared group and individual treatments, both based on perineal muscle training, which were equally effective as compared with no treatment, thus concluding that quality group treatment protocols should be established, at both a public and private level. Lamb et al.<sup>4</sup> also compared group and individual treatments, revealing that, despite the embarrassment or fear that may be experienced by women in the group treatment, there were no differences in the results obtained regarding urinary, psychological, and quality-of-life symptoms, with similar assistance in both.

Treatment supervision by a physiotherapist and adequate training to perform the exercises are fundamental,<sup>38</sup> and this is reflected in the results obtained and subsequent treatment compliance, as indicated by Simard and Tu,<sup>31</sup> and ensures that good results are obtained for up to 5 years.

The limitations of this review are the sample of the included studies, due to some of the studies performed having specific limitations on enrollment (inclusion or exclusion criteria); more studies are needed to provide more evident and reliable results that may be extrapolated to the rest of the population. The treatment protocols and results obtained in these studies were heterogeneous, some of them being more effective than others, based on a pretreatment assessment. The participants in the analyzed studies were assessed at least at the start and end of treatment, but an assessment of the follow-up or the effects of the different techniques over the long term were not reported for all of them.

### Conclusions

This review is a synthesis of the distinct physiotherapy protocols and techniques that are typically used for the treatment of UI in women as PFMT, Kegel exercises, electrostimulation, bladder training, and biofeedback. In the included studies, all results obtained following application of these techniques support conservative treatment as the starting point for UI treatment in women, allowing physiotherapy to play a preventive role in women with SUI. Beforehand, it is necessary to conduct an individualized assessment to determine, among other aspects, the contractile capacity of the PFM in these women. Although this systematic review supports the benefit of all the modalities evaluated in the studies reviewed, practitioners should continue to perform an expert assessment to find other underlying problems that would be treated differently. Sometimes, it is necessary to establish a combination of various techniques to obtain more favorable long-term results. Despite substantial heterogeneity among studies, attributable benefit for public health can be estimated due to the existence of effective treatment options (protocols consisting of education and supervised PFMT with palpation and behavioral therapy), and this information could be used in clinical decision making regarding the management of various types of UI, to improve the quality of life in community-dwelling women.

This work attempts to provide information that promotes the creation of individual and group treatment protocols for women who have UI, supervised by a physiotherapist, which may reduce the economic and social costs of this health problem in our society. Furthermore, research should be carried out on the long-term curative effects of the distinct treatment techniques that are currently available.<sup>39</sup>

### Author Contributions

Conceptualization, methodology, writing (original draft preparation, review, and editing): R.L.L., M.A.V.M., P.R.P., and D.P.G. Formal analysis: R.L.L. and M.A.V.M.

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