Pelvic floor physical therapy in the treatment of pelvic floor dysfunction in women

Shannon L. Wallace, Lucia D. Miller, and Kavita Mishra

Purpose of review
To describe the principles of pelvic floor physical therapy (PFPT), review the evidence for PFPT as a treatment for pelvic floor dysfunction, and summarize the current recommendations for PFPT as a first-line conservative treatment option for pelvic floor disorders.

Recent findings
Pelvic floor dysfunction can cause voiding and defecation problems, pelvic organ prolapse (POP), sexual dysfunction, and pelvic pain. PFPT is a program of functional retraining to improve pelvic floor muscle strength, endurance, power, and relaxation in patients with pelvic floor dysfunction. Based on the available evidence, PFPT with or without supplemental modalities can improve or cure symptoms of urinary incontinence, POP, fecal incontinence, peripartum and postpartum pelvic floor dysfunction, and hypertonic pelvic floor disorders, including pelvic floor myofascial pain, dyspareunia, vaginismus, and vulvodynia. Currently, there is conflicting evidence regarding the effectiveness of perioperative PFPT before or after POP and urinary incontinence surgery.

Summary
PFPT has robust evidence-based support and clear benefit as a first-line treatment for most pelvic floor disorders. Standards of PFPT treatment protocols, however, vary widely and larger well designed trials are recommended to show long-term effectiveness.

Keywords
hypertonic pelvic floor disorders, pelvic floor dysfunction, pelvic floor physical therapy, pelvic organ prolapse, urinary incontinence

INTRODUCTION
Pelvic floor physical therapy (PFPT), also referred to as pelvic floor muscle training (PFMT), is a conservative, first-line treatment for many pelvic floor disorders [1]. PFPT is a general term for the instruction of pelvic muscle strengthening, relaxation, and coordination exercises by a trained physical therapist [2] (Table 1). PFPT may involve manual therapy, biofeedback or electrical stimulation, behavioral education, and the creation of home exercise programs [3]. PFPT has robust evidence-based support as a first-line, minimally invasive option to treat pelvic floor dysfunction, including pelvic organ prolapse (POP), fecal or urinary incontinence, peripartum and postpartum pelvic floor dysfunction and chronic pelvic pain [4–6]. In this review, we will describe pelvic floor disorders that may benefit from a trial of PFPT and discuss the evidence for these treatments.

HISTORY OF PELVIC FLOOR PHYSICAL THERAPY
DeLancey [7] and Norton [8] argued that when the pelvic floor muscles have normal strength and tone, the pelvic organs are supported with limited tension on the ligaments and fascia of the pelvis. These pelvic floor muscles may become stretched during childbirth, weak during aging, or hypertonic with increased stress, eventually leading to pelvic floor dysfunction. Strain on the pelvic connective tissues can lead to a myriad of pelvic floor disorders [9,10]. PFPT aims to restore normal pelvic muscle strength, endurance, power, resting tone or a combination of these to reverse damage to the muscles and connective tissue [11].

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**Urogyneiology**

**KEY POINTS**

- PFPT is a program of exercise to improve pelvic floor muscle strength, endurance, power, relaxation or a combination of these.
- PFPT is performed by physical therapists who complete specialized PFPT training and are licensed by the American Physical Therapy Association.
- Robust evidence-based support recommends PFPT with or without supplemental modalities for the treatment of urinary incontinence, POP, fecal incontinence, peripartum and postpartum pelvic floor dysfunction, and hypertonic pelvic floor disorders, including pelvic floor myofascial pain, dyspareunia and vaginismus, and vulvodynia.
- There is conflicting evidence regarding the effectiveness of perioperative PFPT before or after POP and urinary incontinence surgery and further research trials needed to establish benefit.

**PELVIC FLOOR ANATOMY AND PHYSIOLOGY**

A good understanding of pelvic anatomy and neurophysiology is critical to accurate diagnosis and management with appropriate physical therapy techniques. The deep pelvic floor muscles include the coccygeus muscles and the levator ani muscle complex, including the puborectalis, pubococcygeus, and iliococcygeus muscles (Fig. 1). These muscles maintain pelvic floor tone and protect the connective tissues from excess load [12]. The superficial pelvic floor muscles, also known as the urogenital diaphragm, include the bulbospongiosus, ischiocavernosus, superficial and deep transverse perineal muscles, fascial layers, and urethral and anal sphincters. The perineal body or central perineal tendon is the convergence of the superficial pelvic muscles and sphincters and provides support to the pelvic floor [13]. The obturator internus and piriformis muscles are muscles of the pelvic side walls and externally rotate the femur [14]. The pelvic floor muscles are innervated by sacral nerve roots, the pudendal nerve, and the levator ani nerve. These nerves and the pelvic floor muscles, which are 70% slow-twitch, striated skeletal muscle, provide nearly constant muscle tone to the pelvic floor, maintaining urinary and fecal continence [15].

**Table 1. Pelvic floor physical therapy training and certification**

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<td>The CAPP: awarded to physical therapists who have completed comprehensive training, and testing programs from pelvic floor dysfunction</td>
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**PHYSICAL THERAPY EXAMINATION**

PFPT examination and treatment include both internal and external components. During external examination, the lumbosacral and sacroiliac joints, iliofemoral and piriformis muscles, iliacus and rectus abdominis muscle insertions, and abdominal viscera and bladder are palpated for points of tenderness. An exam for diastasis recti abdominus, abdominal hernia, and inguinal hernia is also performed. During internal examination, pelvic floor muscles are assessed for tone, elasticity, and areas of tenderness and pain [17]. The examiner also evaluates the patient’s ability to perform voluntary contraction and voluntary relaxation, assessing coordination, muscle length, strength, and endurance. An assessment for POP and pelvic floor descent with Valsalva maneuver is also performed. The rest of the internal examination includes palpation of the obturator internus, pubococcygeus, and piriformis muscles, iliacus and rectus abdominis muscle insertion, the lumbosacral and sacroiliac joints, iliopsoas and rectus femoris, and the femur [14]. The pelvic floor muscles are innervated by sacral nerve roots, the pudendal nerve, and the levator ani nerve. These nerves and the pelvic floor muscles, which are 70% slow-twitch, striated skeletal muscle, provide nearly constant muscle tone to the pelvic floor, maintaining urinary and fecal continence [15].

**PELVIC FLOOR PHYSICAL THERAPY**

In addition to manual manipulation, modalities such as electrostimulation, biofeedback, and vaginal dilators or vaginal weighted cones can be used to help with isolation of pelvic floor musculature and improve control [18–21].

1. **Electrical stimulation provides a small electrical current to contract the pelvic floor and assist the patient in isolation of the proper muscles.**
2. **Biofeedback uses a vaginal or rectal pressure sensor to provide an audible and/or visual...**
feedback of the strength of the muscle contraction (Fig. 2).

(3) A vaginal weighted cone is inserted into the vagina and held in place by pelvic muscle contractions during activity.

PELVIC FLOOR PHYSICAL THERAPY FOR LOW-TONE PELVIC FLOOR DISORDERS

Stress urinary incontinence
Stress urinary incontinence (SUI) is the involuntary loss of urine associated with increased intra-abdominal pressure during activities, such as coughing, laughing, sneezing, impact movements or squatting [6,22]. It affects 25–45% of women [23,24]. Pelvic floor muscle contraction can increase urethral pressure and elevate the urethra under the pubic symphysis to maintain continence and prevent urinary leakage. PFPT is used to strengthen and support the pelvic floor structures to improve SUI [25].

A recent 2018 Cochrane Review assessed 31 randomized controlled trials (RCTs) of PFPT for women with urinary incontinence. Women with SUI who were in the PFPT groups were eight times more likely to report cure (56 versus 6%; risk ratio 8.38) and six times more likely to report cure or improvement (74 versus 11%; risk ratio 6.33) than women in the placebo, sham, or no treatment groups [26**]. A 2019 systematic review of 11 RCTs of PFPT with biofeedback versus conservative treatment found that biofeedback did not offer additional symptom improvement in women with SUI [27*]. In two single-blinded RCTs, however, the highest cure rates were in the treatment arms of combined PFPT with biofeedback and electrical stimulation. These studies also had close follow-up every 1–2 weeks, high adherence and low drop-out rates. It is likely that the key factors for successful SUI treatment with PFPT are close follow-up and intensive training [28,29].

Overactive bladder
Overactive bladder syndrome is a constellation of symptoms including urinary urgency, frequency, urgency incontinence (UUI) and nocturia [30]. These symptoms are caused by involuntary contractions of the bladder detrusor muscle. Studies have
shown that pelvic floor activation can inhibit bladder contraction [31]. One theory suggests that pelvic floor muscle contraction can improve conscious control of bladder function by activating the frontal cortex of the brain, which is responsible for the voluntary urinary inhibition reflex [32]. A second theory suggests that pelvic floor activation of the puborectalis and the external urethral and anal sphincters can relax the detrusor muscle via mechanisms of reciprocal inhibition [33]. PFPT can be used in the management of UUI by activating pelvic floor muscles to inhibit detrusor overactivity and avoid urinary leakage.

In the 2018 Cochrane Review only one of the 31 RCTs evaluated cure or improvement in UUI [26]. In this study, women who underwent PFPT had fewer leakage episodes in 24 h than women without treatment (0.77 episodes versus 2.6 episodes, mean difference $-1.83$, 95% confidence interval $-2.65$ to $-1.01$) [34]. A 2012 systematic review identified 13 RCTs comparing PFPT with no treatment for UUI, all of which showed some improvement in UUI with PFPT [35]. These improved outcomes suggest PFPT is a viable treatment for UUI, however, there was considerable variability in the level of improvement and more robust data is needed.

Pelvic organ prolapse

Pelvic floor physical therapy for nonsurgical pelvic organ prolapse

POP occurs when there is weakness of the pelvic floor and connective tissue attachments to the bony pelvis allowing abnormal descent or herniation of the pelvic organs (uterus, vaginal apex, bladder, or rectum) from their normal position in the pelvis [36]. Women with POP usually complain of pelvic heaviness, fullness, low back pain, or voiding and/or defecation dysfunction [37]. An ordinal staging system of POP (POP-Q) based on the extent of vaginal wall descent relative to the hymen is used to describe POP severity: stage 0 is no descent, stage 1 is minimal descent, stage 2 is descent within 1 cm of the hymen, stage 3 is descent beyond the hymen but less than 2 cm of full vaginal length, and stage 4 is complete descent of the vaginal walls [38]. By improving muscle strength and coordination with PFPT, the resting position of the uterus, bladder, and rectum can be elevated to decrease symptoms, reduce POP-Q stage, and improve quality of life [39].

The largest study to address PFPT for POP was the Pelvic Organ Prolapse Physiotherapy trial, a
multicenter, RCT at 23 centers. Women with newly diagnosed symptomatic stage I, II, or III prolapse were randomized to PFPT or a prolapse lifestyle advice pamphlet. Women in the PFPT group had a significantly greater reduction in POP symptom scores at 12 months (mean reduction from baseline 3.77 versus 2.09, \( P = 0.0053 \)), and more women in the control group received further treatment within 12 months (risk ratio 2.1, \( P < 0.0001 \)) [40]. A 2016 meta-analysis of 13 RCTs reported that women who had PFPT for POP had greater improvement in objective POP stage (risk ratio 1.70) and the number of women who reported prolapse improvement was higher (risk ratio 5.48) [41]. The 2013 International Consultation on Incontinence report concluded that there is level 1, grade A evidence to recommend PFMT in treatment of POP [42]. Many of the RCTs showing improved outcomes with PFPT had physical therapy regimes with individualized training and vigorous supervision.

Perioperative and postoperative pelvic floor physical therapy for pelvic organ prolapse and stress urinary incontinence surgery

The lifetime risk of undergoing surgery for prolapse and incontinence is between 11 and 20% [43]. Multiple RCTs have sought to evaluate whether PFPT before and after POP or SUI surgery is associated with any clear benefit [44,45].

A 2018 systematic review examined perioperative interventions for POP surgery [46]. In three RCTs, there were no differences in objective surgical failure rates and inconsistent results regarding symptom reduction when comparing patients who had perioperative PFPT and those who did not [47–49]. The largest trial of postoperative PFPT was the Operations and Pelvic Muscle Training in the Management of Apical Support Loss trial, which randomized patients to either uterosacral ligament suspension (USLS) or sacrospinous ligament fixation (SSLF), as well as perioperative behavioral therapy with PFMT (BPMT) or usual care. There were no significant improvements in urinary symptoms at 6 months or prolapse outcomes at 2 years between then BPMT and usual care groups. Although a higher number of patients who underwent USLS and BPMT had apical descent more than 1/3 of the vaginal length at 2 years, there were no significant differences in outcomes between the groups at 5-year analysis [47,50].

The Effects of Surgical Treatment Enhanced with Exercise for Mixed Urinary Incontinence trial randomized female patients with mixed urinary incontinence (MUI) to either midurethral sling (MUS) surgery and postoperative PFPT or MUS alone. Preliminary results indicate that adding PFPT after MUS surgery results in greater improvements in MUI, higher quality-of-life scores, and fewer incontinence episodes compared with sling alone [45].

Currently, there is conflicting evidence regarding the effectiveness of perioperative PFPT and it has not been routinely recommended before or after POP surgery. Perioperative PFPT may be helpful after SUI surgery in patients with MUI although data is limited.

Anal incontinence

Anal incontinence, which includes gas, liquid, and stool incontinence, has an estimated prevalence of 2–24% [51]. Fecal incontinence, referred to as accidental bowel leakage, is the involuntary loss of solid or liquid stool [52]. The prevalence of fecal incontinence increases from 2.6% in young women (aged 20–29 years) to 15.3% by age 70 years or older [53]. Half of patients with fecal incontinence also have urinary incontinence [54]. PFPT for fecal incontinence seems to reduce incontinence episodes with the addition of biofeedback in nonrandomized studies [55–57]. A randomized trial of biofeedback compared with either PFPT or advice alone, however, showed no additional benefit from biofeedback [58]. A recent 2016 Cochrane Review did not find any evidence that specific types of biofeedback or exercise were more beneficial than others, but did find that biofeedback or electrical stimulation is more efficacious than PFPT alone in patients who have failed to respond to other measures [59]. PFPT with biofeedback or electrical stimulation seems to be a beneficial first-line treatment for anal incontinence and fecal incontinence.

Peripartum and postpartum period

Pregnancy and childbirth are commonly considered to be major risk factors for women with pelvic floor dysfunction, which can occur in 46% of puerperal women [60]. Among postpartum women, up to 34% report urinary incontinence and 4% report fecal incontinence [61,62].

A 2018 Cochrane Review reviewed 38 RCTs to determine the effectiveness of PFPT in the prevention or treatment of urinary and fecal incontinence in pregnant or postnatal women [63]. In six RCTs of continent pregnant women, patients who performed antenatal PFPT compared with those who had no PFPT had a lower risk of urinary incontinence in late pregnancy (risk ratio 0.38) and a lower risk of urinary incontinence 3–6 months postpartum (risk ratio 0.71). In studies of women at least 6 months postpartum, a decreased risk of urinary incontinence was not seen.
Pelvic Floor Myofascial Pain Disorder

Pelvic floor myofascial pain disorder is characterized by short, tight, tender pelvic floor muscles with myofascial trigger points causing local and referred pain. Symptoms include chronic pelvic pain and dyspareunia [67]. PFPT is considered the first-line therapy of myofascial pain and spasm [68].

Tu et al. performed a 2005 systematic review of two RCTs and 27 observational case series to evaluate the use of manual techniques to alleviate musculoskeletal pelvic pain. Although there was wide variation in PFPT techniques and study size, the authors concluded that 59–80% of women reported improvement in pelvic pain [69]. Oyama et al. performed a nonrandomized study of 21 women with pelvic floor myofascial disorder. Patients had improvement in pain scores after 5 weeks of twice weekly intravaginal myofascial myofascial release for up to 4.5 months after treatment (P < 0.05) [70].

Dyspareunia and Vaginismus

Dyspareunia is characterized by pain during sexual intercourse or vaginal penetration and vaginismus is characterized by a spasm of the perineal muscles making vaginal penetration difficult [71]. PFPT is an important treatment strategy in the multidisciplinary approach to dyspareunia and vaginismus as it improves muscle relaxation, normalizes resting muscle activity, increases vaginal elasticity, muscle awareness, and proprioception [72].

In a 2013 retrospective observational study, Bedaiwy et al. analyzed a cohort of patients with chronic pelvic pain and dyspareunia who received at least 12 sessions of PFPT. Forty-five percent of patients reported improvement in dyspareunia [73]. A more recent 2019 RCT randomized 42 women with dyspareunia to receive PFPT or lower back and abdominal physical therapy. Patients who received PFPT showed significant improvement in pain (P ≤ 0.001), overall quality-of-life scores (P ≤ 0.001), and overall sexual function (P < 0.018), compared with patients who did not have pelvic floor training [74]. Reissing et al. retrospectively reviewed and interviewed 53 women with vaginismus who were treated with an average of 29 PFPT therapy sessions. Internal manual techniques were most effective at improving vaginismus symptoms followed by patient education, dilatation exercises, and then home exercises [75].

Vulvodynia

Vulvodynia is vulvar discomfort, most commonly burning pain, in the absence of other findings or diagnoses [76]. Pelvic floor dysfunction can cause tissue hypersensitivity, decreased blood flow, and referred pain to the vulva. PFPT is recommended by the American College of Obstetrics and Gynecology as a treatment strategy for vulvodynia and has been incorporated into the International Consultation of Sexual Medicine’s recommendation (grade B) for the management of vulvodynia [77,78].

Gentilcore-Saulnier et al. evaluated women with provoked vestibulodynia prior to PFPT and found that this cohort had higher tonic surface electromyography activity in their superficial pelvic floor muscles as well as a heightened pain response to palpation of pelvic floor muscles compared with a control group of women. After eight PFPT sessions, women with vestibulodynia had less pelvic floor
muscle responsiveness to pain, less pelvic floor muscle tone, improved vaginal flexibility, and improved pelvic floor muscle capacity [79].

COUNSELING ON PELVIC FLOOR PHYSICAL THERAPY

Although PFPT for the treatment of pelvic floor disorders is a low-risk therapy with a high success rate, patient knowledge and perception of this option is often poor. Patients may dismiss PFPT because of their discomfort about intravaginal exams. Adherence is often very low as patients may be time-restricted and symptoms may only improve after multiple sessions. Extensive patient education regarding treatment details as well as expectations for treatment goals can reduce the negative perception and anxiety surrounding PFPT [80*–82*]. Educating clinical staff on the treatment details and providing patient hand-outs can improve compliance. In addition, clinicians and pelvic floor physical therapists should have a good working relationship and communicate frequently and openly about mutual patients.

LIMITATIONS ON PELVIC FLOOR PHYSICAL THERAPY RESEARCH DATA

There are currently no gold standards for PFPT research regarding recommended PFPT modalities, therapy session length, frequency, duration, and intensity. Comparisons of different studies can be difficult and imprecise. A standardized approach to clinical trials of PFPT would allow for easier therapeutic analysis and more robust and useful data.

CONCLUSION

PFPT is recommended as a first-line, low-risk, minimally invasive therapy for preventing and treating pelvic floor dysfunction. Initial studies have been very promising and more robust research with standardized protocols will be forthcoming for both hypotonic and hypertonic pelvic floor disorders, specifically those that may occur in the peripartum and postpartum period (Table 2).

Acknowledgements

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None.

Conflicts of interest

There are no conflicts of interest.

REFERENCES AND RECOMMENDED READING

Papers of particular interest, published within the annual period of review, have been highlighted as:
- of special interest
- of outstanding interest


This is a consensus-based terminology report for the conservative management of female pelvic dysfunction and combines the input of members and elected nominees of the Standardization and Terminology Committees of two International Organizations, the International Urogynecological Association, and the International Continence Society.


Urogynecology


The systematic review analyzed the literature for examination techniques used to assess pelvic floor myofascial pain in women. Examination components varied significantly among the included studies and a consensus examination guideline was developed based on the available data.


The Cochrane systematic review included 31 trials comparing the effects of pelvic floor physical therapy (PFPT) on urinary incontinence by comparing patients who underwent PFPT to those patients who did not. The authors concluded that PFPT can cure or improve symptoms of stress urinary incontinence (SUI) and all other type of urinary incontinence and suggested that PFPT could be included in the first-line conservative management programs for women with urinary incontinence.


The authors conducted a randomized, multicenter trial of midurethral sling (MUS) and PFPT versus MUS alone for the treatment of mixed urinary incontinence. They found that combined MUS and PFPT is associated with greater improvements in urinary symptoms and quality of life with MUS alone.


33. The Cochrane Systematic review analyzed 15 randomized controlled trials (RCTs) to compare the safety and effectiveness of a range of perioperative interventions versus no interventions at the time of surgery for pelvic organ prolapse (POP). The authors found that a structured program of PFPT before and after prolapse surgery did not consistently demonstrate any benefit for the intervention.


In this study, the authors conducted a 2 × 2 factorial randomized clinical trial at nine US medical centers to compare outcomes in women randomized to USLS or SSLF and usual care perioperative behavioral therapy and pelvic floor muscle training (PFMT) for vaginal apical prolapse. Among women who had undergone vaginal surgery for apical pelvic organ vaginal prolapse, there was no significant difference between USLS and SSLF in rates of surgical failure and no significant difference between perioperative behavioral therapy and usual care on rates of anatomic success and symptom scores at 5 years.


Pelvic floor physical therapy in women Wallace et al.


The study analyzed 15 RCTs comparing PFPT versus watchful waiting in women with stage 2 or less POP within 1-year postpartum. The authors found that postpartum PFPT reduces the risk of urinary incontinence, particularly SUI symptoms.


In this article, the authors discuss how the trained pelvic floor physical therapist assesses and treats patients with chronic pelvic pain.


In this study, the authors performed a randomized trial of either PFPT or lower back with myofascial release in climacteric women aged between 40 and 60 years old who were sexually active and had complaints of dyspareunia. PFPT was effective to improve pain, quality of life, sexual function, and pelvic floor muscle function in climacteric women with dyspareunia.


The article details the definitions of vulvodynia descriptors as determined by a multistaged process of discussion among healthcare providers with expertise in the pathophysiology, evaluation, and treatment of vulvodynia.


In this study, the authors surveyed 70 patients to identify barriers preventing patients from following through with PFPT. Major barriers included insurance noncoverage, time constraints, anxiety, and unclear explanations of the treatment.


The authors performed a RCT of 200 patients undergoing PFPT who either received standard handout counseling or enhanced video counseling. Enhanced video counseling did not improve patient preparedness or odds of attending PFPT.


The authors in this observational, descriptive, cross-sectional study attempted to identify the factors that influence long-term adherence to pelvic floor exercises in women with urinary incontinence. Sixty-one women participated in this study. Forgetting to do the exercises and boredom with the exercises were the factors most strongly related to low treatment adherence.

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