

# Physical Therapist Interventions to Prevent Postpartum Urinary Incontinence: A Systematic Review

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## **Abstract**

**Importance:** Postpartum urinary incontinence has a negative impact on the quality of life of women.

**Objective:** This systematic review aimed to describe and synthesize the scientific evidence on the effects of physical therapy in preventing postpartum urinary incontinence.

**Data Sources:** The following databases were searched up to April 2023: PubMed/MEDLINE, Web of Science, ScienceDirect, PEDro, CINAHL, and Scopus.

**Study Selection:** Studies were included if they were randomized controlled trials; included women during pregnancy or at postpartum period; conducted a physical therapist intervention; and studied the prevention of postpartum urinary incontinence.

**Data Extraction and Synthesis:** Two researchers extracted information of the descriptive characteristics of the studies and the interventions, variables, main outcomes, and results.

**Main Outcome and Measures:** Main outcomes were variables related to postpartum urinary incontinence. Quality appraisal was conducted using the PEDRO and Cochrane Risk of Bias 2.0 tools.

**Results:** Among the 2067 studies initially identified, 9 met the inclusion criteria. The main interventions include pelvic floor muscle exercises, electrical stimulation, and perineal massage. The studies demonstrated a positive impact on postpartum urinary incontinence incidence and related symptoms in most of the studies included. However, the heterogeneity presented in the characteristics of the sample, protocol, and outcome measures limited the conclusions reached. Quality assessment revealed moderate to high methodological quality in 90% of trials using the PEDro scale, while 70% presented a high risk of bias according to the Cochrane tool.

**Conclusions and Relevance:** Physical therapist interventions, particularly pelvic floor muscle exercises, may have a positive effect in preventing postpartum urinary incontinence compared to usual care or no intervention. However, the heterogeneity and limited number of studies emphasize the need for more high-quality randomized controlled trials.

## Introduction

Postpartum urinary incontinence (PPUI) is defined as a complaint of involuntary loss of urine experienced during the postpartum period and up to 12 months after delivery.<sup>1</sup> The prevalence ranges from 24% at 6 weeks to 32% at 12 months postpartum.<sup>2</sup>

Previous studies have shown that the trauma caused by delivery is one of the most important risk factors for PPUI, leading to irreversible damage to the pelvic floor muscles.<sup>3,4</sup> This trauma might include decreased pelvic organ support, changes in the pudendal nerve function, damage to the levator ani muscle, and also injury to the perineal body, perineal membrane, and associated fascial tissues.<sup>5</sup> Moreover, different studies have reported the role of urethral failure in PPUI.<sup>6,7</sup> DeLancey et al<sup>6</sup> found that maximal urethral closure pressure was the factor most strongly associated with de novo stress incontinence in primiparas. They also reported the importance of the combined effects of decreased urethral closure pressure and altered urethral mobility.<sup>6</sup> In this line, Pipitone et al<sup>7</sup> show that women with poor urethral function who experience leakage during pregnancy are more likely to have incontinence afterward. Additionally, hormonal and urinary system changes occurring as a result of pregnancy, maternal age over 35 years, high body mass index, and multiparity are also accepted as risk factors for PPUI.<sup>4,8</sup>

PPUI has a negative impact on the quality of life of women, affecting their psychological and social function. Mothers often experience the loss of urine as embarrassing and humiliating, leading to the development of anxiety and depressive symptoms.<sup>9,10</sup> Also, PPUI has been theorized to contribute to physical problems such as fatigue, back pain, and sexual dysfunction.<sup>11-13</sup> Thus, it is associated with a high burden of suffering and considerable socio-economic costs.<sup>14</sup>

Medical treatment options for PPUI include pharmacological treatment and surgery. The pharmacological approach includes drugs, such as alpha-adrenergic agonists or hormone replacement treatment.<sup>15</sup> However, side effects including hypertension, nasopharyngitis, and urinary tract infection have been reported.<sup>16</sup> The surgical options were associated with substantially higher costs and a significant number of postoperative patients experience continued incontinence.<sup>17</sup> In this sense, there is a preference for conservative approaches to PPUI, including physical therapist interventions such as pelvic floor muscle training, scar treatment, posture adjustment, electrical stimulation, and abdominal and respiratory exercises.<sup>18</sup> Furthermore, recent systematic reviews of clinical practice guidelines for PPUI recommend pelvic floor muscle training as the first-line management for urinary incontinence.<sup>19</sup>

Physical therapist interventions are also recommended for the prevention of PPUI during pregnancy and postpartum. Given the negative consequences associated with PPUI, the prevention of this condition is therefore an important objective. Although some evidence exists on the role of pelvic floor muscle training and its effects on urinary incontinence in late pregnancy and early postpartum,<sup>20,21</sup> there is no previous review assessing the role of physical therapist interventions including the different modalities of interventions in the prevention of PPUI. Thus, an update of the scientific evidence related to prevention is needed. This systematic review aims to describe and synthesize the most current scientific evidence on the effects of physical therapy in preventing PPUI.

## **Methods**

This is a systematic review conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. This review was

registered in the International Prospective Register of Systematic Reviews (PROSPERO Registration: CRD42023397958).

### Data Sources and Searches

An extensive electronic search was conducted by accessing the most popular health sciences databases (PubMed/MEDLINE, Web of Science, ScienceDirect, PEDro, CINAHL, and Scopus). The search strategy for PubMed is provided in a Supplementary Table. The strategy was adapted to account for differences in indexing across the other databases. This review began on April 26, 2023, and included all articles that existed in the databases until that date.

### Study Selection

The inclusion criteria were established following the PICOS principles (P: population; I: intervention; C: comparison; O: outcomes; and S: study design). The inclusion criteria were: (1) P: women during pregnancy or at postpartum period without restriction of ethnicity and setting; I: physical therapist interventions alone or in combination with other treatment; C: control group with no intervention, placebo, or other intervention; O: variables assessing PPUI; S: randomized controlled clinical trials. English, Spanish, French, Italian, Brazilian, and Portuguese language studies were considered for inclusion.

### Data Extraction

After the records were obtained, duplicates were removed. Next, 2 reviewers performed independent evaluations of the titles and abstracts and further reviewed the full-text study to ensure eligibility. For all eligible trials, data extraction was independently completed by 2 authors (C.A.-C. and J.L.-P.). Disagreements were solved by discussion, and a third author (C.M.-I.) was available to resolve differences if necessary.

## Quality Assessment

The methodological quality of each article was assessed using the PEDro<sup>22,23</sup> and Cochrane risk-of-bias 2 (RoB 2) tools.<sup>24,25</sup>

### PEDro Scale

The PEDro scale evaluates 11 items including eligibility criteria, random allocation, concealed allocation, the possibility of comparing the groups at the beginning of the study, masking of patients, therapists, and evaluators, the analysis by intention to treat, the adequacy of follow-up, between-group comparisons and point estimates and variability.<sup>22</sup> These add up to a total of 10 points. Item 1 does not score on the PEDro scale. A higher score indicates better methodological quality of the trial. The cut-off score of 5 was used to classify the studies as low (<5) or high-quality ( $\geq 5$ ).<sup>26</sup> The PEDro scale has been reported to be a valid<sup>20</sup> and sufficiently reliable tool for use in systematic reviews of physical therapy randomized controlled trials.<sup>27</sup>

### Cochrane Risk of Bias 2 (RoB 2) Scale

This tool includes 5 domains: the randomization process, deviations from the intended interventions, missing outcome data, measurement of the outcome, and the selection of the reported result. The studies can be scored as low risk of bias, some concerns, or high risk of bias, depending on whether or not the criteria specified in each domain are met.<sup>24,25</sup>

Reviewers applied the PEDro and RoB 2 scales to the trials selected in this review and reached a consensus. They took note and discussed the selected options and difficulties in using the tool and the resolutions they adopted, definitively. The quality assessment of the included studies was carried out by 2 independent researchers (C.A.-C. and J.L.-P.). A third researcher (C.M.-I.) resolved any discrepancies between reviewers.

Although there was a plan to perform meta-analyses for this research question, it was not possible due to the heterogeneity of studies (few studies addressing similar outcomes and broad differences in the tools used to assess them).

## Results

The PRISMA flow diagram for the study selection process is shown in Figure 1.

The databases search identified 2067 studies. After removing duplicates, 1453 titles were screened, of which 1375 were excluded after the first screening by title and abstract. Then, 69 studies were excluded after the second full-text screening. In total, 9 studies met the inclusion criteria.<sup>28-36</sup> Table 1 summarizes the participants' characteristics of the studies included.

The number of groups ranged between 2<sup>28,29,31-35</sup> and 4<sup>36</sup> groups. The sample size ranged between 60<sup>31</sup> and 947.<sup>36</sup> The participants included in the studies were women over 18 years old, pregnant, or in the postpartum period without urinary incontinence. The mean age of the samples varies between 24 and 29 years. The time in which the intervention took place was during pregnancy, from the second trimester onwards<sup>31-34,36</sup> and/or after delivery, between 2 hours and 11 months postpartum.<sup>28-30,35</sup> The number of drop-outs was less than 10% in 6<sup>29-31,33-35</sup> of the 9 records and less than 5% in 3<sup>30,33,34</sup> of the 9 records.

Table 2 summarizes the main characteristics of the interventions proposed, PPUI outcomes, and the main results obtained after the interventions.

The duration of the studies ranged from 3 weeks to 16 months. PPUI outcomes included the presence and frequency of leakages, symptom severity, and self-reported PPUI symptoms measured with specific scales (International Consultation on Incontinence Questionnaire Short-Form,<sup>28</sup> Incontinence Severity Score,<sup>34</sup> Pad Test,<sup>30</sup> Voiding Diary/Three-day Diary,<sup>30-34</sup> Urogenital condition questionnaire [UDI-6], Incontinence

Impact Questionnaire [IIQ-7], and Quality of Life Questionnaire on Overactive Bladder Symptoms [OAB-q<sup>33</sup>) or interviews.<sup>29,32,33,35,36</sup>

All the studies received a physical therapist intervention. Pelvic floor muscle training was the most used intervention and, in 5 studies, the pelvic floor muscle exercises were performed at home.<sup>28,29,31,33,35</sup> Four studies also included pelvic floor health information.<sup>29,32,34,35</sup>

Additionally, Yang et al<sup>30</sup> included direct low-frequency electrical stimulation of the vagina from the second day to 3 months postpartum. This technique was used to transmit currents of differing intensities through a vaginal treatment probe to stimulate the pelvic floor muscles and nerves. The study of Labrecque et al<sup>36</sup> used perineal massage from 34-35 weeks of gestation until delivery to prevent PPUI. The characteristics of interventions and the protocol used in the studies were heterogeneous. The comparator group included the usual care,<sup>29,30,34,35</sup> information,<sup>29,34</sup> or no intervention.<sup>28,31-33,36</sup>

Most of the studies reported positive results with a decrease in the incidence of PPUI and/or frequency or severity of the symptoms. Specifically, an intervention combining education and pelvic floor muscle training, initiated during gestation and continued postpartum reduced the incidence of PPUI in 3 studies.<sup>29,32,34</sup> Chiarelli et al<sup>35</sup> also found a decrease in the incidence and severity of symptoms when pelvic floor muscle training included strategies to improve compliance in a program conducted from the second day to the eighth week postpartum. In addition, the incidence and symptoms improved when pelvic floor muscle training was combined with biofeedback<sup>33</sup> and direct low-frequency, low-voltage electrical stimulation of the vagina.<sup>30</sup> No significant differences between the groups were found in 3 studies.<sup>28,31,36</sup> Sacomori et al<sup>28</sup> found no significant difference in the frequency and amount of leakage and related quality of life after home-based pelvic floor muscle training performed after delivery and before hospital discharge.<sup>28</sup> Sut et al<sup>31</sup>

found improvements during the postpartum period following a Kegel exercise home program started at the 28<sup>th</sup> week of gestation, as reported in participants' questionnaires; however, there were no significant differences between the groups for the data collected from the voiding diary. The study implementing perineal massage did not achieve significant improvement in the prevention of PPUI.<sup>36</sup>

Table 3 and Figure 2 show the methodological quality of the studies. All the articles were evaluated using the PEDro Scale.

One study obtained a poor score (0-5)<sup>32</sup> and 8 trials had moderate to high quality, with scores greater than or equal to 6/10 on the PEDro scale.<sup>28-31,33-36</sup> Most of the studies used random assignment<sup>28-31,33-36</sup> and concealed allocation.<sup>28-30,33-35</sup> Also, they measured at least 1 key outcome from more than 85% of the participants initially allocated to groups,<sup>28-31,33-35</sup> and used intention-to-treat analyses<sup>28,29,31,33-36</sup>. All the studies presented groups similar at the beginning of the study, reported the results of between-group statistical comparisons, and provided point measures and measures of variability for at least 1 key outcome.<sup>28-36</sup> In addition, in 3 studies there was blinding of all assessors who measured at least 1 key outcome,<sup>30,34,35</sup> in 2 there was blinding of all participants<sup>30,32</sup> and in 2 there was blinding of all therapists who administered the interventions.<sup>34,36</sup>

Details regarding the risk of bias measured with the Revised Cochrane Risk of Bias tool (ROB 2) for randomized trials are shown in Figure 2.

The risk of bias arising from the randomization process was low in 6 articles,<sup>28-30,33-35</sup> the risk of bias due to deviations from the intended interventions was low in 4 of the studies selected.<sup>30,31,34,36</sup> For the risk of bias due to missing outcome data, 7 articles had low risk.<sup>28-31,33,34,36</sup> In addition, the risk of bias in the measurement of the outcome was low in

5 studies.<sup>30,32,34-36</sup> Finally, 8 studies presented a low risk of bias in the selection of the reported result.<sup>28-31,33-36</sup>

## Discussion

This systematic review aims to describe and synthesize the current scientific evidence on the effects of physical therapy in preventing PPUI. Our results support the idea that physical therapist interventions, mainly pelvic floor muscle training in combination with education, strategies to increase compliance, biofeedback, or direct low-frequency, low-voltage electrical stimulation of the vagina can be effective in decreasing the incidence and related symptoms of PPUI in women. Nonetheless, our results should be interpreted with caution due to the differences in the interventions proposed as well as implementation time, and doses of the studies reviewed.

Significant improvements were found in the groups receiving physical therapist interventions in 6 of the manuscripts included in our review<sup>29,30,32-35</sup>. The most frequent modality used was pelvic floor muscle training.<sup>28-35</sup> This intervention aims to strengthen the pelvic floor muscles to provide stability for muscles, aponeurotic elements, and ligaments involved in micturition, supporting the vesical-urethral junction. The pelvic floor is composed of 2 types of muscle fibers: slow contraction fibers, which are fatigue-resistant and responsible for organ support and postural control, and fast contraction fibers, which generate powerful forces and are located at the level of the periurethral-striated sphincter. When abdominal pressure increases, these muscle fibers generate urethral closure together with the aponeurotic elements. In this sense, pelvic floor muscle training combines gentle and sustained contractions with rapid and vigorous contractions to strengthen both types of fibers.<sup>36</sup> Moreover, recent evidence recommends the use of pelvic floor muscle training as the first-line management for urinary incontinence.<sup>19</sup> A previous systematic review conducted by Lemos et al<sup>20</sup> suggested that pelvic floor muscle

training during pregnancy offered a protective effect against the onset of urinary incontinence from 6 weeks to 3 months post-delivery. Additionally, Hay-Smith et al<sup>21</sup> reported that intensive antenatal pelvic floor muscle training has a positive impact on preventing urinary incontinence during the later stages of pregnancy and for up to 6 months after childbirth.

The protocols used for pelvic floor muscle training were highly heterogeneous. According to a previous review, prioritizing the accumulation of a higher quantity of shorter sessions is deemed more crucial than opting for a smaller number of longer sessions.<sup>37</sup> A possible explanation for this might be that a greater number of short sessions increases motor learning retention<sup>20</sup> and that training programs that lasted less than 8 weeks were insufficient for reaching muscle hypertrophy.<sup>38</sup> In addition, when pelvic floor muscle training is supervised by a physical therapist greater efficacy was reported. This supervision may guarantee adequate pelvic floor muscles contraction. In this line, previous studies compared rehabilitation exercises with and without supervision and found that supervised groups achieved better benefits in the urinary incontinence assessment.<sup>39,40</sup>

Another aspect to consider is the application of pelvic floor muscle training combined with other therapies. Yang et al<sup>30</sup> included vaginal low-frequency electrical stimulation in addition to pelvic floor exercises. Electrical stimulation transmits current to a vaginal probe to stimulate the pelvic floor muscle and nerves.<sup>30,41</sup> This technique can improve neuromuscular excitability, thereby addressing PPUI. Eriksen et al<sup>42</sup> documented that out of 55 patients with stress incontinence, 26 (48%) achieved a cure, and 12 (22%) showed improvement, resulting in an overall success rate of 56% 2 years post-treatment.

Labrecque et al<sup>36</sup> studied the effect of perineal massage during the third trimester on postpartum perineal function using a questionnaire including aspects such as the presence

of PPUI, perineal pain, dyspareunia, or sexual satisfaction. Their results suggest that perineal massage may be useful to reduce postpartum perineal pain among women with previous vaginal delivery. However, they did not find significant between-groups differences in the incidence of PPUI at 3 months after delivery. According to a Cochrane review,<sup>43</sup> engaging in antenatal perineal massage was found to lower the likelihood of perineal trauma, particularly episiotomies, and alleviate persistent perineal pain. Two randomized controlled trials<sup>44,45</sup> indicated a decrease in the requirement for episiotomy and the risk of more severe perineal lacerations associated with antenatal perineal massage. However, our results suggest that this effect does not translate into a reduction of urinary incontinence after childbirth.

Among the studies included, the participants' characteristics were heterogeneous. The fertile period of a woman is finite, ranging from 15 to 49 years old<sup>46</sup> and there is clear evidence to support that childbirth at an advanced maternal age is related to increased risk of adverse maternal perinatal outcomes.<sup>47</sup> Specifically, urethral function declines 15% per decade with age.<sup>7</sup> Moreover, the incidence of urinary incontinence increases with age.<sup>48</sup> Moreover, epidemiological studies indicate that multiparity is considered a risk factor for PPUI.<sup>8</sup> During gestation, the spine, abdominal, and pelvic anatomy change. Therefore, there is a decrease in pelvic floor muscle stability, leading to an increased risk of having PPUI.<sup>49</sup> Another factor to take into account is cesarean section. Two studies<sup>29,30</sup> specified women with vaginal deliveries as an inclusion criterion, and 1 study<sup>33</sup> excluded women with 2 or more cesarean sections. Considering the scientific evidence, a cesarean section may reduce the prevalence of PPUI given that the pelvic floor appears to experience less stress.<sup>50</sup> However, this surgical intervention involves potential damage to the abdominal muscles which could disrupt abdominal pressure management and thereby promote urinary incontinence.<sup>51</sup>

The variables used to evaluate the results of PPUI were heterogeneous. Molloy et al<sup>52</sup> established that the 2x12 hour pad test can serve as an effective and reliable measure of urine leakage. However, Martin et al<sup>53</sup> identified the urinary diary as the most cost-effective test used in addition to clinical history. On the other hand, 1 randomized controlled trial recommended specific questionnaires for measuring urinary incontinence symptoms in women, such as the Incontinence Severity Index, or the Bristol Female Lower Urinary Tract Symptoms questionnaire.<sup>54</sup> In the studies included in our review, different tools were used to measure the incidence and severity of PPUI in the women evaluated.

### Limitations

This systematic review has limitations that should be considered when interpreting the results. First, the assessor evaluating the methodological quality disagreed on some aspects and they were ultimately chosen based on a discussion with a third researcher. Secondly, despite having large sample sizes, the studies selected did not present high methodological quality and were heterogeneous in the application, outcome measures, and evaluation points. Some manuscripts used objective variables and others used self-reported variables. Additionally, in some studies, the dose and frequency of interventions were not specified. Furthermore, it should be considered that there may be bias in the studies due to the lack of clear and consistent definitions of what is meant by physical therapy. Moreover, due to the nature of the interventions, there could be no blinding of therapists and this could affect the objectivity of the results. Finally, it must be taken into account that the small number of studies and the heterogeneity presented limits our ability to quantitatively analyze the results obtained.

Our systematic review provides some practical applications. Physical therapists may have an important role in supporting individuals with PPUI. The modality most frequently

studied was pelvic floor muscle training showing promising results. The effects of combined modalities may be of interest in future studies. However, to better understand the effect of physical therapy on the prevention of urinary incontinence after pregnancy and childbirth, trials including double blinding are needed. The inclusion of effect sizes and confidence intervals in the statistical analysis would be relevant to analyze the results obtained. In addition, further studies should assess whether implementing physical therapist interventions during gestation or after childbirth is more effective for preventing PPUI. Further randomized controlled studies should include long-term follow-up of at least 1 year postpartum to evaluate the effectiveness of the interventions. Moreover, to analyze if the clinical characteristics such as type of delivery or the number of previous gestations could influence the results of the intervention is relevant. Without these trials, it is not possible to establish the optimal dose and/or dose response for the prevention of PPUI, and evidence supporting physical therapist intervention guidelines will remain limited.

## **Conclusions**

The studies reviewed suggest that physical therapist interventions, especially pelvic floor muscle training have a positive impact on preventing the development of PPUI in comparison with usual care or no intervention. More high-quality randomized controlled trials are needed to define the characteristics of this prevention treatment strategy alone and in combination with other therapies, as well as in the long term.

## **CRedit – Contributor Roles**

Irene Cabrera-Martos (Conceptualization [Lead], Formal analysis [Supporting], Investigation [Lead], Methodology [Equal], Supervision [Lead], Writing - review & editing [Lead]), Cristina Cortés-Alcaraz (Data curation [Equal], Formal analysis [Equal], Visualization [Equal], Writing - original draft [Equal]), Paula Jiménez-López (Data curation [Equal], Formal analysis [Equal], Investigation [Equal], Writing - original draft [Equal]), Laura López López (Investigation [Equal], Validation [Equal], Writing - review & editing [Equal]), Irene Torres-Sánchez (Investigation [Equal], Methodology [Equal], Project administration [Equal], Validation [Equal], Writing - review & editing [Equal]), Esther Diaz Mohedo (Funding acquisition [Lead], Investigation [Lead], Project administration [Lead], Resources [Lead], Validation [Lead]).

## **Supplementary Material**

Supplementary material is available online.

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## **Systematic Review Registration**

This review was registered in the International Prospective Register of Systematic Reviews (PROSPERO Registration: CRD42023397958).

## **Disclosures**

The authors completed the ICMJE Form for Disclosure of Potential Conflicts of Interest and reported no conflicts of interest.



6. DeLancey JOL, Miller JM, Kearney R, et al. Vaginal birth and de novo stress incontinence: Relative contributions of urethral dysfunction and mobility. *Obstet Gynecol.* 2007;110(2 Pt 1):354–62. doi:10.1097/01.AOG.0000270120.60522.55.
7. Pipitone F, Sadeghi Z, DeLancey JOL. Urethral function and failure: A review of current knowledge of urethral closure mechanisms, how they vary, and how they are affected by life events. *Neurourol Urodyn.* 2021;40(8):1869–79. doi: 10.1002/nau.24760
8. Da Silva LL, Lucio A, de Moraes Lopes MHB. Risk factors for postpartum urinary incontinence. *Rev Esc Enferm USP.* 2016;50(2): 200-7. doi:10.1590/S0080-623420160000200004
9. Coyne KS, Wein A, Nicholson S, Kvasz M, Chen C, Milsom I. Economic burden of urgency urinary incontinence in the United States: a systematic review. *J Manag Care Pharm.* 2014;20(2):130–40. doi: 10.18553/jmcp.2014.20.2.130
10. Coyne KS, Kvasz M, Ireland AM, Milsom I, Kopp ZS, Chapple CR. Urinary incontinence and its relationship to mental health and health-related quality of life in men and women in Sweden, the United Kingdom, and the United States. *Eur Urol.* 2012;61(1):88–95. doi: 10.1016/j.eururo.2011.07.049
11. Bartoli S, Aguzzi G, Tarricone R. Impact on quality of life of urinary incontinence and overactive bladder: a systematic literature review. *Urology.* 2010;75(3):491–500. doi: 10.1016/j.urology.2009.07.1325
12. Deffieux X, Hubeaux K, Dick J, Sheikh Ismael S, Raibaut P, Amarenco G. Urine leakage related to physical fatigue in women with urinary stress incontinence. *J Obstet Gynaecol Res.* 2009;35(4):738-45. doi: 10.1111/j.1447-0756.2008.01000.x.
13. Welk B, Baverstock R. Is there a link between back pain and urinary symptoms? *Neurourol Urodyn.* 2020;39(2):523-32. doi: 10.1002/nau.24269.

14. Cheng H, Gong F, Shen Y, OuYang P, Ni R, Gao H. A nomogram model predicting the risk of postpartum stress urinary incontinence in primiparas: A multicenter study. *Taiwan J Obstet Gynecol.* 2022;61(4):580-4. doi: 10.1016/j.tjog.2022.04.004
15. Gandi C, Sacco E. Pharmacological management of urinary incontinence: current and emerging treatment. *Clin Pharmacol.* 2021;13:209-23. doi: 10.2147/CPAA.S289323
16. Hagovska M, Svihra J. Evaluation of duloxetine and innovative pelvic floor muscle training in women with stress urinary incontinence (DULOXING): Study protocol clinical trial (SPIRIT Compliant). *Medicine (Baltimore).* 2020;99(6):e18834. doi: 10.1097/MD.00000000000018834
17. Burbaker L. Surgical treatment of urinary incontinence in women. *Gastroenterology.* 2004;126(1 Suppl 1):S71-6. doi: 10.1053/j.gastro.2003.10.002
18. Wang Y, Li H, Wang Y, et al. A network meta-analysis protocol of conservative interventions for urinary incontinence in postpartum women. *Medicine (Baltimore).* 2020;99(33): e21772. doi: 10.1097/MD.00000000000021772
19. Abrams P, Andersson KE, Apostolidis, et al. 6th International Consultation on Incontinence. Recommendations of the International Scientific Committee: Evaluation and treatment of urinary incontinence, pelvic organ prolapse and faecal incontinence. *Neurourol Urodyn.* 2018;37(7):2271-2. doi: 10.1002/nau.23551.15.
20. Lemos A, de Souza AI, Gomes Ferreira ALC, Natal Figueiroa J, Cabral-Filho JE. Do perineal exercises during pregnancy prevent the development of urinary incontinence? A systematic review. *Int J Urol.* 2008;15(10):875–80. doi: 10.1111/j.1442-2042.2008.02145.x
21. Hay-Smith J, Mørkved S, Fairbrother KA, Herbison GP. Pelvic floor muscle training for prevention and treatment of urinary and faecal incontinence in antenatal and

postnatal women. *Cochrane Database Syst Rev.* 2008;4:CD007471. doi:

10.1002/14651858.CD007471

22. de Morton NA. The PEDro scale is a valid measure of the methodological quality of clinical trials: a demographic study. *Aust J Physiother.* 2009;55(2):129-33.

doi:10.1016/s0004-9514(09)70043-1

23. Albanese E, Bütikofer L, Armijo-Olivo S, Ha C, Egger M. Construct validity of the Physiotherapy Evidence Database (PEDro) quality scale for randomized trials: Item response theory and factor analyses. *Res Synth Methods.* 2020;11(2):227-36. doi:

10.1002/jrsm.1385.

24. Crocker TF, Lam N, Jordão M, et al. Risk-of-bias assessment using Cochrane's revised tool for randomized trials (RoB 2) was useful but challenging and resource-intensive: observations from a systematic review. *J Clin Epidemiol.* 2023;161:39-45.

doi: 10.1016/j.jclinepi.2023.06.015

25. Higgins JPT, Altman DG, Gøtzsche PC, et al. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. *BMJ.* 2011;343:d5928. doi:

10.1136/bmj.d5928

26. Levack WM, Taylor K, Siegert RJ, Dean SG, McPherson KM, Weatherall M. Is goal planning in rehabilitation effective? A systematic review. *Clin Rehabil.*

2006;20(6):739–55. doi: 10.1177/0269215506070791

27. Maher CG, Sherrington C, Herbert RD, Moseley AM, Elkins M. Reliability of the PEDro scale for rating quality of randomized controlled trials. *Phys Ther.*

2003;83(8):713–21.

28. Sacomori C, Zomkowski K, Dos Passos Porto I, Luiz Cardoso F, Flores Sperandio F. Adherence and effectiveness of a single instruction of pelvic floor exercises: a



36. Labrecque M, Eason E, Marcoux S. Randomized trial of perineal massage during pregnancy: perineal symptoms three months after delivery. *Am J Obstet Gynecol*. 2000;182 (1 Pt 1):76-80. doi:10.1016/s0002-9378(00)70493-5
37. García-Sánchez E, Ávila-Gandía V, López-Román J, Martínez-Rodríguez A, Rubio-Arias JA. What pelvic floor muscle training load is optimal in minimizing urine loss in women with stress urinary incontinence? A Systematic Review and Meta-Analysis. *Int J Environ Res Public Health*. 2019;16(22):4358. doi: 10.3390/ijerph16224358
38. Aksac B, Aki S, Karan A, Yalcin O, Isikoglu M, Eskiyurt N. Biofeedback and pelvic floor exercises for the rehabilitation of urinary stress incontinence. *Gynecol Obstet Invest*. 2003;56(1):23–7. doi: 10.1159/000072327
39. Diniz Zanetti MR, de Aquino Castro R, Lyvio Rotta A, Diniz Dos Santos P, Sartori M, Batista Castello Girão. Impact of supervised physiotherapeutic pelvic floor exercises for treating female stress urinary incontinence. *SaPaulo Med J*. 2007;125(5):265–69. doi: 10.1590/s1516-31802007000500003.
40. Konstantinidou E, Apostolidis A, Kondelididis N, Tsimtsiou Z, Hatzichristou D, Ioannides E. Short-term efficacy of group pelvic floor training under intensive supervision versus unsupervised home training for female stress urinary incontinence: A randomized pilot study. *Neurourol Urodyn*. 2007;26(4):486–91. doi: 10.1002/nau.20380
41. Richmond CF, Martin DK, Yip SO, Dick MA, Erekson EA. Effect of supervised pelvic floor biofeedback and electrical stimulation in women with mixed and stress urinary incontinence. *Female Pelvic Med Reconstr Surg*, 2016;22(5):324-7. doi: 10.1097/SPV.0000000000000279
42. Eriksen B, Eik-Nes S. Long term electrostimulation of the pelvic floor: primary therapy in female stress incontinence. *Urol Int*. 1989;44:90-5.

43. Beckmann MM, Stock OM. Antenatal perineal massage for reducing perineal trauma. *Cochrane Database Syst Rev.* 2013;4:CD005123. doi: 10.1002/14651858.CD005123.pub3
44. Abd El ftah Ali, H. Effects of prenatal perineal massage and Kegel exercise on the episiotomy rate. *IOSR J Nurs Health Sci.* 2015;4(4):61–70.
45. Ugwu EO, Ifeikigwe ES, Obi SN, Eleje GU, Ozumba BC. Effectiveness of antenatal perineal massage in reducing perineal trauma and post-partum morbidities: A randomized controlled trial. *J Obstet Gynaecol Res.* 2018;44(7):1252–8. doi: 10.1111/jog.13640
46. Soriano-Ortega KP, Carballo-Mondragón E, Roque-Sánchez AM, Durán-Monterrosas L, Kably-Ambe A. Percepción de la fertilidad en mujeres en edad reproductiva, según su edad. *Ginecol Obstet Mex.* 2017;85(6):364–73.
47. Cavazos-Rehg PA, Krauss MJ, Spitznagel EL, et al. Maternal age and risk of labor and delivery complications. *Matern Child Health J.* 2015;19(6):1202-11. doi: 10.1007/s10995-014-1624-7.
48. Stewart WF, Hirsh AG, Kirchner HL, Clarke DN, Lichtenfeld MJ, Minassian VA. Urinary incontinence incidence: Quantitative meta-analysis of factors that explain variation. *J Urol.* 2014;191(4):996–1002. doi:10.1016/j.juro.2013.10.050
49. Diz-Teixera P, Alonso-Calvete A, Justo Cousiño LA, González-González Y, Da Cuña-Carrera I. Update on physiotherapy in postpartum urinary incontinence. A systematic review. *Arch Esp Urol.* 2023;76(1):29–39. doi: 10.56434/j.arch.esp.urol.20237601.2
50. Thom DH, Rortveit G. Prevalence of postpartum urinary incontinence: a systematic review. *Acta Obstet Gynecol Scand.* 2010;89(12):1511-22. doi: 10.3109/00016349.2010.526188

51. Pazmiño Velasco LM, Esparza D, Ayala L, et al. Prevalencia de la incontinencia urinaria en mujeres de 45–65 años del Hospital Padre Carollo. *Medicinas UTA*. 2019;3:69-78.

52. Molloy SS, Nichols TR, Sexton WL, Murahata RI. Validity and reliability of a pad test model using a simulated urine leak and healthy continent females. *Urol Nurs*. 2007;27(4):300-4.

53. Martin JL, Williams KS, Abrams KR, et al. Systematic review and evaluation of methods of assessing urinary incontinence. *Health Technol Assess*. 2006;10(6):1-132. doi: 10.3310/hta10060.

54. Avery KNL, Bosch JLHR, Gotoh M, et al. questionnaires to assess urinary and anal incontinence: Review and recommendations. *J Urol*. 2007;177(1):39–49. doi: 10.1016/j.juro.2006.08.075

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**Table 1.** Descriptive Characteristics of the Studies Included<sup>a</sup>

Article (first author, y)	Number of groups and sample size per group	Number of participants recruited/number of participants analyzed	Inclusion criteria	Exclusion criteria	Mean age (standard deviation) total and per group	The time in which the intervention takes place	Setting	Drop-outs (%)
Sacomori et al <sup>28</sup> (2020)	2 EG: 98 CG: 104	202/132	>18 y, ability to understand Portuguese.	Previous UI, cancer in the genitourinary tract, neurological disease, to be blind, to be illiterate, drug addiction problems, or not having a telephone.	NR	After delivery and before hospital discharge.	A public maternity hospital in Florianópolis	34.7
Qi et al <sup>29</sup> (2019)	2 EG:120 CG:120	240/225	>18 y, singleton term vaginal delivery, no neurologic bladder dysfunction, ability to perform a correct pelvic	Prenatal UI, UTI, or kidney disease, and tumors in the genital area.	Total: NR EG: 29.6 (4.3) CG: 30.3 (4.8)	CCRP: 2nd wk after delivery to 8th wk. CG: Before discharge from the hospital.	Tongji Hospital, Shanghai	6.2

			floor muscle contraction.					
Yang et al <sup>30</sup> (2017)	3 EG: 63 CombG: 66 CG: 60	240/189	Primiparas with a single surviving baby, 20-35 y, to have an episiotomy.	Heart diseases, diabetes, cancer, neurological disease, high blood pressure, SUI or POP, rubra, serosa, and lochia alba.	Total: NR EG: 28.64 (2.16) CG: 29.0 (1.97) CombG: 28.29 (2.44)	EG: From 2 d to 3 mo pp. CombG: From 6 wk to 11 mo pp. CG: 2 h pp.	Shijiazhuang maternal and child health care hospital	3.5
Sut and Kaplan <sup>31</sup> (2016)	2 EG: 30 CG: 30	64/60	Pregnant women in their third trimester, >18 y.	To have twin or high-risk pregnancies, UTI, POP, neuropathy, collagen tissue disease, neurological illnesses, diabetes, chronic pulmonary disease, a history of pelvic surgery, or a high risk of early delivery.	Total: NR EG: 30.0 (6.5) CG: 27.2 (6.3)	From the 28th wk of gestation.	The Urogynecology Unit of Trakya University	6.3
Kocaöz et al <sup>32</sup>	2	136/102	Ability to attend pregnancy	UI complaints or UTI, chronic disease or genitourinary	Total: 26.01 (4.6)	From 14-20 gestational wk	Antenatal outpatient	25

(2013)	EG: 68 CG: 68		outpatient visits regularly, being in the 14th-20th gestational wk during the first attendance, 20-35 y, at least elementary school, BMI < 40.	pathology.	EG: 26.33 (4.8) CG: 25.70 (4.4)	to 12 wk pp.	clinics of a women's maternity training in Ankara	
Gorbea et al <sup>33</sup> (2004)	2 EG: 38 CG: 34	75/72	Nulliparous, 18-35 y, 20 wk pregnancy.	Pregnancy multiple or with complications, UI, 2 or more cesarean sections, chronic illnesses.	Total: NR EG: 25.5 (6.1) CG: 23.6 (7.2)	Wk 20 to the end of pregnancy and wk 6 to wk 12 pp.	National Institute of Perinatology, Montes Urales Lomas Virreyes, Mexico.	4.0
Mørkved et al <sup>34</sup> (2003)	2 EG: 148 CG: 153	301/289	Nulliparous, ≥18 y, single live fetus at the routine ultrasound scan.	Pregnancy complications, high risk, pain during pelvic floor muscle contractions, UTI, or diseases that could interfere with	Total: NR EG: 28.0 (5.3) CG: 26.9 (3.9)	Beginning at the 20-36 gestation wk.	The National Center for Fetal Medicine, Trondheim University	3.9

				participation.			Hospital	
Chiarelli and Cockburn <sup>35</sup> (2002)	2 EG: 348 CG: 328	720/ 676	Forceps or ventouse  Deliveries, babies with high birth weight (>4000 g).	NR	NR	From 2nd d to 8th wk pp	Postpartum wards at 3 hospitals in the Hunter region, New South Wales, Australia.	6.1
Labrecque et al <sup>36</sup> (2000)	4 EG (NVB): 283 CG (NVB): 289 EG2 (WVB): 187 CG2 (WVB):	1198/949	To be between 30- and 35-wk gestation.	NR	Total: NR EG (NVB): 28.7 (4.5) CG (NVB): 28.7 (4.5) EG (WVB): 31.5 (3.8) CG (WVB): 31.4 (4.4)	From 34-35 wk of gestation until delivery	Five hospitals in the province of Quebec, Canada.	21

	190							
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<sup>a</sup>BMI = body mass index; CCRP = comprehensive care and rehabilitation program; CG = control group; CG2 = control group 2; CombG = combination group; EG = experimental group; EG2 = experimental group 2; NR = not reported; NVB = no vaginal birth; POP = pelvic organ prolapse; pp = postpartum; SUI = stress urinary incontinence; UI = urinary incontinence; UTI = urinary tract infection; WVB = with vaginal birth.

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Table 2. Characteristics of the Interventions, Variables, and Main Outcomes in the Included Studies<sup>a</sup>

Article (first author, y)	Description of PT interventions	Description of CG interventions	Session duration (min)/frequ y (times per wk)/total duration (wk)	PPUI assessment		Assessment points	Main results
				Subjective	Objective		
Sacomori et al <sup>28</sup> (2020)	Home-based pelvic floor exercise program	No intervention	NR	Frequency of leakage, amount of leakage, and influence of leakage on quality of life through the questionnaire ICIQ-SF.	-	Baseline 3 mo pp	No significant differences between groups expressed in median (interquartile range) in both groups ( <i>P</i> ) in the frequency of leakage 0 (0.25) vs 0 (0.25) ( <i>P</i> = .821), amount of leakage 0 (0.26) vs 0 (0.26) ( <i>P</i> = .746), and influence of leakage on quality of life 0 (0.59) vs 0 (0.59) ( <i>P</i> = .823).
Qi et al <sup>29</sup> (2019)	Educational materials + CCRP (intensive healthy education, detailed guidance of PFMT,	Usual care guidance	EG: NR/1/6	Incidence of PPUI, through an interview.	-	Baseline (within 1st wk pp) 8th wk pp.	The incidence of PPUI decreased in the EG (15.0%) compared with the CG (31.7%) after the interventions ( <i>P</i> = .002).

	psychological counseling, and regular supervision).						
Yang et al <sup>30</sup> (2017)	EG: rehabilitation exercises (Kegel exercises and pelvic movements)  CombG: DES on pelvic nerve electrophysiology + rehabilitation exercises	Routine pp guidance	EG: >20/7 (2 or 3 times/d)/12  CG: 60/once/once  CombG: DES 30/ 3/11 + Rehabilitation NR/7 (2 or 3 times/d)/12	Severity and degree of UI (number of occurrences of leakage each wk), assessed with the Incontinence Severity Score.	Leakage on exertion assessed using the Pad Test in 20 jumps and 3 coughs.	Baseline (2 d pp).  3 mo pp.	- Significant differences in severity and degree of leakage ( $P < .001$ ) (number of occurrences % per wk in CG, EG, CombG)  0: 4 (6.7), 22 (34.9), 41 (62.1)  $\leq 1$ : 4 (6.7), 30 (47.6), 22 (33.3)  2-3: 25 (41.7), 10 (15.9), 3 (4.5)  3-7: 25 (41.7), 1 (1.6), 0 (0)  >7: 2 (3.3), 0 (0), 0 (0)  All the time: 0 (0), 0 (0), 0 (0)  -Significant differences in the positive rate n (%) in CG, EG, CombG for the urine pad test ( $P = .029$ ):

							15 (25.0) 12 (19.0) 5 (7.6)
Sut and Kaplan <sup>31</sup> (2016)	Kegel exercises at home	No intervention	NR (3 daily sessions)	Questionnaires UDI-6, IIQ-7, and OAB-q.  Voiding functions (frequency and urgency levels) through voiding diaries.	-	Baseline 6-8 wk after delivery	Both groups improved in the questionnaire scores as well as frequency and urgency in the voiding diary. However, there were no significant differences between the groups ( $P > .05$ ).
Kocaöz et al <sup>32</sup> (2013)	PFMT and information about the reproductive and urinary tract	No intervention	NR/7 (3 times/d)/NR (up to 12 wk pp)	Presence of UI and frequency of leakage: 3-d urinary diary and verbal statements by forms.	-	Wk 14-20 and 28-32 of gestation, and 12 wk pp.	Significant differences ( $P < .05$ ) in the presence of UI in wk 12 pp (1.9% in EG vs 18% in the CG). The frequency was: $\leq 1$ per wk 100% in the EG vs 22.2 in the CG and $> 1$ per wk 0% in the EG vs 77.8% in the CG.
Gorbea et al <sup>33</sup> (2004)	PFMT + Biofeedback (supervised and at	No intervention	With supervision: 60 min /once a	Existence, frequency, and severity of PPUI through a	-	Baseline and wk 6 pp	At 6 weeks pp, the existence of PPUI was 47% in CG, and 15.7% in the EG

	home)		wk/8 wk Home (every day, from wk 20 to late postpartum)	question.			( $P = .009$ ). Frequency was: rarely in 17.6%, weekly in 23.5%, and daily in 5.9% in the CG, and 10.5%, 5.3%, and 0%, respectively in the EG. The severity was grade I in 62.5% and grade II in 37.5% of the cases in the CG and grade I in all the cases of the EG.
Mørkved et al <sup>34</sup> (2003)	Intensive pelvic floor muscle training + pelvic floor information	Usual care and pelvic floor information	EG: 60/1/12	Self-reported PPUI symptoms: number of episodes of involuntary leakage with voiding diary.	-	20 wk of gestation, 36 wk of gestation and 3 mo pp	Significantly fewer women in the EG than in the CG reported PPUI: 29 of 148 (20%) vs 49 of 153 (32%) at 3 mo postpartum.  Voiding diary at 3 mo pp showed a significantly lower incidence in the EG (20 of 148 vs 34 of 144, $P = .049$ ).
Chiarelli	PFMT and strategies to improve	Routine postpartum	EG: The intervention in	PPUI after 3 mo pp and severity		Baseline (48 h pp)	At 3 mo pp, the prevalence of incontinence in the EG

and Cockburn <sup>35</sup> (2002)	compliance (tailoring the exercise program, a poster, and sticky red dots to serve as reminders to do the exercises, an information sheet for her partner, and a booklet)	care (booklet)	hospital: 20/diary/NR The follow-up visit in the 8th wk pp: 30/NR/4	of incontinence evaluated through a survey.	-	and 3 mo pp	was 31.0% (108 women) and in the CG 38.4% (125 women); the difference was 7.4% ( $P = .044$ ). In addition, significantly fewer women with incontinence were classified as severe in the EG (10.1%) vs CG (17.0%).
Labrecque et al <sup>36</sup> (2000)	Perineal massage	NR	EG: 5-10/7/ >2	Self-reported loss of urine involuntarily through a self-administered questionnaire	-	Baseline (30-35 wk gestation) and 3 mo pp	NVB: no significant differences 3 mo after delivery between EG and CG. WVB UI: Similar in EG and CG.

<sup>a</sup>CCRP = comprehensive care and rehabilitation programme; CG = control group; CombG = combination group; DES = direct low-frequency, low-voltage electrical stimulation of the vagina; EG = experimental group; ICIQ-SF = international consultation on incontinence questionnaire short-form; IIQ-7 = incontinence impact questionnaire; NR = not reported; NVB = no vaginal birth; OAB-q = quality of life questionnaire on overactive bladder symptoms; PFMT = pelvic floor muscle exercises; pp = postpartum; PPUI = postpartum urinary incontinence; PT = physical therapist; UDI-6 = urogenital condition questionnaire; UI = urinary incontinence; WVB = with vaginal birth.

Table 3. Methodological Quality of the Studies Included Using the PEDro Scale<sup>a</sup>

First author, y	1	2	3	4	5	6	7	8	9	10	11	Total score
Sacomori et al <sup>28</sup> (2020)	1	1	1	1	0	0	0	1	1	1	1	7/10
Qi et al <sup>29</sup> (2019)	1	1	1	1	0	0	0	1	1	1	1	7/10
Yang et al <sup>30</sup> (2017)	1	1	1	1	1	0	1	1	0	1	1	8/10
Sut and Kaplan <sup>31</sup> (2016)	1	1	0	1	0	0	0	1	1	1	1	6/10
Kocaöz et al <sup>32</sup> (2013)	1	0	0	1	1	0	0	0	0	1	1	4/10
Gorbea et al <sup>33</sup> (2004)	1	1	1	1	0	0	0	1	1	1	1	7/10
Mørkved et	1	1	1	1	0	1	1	1	1	1	1	9/10

a <sup>134</sup> (2003)												
Chiarelli and Cockburn <sup>35</sup> (2002)	1	1	1	1	0	0	1	1	1	1	1	8/10
Labrecque et al <sup>36</sup> (2000)	1	1	0	1	0	1	0	0	1	1	1	6/10

<sup>a</sup>Item 1 does not score on the PEDro scale.

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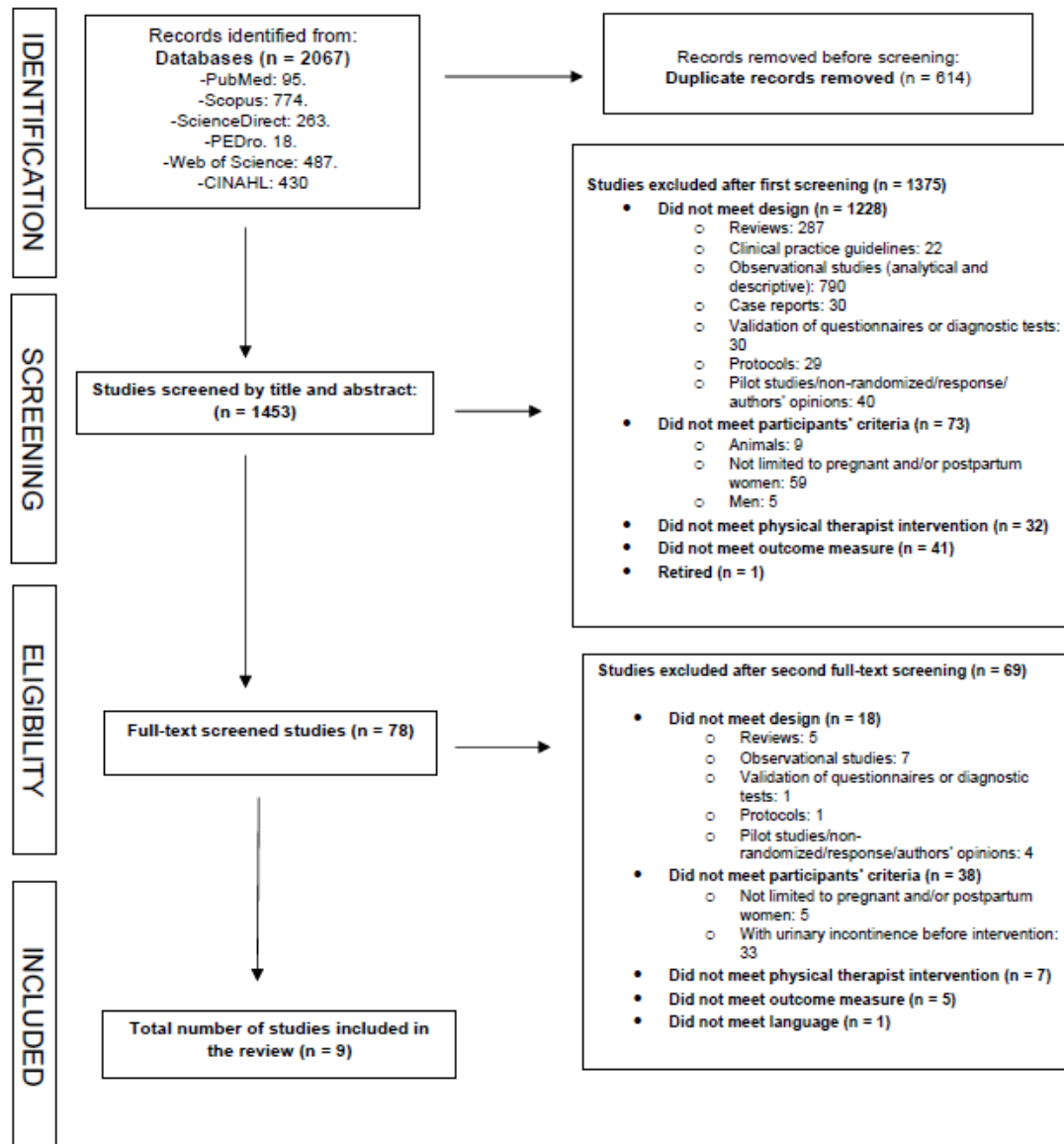


Figure 1. Flow diagram.

<u>Author, year</u>	<u>D1</u>	<u>D2</u>	<u>D3</u>	<u>D4</u>	<u>D5</u>	<u>Overall</u>
C. Sacomori, 2020	+	-	+	!	+	-
X. Qi, 2019	+	-	+	!	+	-
S. Yang, 2017	+	+	+	+	+	+
H. K. Sut, 2016	-	+	+	!	+	-
S. Kocaöz, 2013	-	-	!	+	!	-
V. Gorbea, 2004	+	-	+	!	+	-
S. Mørkved, 2003	+	+	+	+	+	+
P. Chiarelli, 2002	+	!	!	+	+	-
M. Labrecque, 2000	!	+	+	+	+	!

+ Low risk  
 ! Some concerns  
 - High risk

D1 Randomization process  
 D2 Deviations from the intended interventions  
 D3 Missing outcome data  
 D4 Measurement of the outcome  
 D5 Selection of the reported result

Figure 2. Risk of bias assessment using the Cochrane tool (ROB 2).

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