



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

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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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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

Table 1. Pelvic floor physical therapy training and certification

PFPT is performed by physical therapists who complete specialized PFPT training and are licensed by the APTA

APTA offers two types of certification to physical therapists who have completed PFPT training:

The CAPP: awarded to physical therapists who have completed comprehensive training, and testing programs from pelvic floor dysfunction

The WCS certification: indicates the highest level of proficiency in evaluating and treating all women's health diagnoses, including pelvic floor pain

While treatment regimens may vary:

Most pelvic therapists recommend 4–8 hour-long sessions every week with home exercises

Depending on the severity and complexity of symptoms, some women may need to continue PFPT for several months

The APTA provides directories of certified providers

For CAPP: www.womenshealthapta.org/capp

For WCS: <https://ptl.womenshealthapta.org>

APTA, American Physical Therapy Association; CAPP, Certificate of Achievement in Pelvic Physical Therapy; PFPT, pelvic floor physical therapy; WCS, Women's Health Clinical Specialist.

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].

PHYSICAL THERAPY EXAMINATION

PFPT examination and treatment include both internal and external components. During external examination, the lumbosacral and sacroiliac joints, iliopsoas 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 abdominis, 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, pudendal nerve in Alcock's canal, periurethral connective tissue, and vulva. Following examination, the physical therapist will link the objective findings to specific symptoms and devise a treatment plan.

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 contraction [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

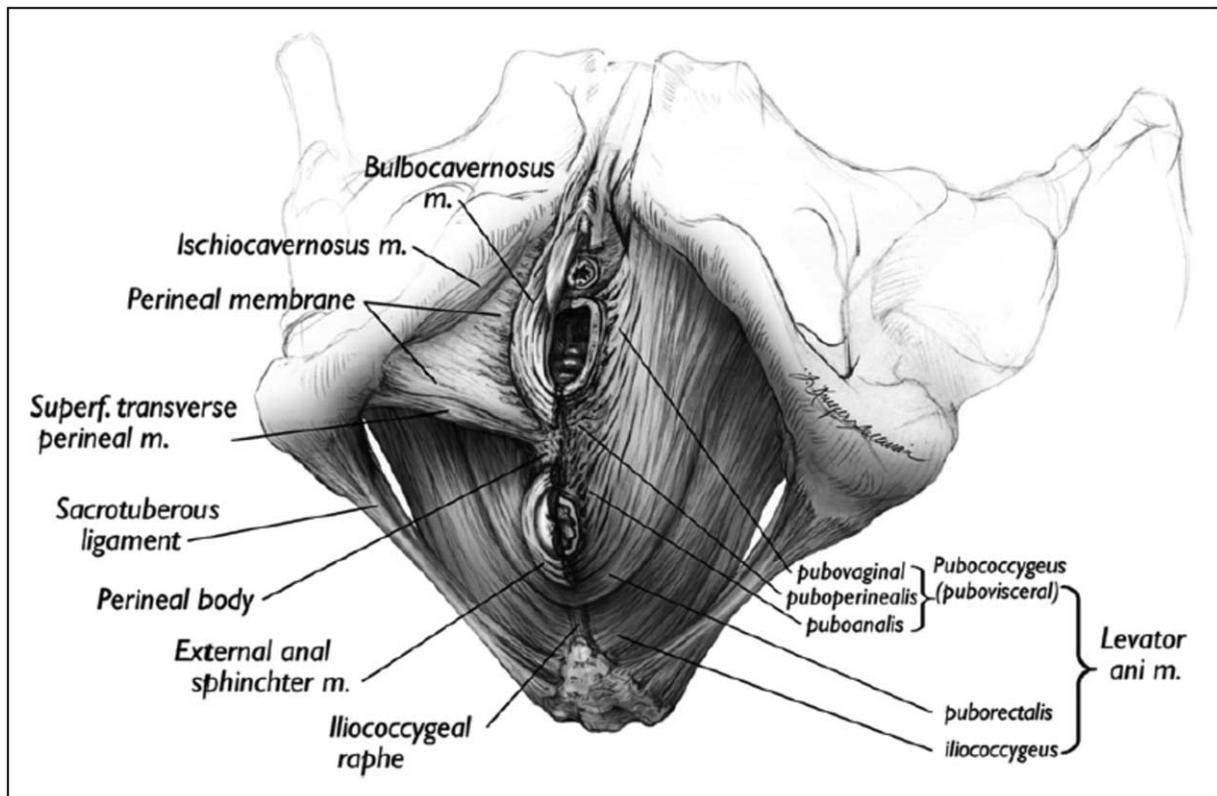


FIGURE 1. Superficial and deep muscles of the pelvic floor. The deep pelvic floor muscles include the coccygeus muscles and the levator ani muscle complex, including the puborectalis, pubococcygeus, and iliococcygeus muscles. The superficial pelvic floor muscles, also known as the urogenital diaphragm, include the bulbospongiosus, ischiocavernosus, superficial and deep transverse perineal muscles, fascial layers, and urethral and anal sphincters [16].

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



FIGURE 2. Biofeedback equipment. Biofeedback uses a vaginal or rectal pressure sensor to provide an audible and/or visual feedback of the strength of the muscle contraction.

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 [26¹¹]. 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.

A 2018 meta-analysis analyzed 15 RCTs to determine the effect of postpartum PFPT on POP, sexual function, and fecal incontinence [64[¶]]. Consistent with previous studies, seven RCTs showed that postpartum women receiving PFPT were less likely to report urinary incontinence (risk ratio 0.44) up to 12 months postpartum. Pooling of data from three RCTs showed that women receiving PFPT were less likely to report bothersome POP symptoms between 6 and 12 months postpartum (risk ratio 0.48). Although pooling of data from six RCTs showed that there was an overall trend toward reduction of stage II or greater POP within 12 months postpartum (risk ratio 0.74), these results were not statistically significant. Pooling of data from four RCTs showed a reduction in unsatisfactory sexual function up to 12 months postpartum who received structured PFPT (risk ratio 0.48). Three trials showed no significant difference in fecal incontinence symptoms (risk ratio 1.11). This is consistent with an RCT of patients with Obstetric Anal Sphincter Injury (OASIS) allocated to PFPT or usual care, which showed no difference in quality of life improvements between the two groups [65]. Based on the available evidence, PFPT should be commonly recommended during pregnancy and after birth to prevent and treat urinary incontinence, POP and postpartum sexual dysfunction in the short-term. More evidence is needed to evaluate the effectiveness for PFPT for fecal incontinence, specifically in those postpartum patients with OASIS.

PELVIC FLOOR PHYSICAL THERAPY FOR HIGH-TONE PELVIC FLOOR DISORDERS

High-tone or hypertonic pelvic floor muscles affect 16% of women and are associated with pelvic floor myofascial pain, dyspareunia, vaginismus, and vulvodinia [66].

Pelvic floor myofascial pain

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 vaginal discomfort 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 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 musculature 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 ($P \leq 0.001$), overall quality-of-life scores ($P \leq 0.001$), 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].

Vulvodinia

Vulvodinia 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 vulvodinia and has been incorporated into the International Consultation of Sexual Medicine's recommendation (grade B) for the management of vulvodinia [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

Table 2. Evidence for conditions treated with pelvic floor physical therapy

Conditions treated with pelvic floor physical therapy	Supporting evidence
Hypotonic pelvic floor disorders	
Stress urinary incontinence	Strong
Overactive bladder	Moderate
Pelvic organ prolapse	Strong
Pelvic organ prolapse surgery	Weak
Stress urinary incontinence surgery	Weak
Anal and fecal incontinence	Moderate
Postpartum urinary incontinence	Moderate
Postpartum pelvic organ prolapse	Moderate
Hypertonic pelvic floor disorders	
Pelvic floor myofascial pain	Strong
Dyspareunia	Moderate
Vaginismus	Moderate
Vulvodynia	Moderate
Postpartum sexual dysfunction	Moderate

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).

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Conflicts of interest

There are no conflicts of interest.

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

- of special interest
- of outstanding interest

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