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NARRATIVE LITERATURE REVIEW

To contract or not to contract: should we use pelvic floor muscle exercises in the treatment of dyspareunia?

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Abstract

Pelvic floor physiotherapy incorporates pelvic floor muscle (PFM) exercises (PFMEs), i.e. various tasks involving contraction and relaxation. These are widely used as an integral part of conservative treatment for different pelvic health conditions (e.g. urinary incontinence). Currently, there is a debate about the adoption of PFMEs for pelvic pain conditions, specifically dyspareunia. The prevailing belief within both the physiotherapy community and wider social media platforms is that PFMEs for dyspareunia are not appropriate and may even be harmful. The aim of this study was to investigate the role of PFMEs in the treatment of dyspareunia, including an exploration of potential mechanisms through which these exercises may alter its symptoms. Specifically, the authors addressed the following questions: What is the rationale for PFMEs in dyspareunia? What are the documented side effects, if any? What are the outcomes following PFMEs? A list of relevant studies was compiled from extensive searches conducted for the purpose of other reviews performed by the authors, and additional, complementary searches utilizing a combination of keywords associated with dyspareunia, physiotherapy and PFMEs. The inclusion criteria were any studies discussing and investigating the use of PFMEs, such as (but not limited to) repeated contractions or hold contractions as a sole intervention or as part of multimodal treatment. Data were extracted and narratively synthesized to identify arguments advocating for and against PFMEs in the treatment of dyspareunia. Part of the narrative analysis included 10 studies involving women with different types of dyspareunia, such as vulvodynia, postpartum dyspareunia, dyspareunia related to menopause and dyspareunia in cancer survivors. Pelvic floor muscle exercises were implemented as a main intervention or as a part of multimodal physiotherapy. All of the studies reported positive results favouring interventions involving PFMEs across various outcomes, such as pain intensity, sexual function, symptom severity and inconvenience, and PFM morphometry and function. None of the studies reported any side effects following interventions incorporating PFMEs. These exercises may have multiple applications in the treatment of dyspareunia. It appears essential to consider PFMEs as a multifaceted intervention that can be adapted in various forms for diverse objectives that extend beyond simple strengthening. Contrary to prevailing beliefs, PFMEs have been widely incorporated in research studies that have reported positive outcomes and demonstrated the safety of the interventions implemented.

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Introduction

Pelvic floor physiotherapy incorporates various pelvic floor muscle (PFM) exercises (PFMEs). Widely used to treat diverse pelvic health conditions in both women and men, this form of training has become an integral part of conservative treatment for conditions such as urinary incontinence (UI) (Todhunter-Brown *et al.* 2022), faecal incontinence (Mazur-Bialy *et al.* 2020), erectile dysfunction (Myers & Smith 2019) and pelvic organ prolapse (NICE 2019). For the treatment of non-painful conditions such as UI and pelvic organ prolapse, PFMEs are a first-line conservative treatment, with level 1, grade A evidence (Bø *et al.* 2022; Todhunter-Brown *et al.* 2022).

However, there is currently considerable discussion about the adoption of PFMEs (i.e. various tasks involving the contraction and relaxation of these muscles, such as repeated contractions or hold contractions) for pelvic pain conditions, specifically dyspareunia, because of a divergence in contemporary theories about the underlying pain mechanism. Dyspareunia is pelvic pain associated with penetration during sexual activity, including both vaginal and anal intercourse. The aetiology of dyspareunia is complex, and encompasses structural, inflammatory, infectious, neoplastic, traumatic, hormonal, muscular and psychosocial factors. The symptoms of dyspareunia can be associated with some pathologies/events (e.g. cancer) and alterations in physiology (e.g. the postpartum or menopausal periods), or constitute a chronic pain condition on their own (e.g. vulvodynia) (Steege & Zolnoun 2009; Alimi *et al.* 2018; Engeler *et al.* 2024). As will be discussed later, divergent hypotheses exist on whether PFMEs should be implemented in the treatment of painful conditions. It is frequently suggested that these exercises are contraindicated in the treatment of pelvic pain. This perspective is based on the premise that the underlying pain mechanism is muscle tension, and that contracting muscles further increases that which is already present.

Historically, the literature indicated that the presence of inflammation in certain pelvic pain conditions (e.g. coccygodynia) could lead to an increase in pain following muscle contraction (Simpson 1859). Initially, this observation did not specifically link the increase in pain to muscle tension, and this connection was established later (Thiele 1937). Over time, this has developed into a suggestion that PFMEs are a contraindication since these not only provide no benefit in the treatment of pelvic pain, but more importantly, may cause harm, leading to more tension and pain (FitzGerald & Kotarinos 2003). Instead, PFM relaxation and down-training (e.g. reverse Kegel exercises) are often recommended (FitzGerald & Kotarinos 2003; Prendergast & Akincilar 2017). Conflicting arguments suggest that repeated contractions reduce tension (e.g. contract–relax) (Naess & Bø 2018). Further understanding of the PFMEs and a proposed mechanism of intervention is required.

Pelvic floor muscle exercises are often associated with traditional Kegel exercises, which involve numerous repeated contractions and sustained holds that are intended to increase stiffness, induce muscle hypertrophy (improving muscle bulk) and enhance strength. However, PFMEs may take different forms and serve various purposes, including strengthening, endurance, proprioceptive awareness and functional control (Frawley *et al.* 2017; Cyr *et al.* 2020; Morin *et al.* 2021). Therefore, using PFM contractions may potentially yield a range of benefits beyond mere strengthening, enhancement of function and overall body perception of the region.

The beneficial role exercise plays in overall health is well known, and recent evidence also supports its value for persistent musculoskeletal pain conditions, such as low back pain (LBP), and hip and knee pain (Geneen *et al.* 2017). It has been shown that exercising the affected areas can yield benefits in terms of pain relief, improved function and quality of life (Booth *et al.* 2017). Furthermore, exercises that were once deemed harmful, such as deadlifts or squats for

LBP, are now often recommended (Fischer *et al.* 2021; Hayden *et al.* 2005, 2021a, b) because no harmful effects have been substantiated, and these have been found to contribute to muscle strengthening and reduced fear of movement (Fischer *et al.* 2021). Thus, the paradigm for treating pain conditions has shifted from rest to maintaining activity. Exercise-induced hypoalgesia contributes to enhanced pain modulation after exercise through the activation of descending inhibitory pain mechanisms (Rice *et al.* 2019). Different types of training can improve various muscle function qualities; for instance, eccentric training of the upper trapezius has been shown to reduce muscle stiffness and discomfort in patients with neck pain (Kisilewicz *et al.* 2020). Heavy, slow resistance training has been demonstrated to alter tendon mechanical properties and reduce pain levels through progressive loading (Beyer *et al.* 2015). This prompts the question: Can strategies incorporating the principles of exercise and tissue loading from other musculoskeletal pain conditions be applied to pelvic health, and more specifically, dyspareunia?

Currently, there is a lack of consensus in the literature regarding the implementation of PFMEs for this condition. Therefore, it is crucial to determine whether there is any rationale to use these exercises in the treatment of dyspareunia, and if so, how interventions that incorporate PFMEs can be effectively and safely applied to individuals suffering from it. The aim of the present narrative literature review was to assess the available body of evidence to address the following questions:

- What is the rationale for PFMEs in the treatment of dyspareunia (including an exploration of potential mechanisms through which PFMEs may alter its symptoms)?
- What are the documented side effects, if any?
- What are the outcomes following PFMEs?

Materials and methods

The studies discussed in the present narrative literature review were derived from searches conducted for the purpose of others performed by the authors (Bond *et al.* 2023; Starzec-Proserpio *et al.* 2024). Additionally, complementary searches were run on the PubMed database in December 2023 that utilized a combination of keywords associated with dyspareunia, physiotherapy and PFMEs ("Appendix 1"; https://tinyurl.com/44hkj6ee). The present authors also searched the reference lists of previous review articles in this area (Sobhgol *et al.* 2019; Fernández-Pérez *et al.* 2023). Studies investigating the use of PFMEs, such as (but not limited to) repeated contractions or hold contractions, provided as a sole intervention or as part of multimodal treatment, were included. Moreover, literature that was not found in the initial searches was incorporated to provide additional data for discussing the possible role of PFMEs in the management of dyspareunia.

Results

Evidence for and arguments against using pelvic floor muscle exercises to treat dyspareunia

There is a body of opinion that PFMEs involving repeated and sustained contractions should be avoided in the treatment of pelvic pain and sexual dysfunction (Stein 2009; Bradley *et al.* 2017). The theoretical basis for this stems from common clinical observations of increased PFM tone and overactivity in these conditions (Kadah *et al.* 2023).

Currently, there are not enough longitudinal studies to establish whether or not PFM tone is a cause of pain, or a consequence of further modulating the pain experience (Kadah *et al.* 2023; Worman *et al.* 2023). A focus on PFM relaxation and down-training rather than typical muscle strengthening is a common physiotherapy practice in the treatment of these conditions (Stein *et al.* 2019). Down-training is an intervention that can reduce the resting tone of the PFMs, and may include internal manual therapy, electrotherapy and active relaxation techniques (e.g. biofeedback, breathing exercises, pelvic floor stretches, reverse Kegels and pelvic drops) (Padoa *et al.* 2021). Reverse Kegel and pelvic drops are exercises that relax and stretch the PFMs, in contrast to the more commonly known Kegels, which contract these muscles (FitzGerald & Kotarinos 2003). Reverse Kegels and pelvic drops focus on PFM relaxation to allow for opening, a sensation similar to that experienced during voiding or defecating that does not include the initiation of bearing down or a Valsalva manoeuvre (Sadownik 2014). One widespread assumption is that these therapies relieve pain by reducing the resting tone of the PFMs. It has been suggested that down-training modulates the central nervous system by desensitizing the pelvic area, which should reduce muscle spasms and allow for muscle lengthening, and alleviate pain during penetrative sexual intercourse (Vandyken & Hilton 2016; Prendergast 2017).

Pelvic floor muscle exercises involving repeated contractions are not only considered unjustified, but also deemed harmful in conditions such as dyspareunia (Rosenbaum & Owens 2008). It is suggested that these have the potential to further increase an already elevated PFM tone, thereby exacerbating the symptoms of pain (Rosenbaum & Owens 2008; Bradley *et al.* 2017; Tracey 2022), especially if performed without specialist advice and a prior examination of the muscles (FitzGerald & Kotarinos 2003; Tracey 2022). Repetitive contractions performed in individuals with increased PFM tone are considered unreasonable, and there is an expert opinion that these should be ceased, even in the presence of UI (FitzGerald & Kotarinos 2003). When PFMEs are discussed as a potential treatment option for pelvic pain, these are exclusively recommended after restoring muscle tone first (e.g. through manual release techniques) (Prendergast & Akincilar 2017).

Apart from exacerbating pain, PFMEs (i.e. "Kegels") are hypothesized to cause pain and dysfunction in otherwise asymptomatic individuals, and thus, "tight" PFMs are thought to be prone to pelvic pain (Prendergast & Akincilar 2017). Stein (2009) also suggested that bladder or bowel frequency, or urgency, may occur following PFMEs. Moreover, available reports describe cases in which PFMEs led to pain and dyspareunia, and cessation of exercises alleviated these symptoms (DeLancey *et al.* 1993). However, it should be noted that, according to the authors, these situations were associated with self-prescribed and self-implemented PFMEs, or failure to follow a specialist's advice, such as performing a greater number of exercises than recommended (DeLancey *et al.* 1993).

Based on the information available, it might appear that recommending exercises involving PFM contractions for dyspareunia is not advisable, and could potentially worsen symptoms. This is also the common recommendation currently observed across social media platforms. Therefore, it is critical that the evidence beyond the hypotheses is reviewed.

Evidence supporting the use of pelvic floor muscle exercises in the treatment of dyspareunia

The use of PFMEs to treat dyspareunia-related pain may encompass not only traditional strengthening, but also improvements in tissue relaxation and blood flow. This section will examine the potential benefits associated with PFMEs in conditions related to dyspareunia.

Can exercise reduce pelvic floor muscle tone to a theoretical normal value? Increased or greater PFM tone is commonly implicated as a significant contributing factor in the development and persistence of pelvic pain. Higher levels of PFM tone are frequently observed in conditions related to dyspareunia (Gentilcore-Saulnier *et al.* 2010; Næss & Bø 2015; Morin *et al.* 2017), and changes suggestive of decreased tone can coincide with a reduction in pain (Bardin *et al.* 2020). This supports the common hypothesis that decreasing PFM tone could subsequently lead to lower pain intensity, and thus, it has become a common objective in dyspareunia treatment. It is essential to note that the relationship between PFM tone and pain is nuanced. Currently, it is not fully understood how active and passive PFM tone components contribute to the development and maintenance of dyspareunia, and to what extent these should be targeted in treatment (Worman *et al.* 2023). Acknowledging that, it nevertheless seems important to explore whether PFMEs might potentially modulate (i.e. reduce) increased PFM tone. Additionally, it is essential to address the common belief that PFM contractions lead to an augmentation of already increased tone and stiffness, potentially exacerbating symptoms associated with dyspareunia.

To date, several studies have explored this aspect. Mercier *et al.* (2019, 2020) conducted a single-arm feasibility study to investigate the effects of PFMEs in women with genitourinary syndrome of menopause (GSM) suffering from dyspareunia. The intensive physiotherapy treatment included education along with supervised and home-based PFMEs that incorporated strength, endurance and coordination exercises, as well as functional PFMEs (details in Table 1). Following the intervention, dynamometric results demonstrated a significant improvement in the speed of relaxation after a PFM contraction ($P = 0.003$). Furthermore, PFMEs led to significant improvements in vulvovaginal tissue elasticity [skin elasticity and turgor ($P < 0.001$); and introitus width ($P = 0.007$)], as assessed by the Vaginal Atrophy Index (Mercier *et al.* 2020). However, because of the lack of a control group, it is unclear to what extent the assessed outcomes were abnormal at baseline. Following PFMEs, none of the participants reported an increase in the severity of GSM symptoms, including dyspareunia. In fact, the impact of dyspareunia on

Table 1. Overview of studies that incorporated pelvic floor muscle (PFM) exercises (PFMEs) in their dyspareunia treatment protocols: (SD) standard deviation; (TENS) transcutaneous electrical stimulation; (HEP) home exercise programme; (RCT) randomized controlled trial; (MVC) maximal voluntary contraction; and (TENS) transcutaneous electrical nerve stimulation

Reference	Number of participants, condition, age (mean ± SD), study type	Comparison treatment	Intervention involving PFMEs	Selected results	Side effects in the group receiving PFMEs
Postpartum dyspareunia					
Dionisi & Senatori (2011)	45 women, postpartum superficial dyspareunia, 32.6 ± 4.4 years, single-arm intervention	Not applicable (pre–post design)	Multimodal physiotherapy intervention with PFMEs: • TENS protocol (10 × 30 min/week) • PFM biofeedback (one education session) HEP (10 sessions): • PFM contraction and relaxation (15 and 10 min in the morning and evening, respectively) • myofascial stretching	Complete symptom resolution in 95% of women Pre–post intervention: • decrease in pain ($P < 0.05$) • increase in anovulvar distance (interpreted as a return of PFM tone to a theoretical normal value, no statistics provided)	None of the patients reported side effects during the study
Dyspareunia in peri- and postmenopausal women					
Schvartzman *et al.* (2019)	42 women, 51.3 ± 4.9 years, RCT	Thermotherapy for the lower back region, with myofascial release of the abdominal diaphragm, piriformis and iliopsoas muscles, with no involvement of the PFMs in the treatment	Multimodal physiotherapy intervention with PFMEs (five, 60-min sessions): • infrared thermotherapy of the PFMs • myofascial release of PFM trigger points • PFMEs (contraction and relaxation exercises) guided by PERFECT score • PFM biofeedback (contraction and relaxation exercises) in the last two sessions • myofascial release of the abdominal diaphragm, piriformis and iliopsoas muscles	Greater improvements in group performing PFMEs compared to controls: • pain ($P < 0.001$) • sexual function ($P = 0.017$) • PFM function ($P \leq 0.001$)	Omitted occurrence or absence of adverse events
Dyspareunia in genitourinary syndrome of menopause					
Mercier *et al.* (2019, 2020)	32 women, 68 ± 6.6 years, single-arm feasibility study and secondary analysis	Not applicable (pre–post design)	PFMEs as a main intervention • 12-weeks of PFMEs for 1 h/week supervised by a physiotherapist and daily home-based PFMEs • Each treatment session consisted of a 15-min educational segment and a 45-min exercise component • The exercise component involved PFM strength, endurance and coordination exercises, and functional PFMEs • The intervention protocol was divided into three phases to gradually progress the PFMEs HEP: • PFMEs (progressed from nine to 30 repetitions) for 5 days/week for the duration of the treatment (a total of 220 exercises in 12 weeks)	Pre–post intervention improvements ($P < 0.05$): • dryness, irritation and impact of dyspareunia • blood flow in the internal pudendal artery and the dorsal clitoral artery at rest • speed of relaxation after a PFM contraction, • vulvovaginal tissue elasticity and introitus width	None of the participants reported an increase in symptoms (including dyspareunia)

Continued/

Table 1. (*Continued*)

Reference	Number of participants, condition, age (mean ± SD), study type	Comparison treatment	Intervention involving PFMEs	Selected results	Side effects in the group receiving PFMEs
Dyspareunia in gynecological cancer survivors					
Cyr *et al.* (2020, 2021, 2022a, b)	31 women, 55.9 ± 10.8 years, single-arm prospective intervention	Not applicable (pre–post design)	Multimodal physiotherapy intervention with PFMEs • education • manual therapy (i.e. stretching, myofascial release, pressure and massage) applied externally and intravaginally to the PFMs • PFM biofeedback focused on relaxation, and strength, endurance and coordination A relaxation period preceded and followed the exercises that included MVC (100%), podium contractions (50%/100%/50% MVC) or reversed podium contractions (100%/50%/100% MVC), rapid contractions, and 1-min sustained MVC A lying position (weeks 1–8) was followed by sitting (weeks 9 and 10) and standing positions (weeks 11 and 12) The number of repetitions and the duration of the contraction were progressed (e.g. up to 10 repetitions of two, 10-s MVCs) Twelve weekly individual 60-min sessions HEP: • PFMEs (as learned and practised during individual sessions) • deep breathing exercises • dilator insertion techniques Sexual partners were also invited to attend one session to discuss the main educational topics, and learn how they could assist their partner during the treatment	Pre–post intervention improvements ($P < 0.05$): • pain intensity • pain quality • pain self-efficacy • pelvic floor dysfunction symptoms and related impact on quality of life • sexual distress • sexual functioning, • body image concerns • pain anxiety • pain catastrophizing • depression symptoms Improvements were still significant at 1-year follow-up Changes suggesting decreased muscle tone, stiffness and improved contractility were observed (three- and four-dimensional ultrasound, and vaginal dynamometric speculum)	None of the patients reported side effects during the study

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Table 1. (*Continued*)

Reference	Number of participants, condition, age (mean ± SD), study type	Comparison treatment	Intervention involving PFMEs	Selected results	Side effects in the group receiving PFMEs
Dyspareunia in vulvodynia and provoked vestibulodynia					
Bardin *et al.* (2020, 2023)	111 women, the majority were aged 20–29 years, RCT	(1) Pharmacotherapy (amitriptyline) (2) Electrical stimulation (interferential current applied on the vulva) and pharmacotherapy (amitriptyline)	Multimodal physiotherapy intervention with PFMEs and pharmacotherapy (amitriptyline, 25 mg once a day for 8 weeks, same dose in all three groups): • manual therapy (stretching) delivered by a physiotherapist during eight individual sessions once a week for 8 weeks HEP: • PFMT in different positions (lying, sitting and standing); two series of strong, sustained 10-s contractions with a 20-s pause between each contraction, and 10 quick contractions repeated in each of the four positions; correct relaxation after each contraction was emphasized • self-performed manual stretching once a day for 8 weeks	Greater improvements observed in the group performing PFMEs compared to controls in: • pain during intercourse ($P = 0.007$), but no pain during cotton swab test or sexual function (Bardin 2023) Changes suggesting increased PFM strength and normalization of PFM tone (three- and four-dimensional ultrasound) after treatment favouring the group performing PFMEs (Bardin 2020)	The only side effects present were related to pharmacotherapy treatment The mean pain score reported during the manual stretching exercises was 1.5 ± 0.6
Morin *et al.* (2021)	212 women, median = 22 years, RCT	Pharmacotherapy (topical lidocaine)	Multimodal physiotherapy intervention with PFMEs (one, 60-min session every week for 10 weeks): • education • PFM biofeedback for 20 min, MVC up to 10-s hold, podium and reverse podium contractions, rapid contractions, and a sustained contraction (60 s), relaxation period at the beginning and end of the biofeedback session, the physiotherapist monitored and emphasized the importance of adequate PFM relaxation throughout the session • manual therapy • insertion techniques and vaginal dilation HEP (5 days a week): • deep breathing exercises • PFMEs (as learned and practised during individual sessions) • insertion techniques • vestibular massage, and desensitization and stretching of the PFMs were added where relevant	Significant differences between the groups ($P < 0.05$) favouring the group performing PFMEs in: • pain during intercourse • pain quality • sexual function • perceived improvement	None of the patients reported any side effects during the study

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Table 1. (*Continued*)

Reference	Number of participants, condition, age (mean ± SD), study type	Comparison treatment	Intervention involving PFMEs	Selected results	Side effects in the group receiving PFMEs
Rajalaxmi *et al.* (2018)	40 women, age of sample not provided, RCT	Yoga (15–30 min 5 days/week for 6 weeks)	PFMEs as a main intervention (15–30 min 5 days/week for 6 weeks): • traditional, isolated PFMEs with "Kegel exercises" • isometric exercise (i.e. gluteal and adductor muscles) • active exercises (i.e. squats, jumping jacks, bridges, dead bug and bird dog), most probably performed simultaneously with voluntary PFMEs ("coordinated training"), but not explicitly stated • education and lifestyle modifications The exercises were intended to raise awareness of the PFMs, improve the ability to contract and fully relax these muscles, and address the guarding reflex It is not clear whether these were supervised individual or group sessions	Significant differences in pain intensity between the groups ($P < 0.05$) favouring the group performing PFMEs (P-values and description of statistical analyses not provided)	Did not report the occurrence or absence of adverse events
Dyspareunia (unspecified)					
Ghaderi *et al.* (2019)	64 women, dyspareunia related to "pelvic floor myalgia" (muscular dysfunction), but not associated with vestibulodynia or interstitial cystitis/bladder pain syndrome, and persistent of recurrent pain in the genital area during or after intercourse (visual analogue scale score > 8/10), 35.33 ± 8.52 years, RCT	No treatment (waiting list)	Multimodal physiotherapy intervention with PFMEs (10 individual sessions once a week for 12 weeks): • education • manual PFM techniques (trigger points, myofascial soft tissue release and deep intravaginal massage) • intravaginal TENS HEP: • PFMEs (written instruction and educational video provided) for progressive strengthening and stretching exercises (attention to correct calm breathing during the exercises was emphasized); the PFMEs progressed from isolated contractions (5–12-s hold) and relaxations (5–8 s) in different positions (i.e. lying, sitting and standing) to more-complex, coordinated ones (i.e. bridges, leg rises, clam shells, lounges and standing leg rises); strengthening exercises were alternated with relaxation and stretching exercises PFMEs in some participants were progressed with the use of vaginal cones, and attention to correct performance was emphasized*	Greater improvements ($P < 0.05$) in the group performing PFMEs compared to controls in: • pain on palpation • pain during intercourse • sexual function • PFM strength and endurance	Did not report the occurrence or absence of adverse events

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Table 1. (*Continued*)

Reference	Number of participants, condition, age (mean ± SD), study type	Comparison treatment	Intervention involving PFMEs	Selected results	Side effects in the group receiving PFMEs
Pereira *et al.* (2020)	14 women, dyspareunia (defined based on an affirmative answer to the question "Do you have pain during sexual intercourse?"), and PFM strength ≥ 2 on the Oxford scale, 41.0 ± 15.2 years, RCT	Lecture about women's health	PFMEs as main intervention (40-min group sessions twice a week for 8 weeks): • slow PFM contractions sustained for 5 s, followed by six fast contractions, repeated eight times in each position (i.e. lying, sitting and standing); participants were instructed to start the PFM contraction during exhalation • stretching PFMEs at the beginning of each session (i.e. the adductor, obturator, piriformis, gluteal, abdominal and paravertebral muscles)	Significant differences between the groups favouring the group performing PFMEs in: • effect of dyspareunia on quality of life ($P < 0.05$) • pain during intercourse ($P = 0.05$) Results for other sexual function domains (i.e. desire, arousal, lubrication, orgasm and satisfaction) were not significant	Did not report the occurrence or absence of adverse events
Fernandez-Cuadros *et al.* (2020)	37 women, chronic pelvic pain and dyspareunia of at least 6 months duration, 41.5 ± 12.65 years, single-arm prospective intervention	Not applicable (pre–post design)	Multimodal physiotherapy intervention with PFMEs (eight individual sessions twice a week for 4 weeks): • PFM biofeedback for 30 min, including "tonic contractions" (3-s hold, 6-s rest for 15 min) and "phasic contractions" (five fast contractions followed by a 10-s rest for 15 min) • resistive/capacitive radiofrequency (INDIBA) for 25 min	Pre–post intervention improvements: • pain ($P < 0.001$) • PFM strength ($P < 0.001$)	Did not report the occurrence or absence of adverse events

*Details regarding the PFME protocol were obtained from the authors upon request.

sexual function was significantly lower when assessed by the Atrophy Symptom Questionnaire ($P = 0.004$) (Mercier *et al.* 2019).

Naess & Bø (2018) explored alterations in PFM tone by evaluating vaginal resting pressure with perineometry and PFM activity with surface electromyography after PFM contractions in women with provoked vestibulodynia. Significantly lower values were observed in both measurements following three maximal voluntary contractions (MVCs) of 9–12 s in duration ($P = 0.001$), leading to the hypothesis using a contract–relax method could potentially serve as a muscle relaxation technique.

Pelvic floor muscle exercises were also integrated into multimodal physiotherapy treatment for women with vulvodynia in a study conducted by Bardin *et al.* (2020). The participants were randomly assigned to groups either receiving multimodal physiotherapy with amitriptyline or only amitriptyline. The physiotherapy treatment involved manual stretching and PFM contractions (including sustained and fast contractions in four different positions; see Table 1 for details) that were performed under the supervision of a physiotherapist and as part of a home exercise programme. Following the therapy, the results revealed that, in comparison to the baseline assessment, women undergoing the physiotherapy protocol experienced significant changes in anteroposterior diameter at rest (an increase in the symphysis–levator distance at rest of 0.22 ± 0.2 cm; 95% confidence interval = 0.1–0.4, $P = 0.008$). In contrast, the control group did not show significant changes from baseline to post-treatment in the parameters that could suggest changes in PFM tone. Between-group comparisons indicated significantly greater symphysis–levator distance at rest in the physiotherapy group compared to the group receiving only amitriptyline ($P = 0.005$). The interpretation of these changes was that PFM physiotherapy may assist in returning tone to a theoretical normal value.

Cyr *et al.* (2022b) also incorporated PFMEs in their multimodal physiotherapy programme for survivors of gynaecological cancer suffering from dyspareunia. The treatment in this single-arm prospective interventional study consisted of 12 weekly, 1-h, individually delivered sessions, and combined education, PFMEs with electromyography biofeedback, manual therapy and home exercises. The PFMEs were intended to promote relaxation, contraction, coordination and endurance, and included maximal contractions, podium (50%/100%/50% MVC) and reverse podium (100%/50%/100% MVC) contractions (the podium and reverse podium contractions are a graphic presentation of the PFM contraction on visual biofeedback), rapid contractions, and sustained contractions delivered in a progressive manner. The ultrasound imaging data suggested a reduction in muscle tone and improvements in PFM contractile properties following treatment (Cyr *et al.* 2022b). Correspondingly, intravaginal dynamometric speculum measurements demonstrated a decrease in stiffness as well as improvements in tissue flexibility. However, these findings should be treated with caution because ultrasound is an indirect and combined measure (Worman *et al.* 2023a, b), and the study design did not include a control group. Nevertheless, all the above-mentioned results suggest that PFMEs (applied as a sole intervention or part of multimodal physiotherapy) may help tone return to a theoretical normal value in women with dyspareunia, contrary to common beliefs.

Can pelvic floor muscle exercises influence pain in dyspareunia through blood flow change? Research on skeletal muscles indicates that exercise enhances blood circulation in the arteries connected to the muscles employed even when the body is at rest. This improvement is achieved through better vasodilation, an increase in artery diameter, a reduction in artery wall thickness and enhanced growth of capillaries (Green *et al.* 2011). Similarly, the blood supply to the pelvic floor and vulvovaginal tissues may change following PFMEs. Mercier *et al.* (2020) reported multiple improvements in patients affected by GSM following 12 weeks of a programme of PFMT. Among these were significant increases in peak systolic velocity at rest in the internal pudendal ($P = 0.031$) and dorsal clitoral arteries ($P = 0.040$) compared to pre-intervention values. After the PFM MVC task, significant changes were also noted in the peak systolic velocity in the internal pudendal artery ($P < 0.001$), as well as the timed-average maximum velocity in both the internal pudendal ($P = 0.010$) and dorsal clitoral arteries ($P = 0.038$). The authors suggested that these changes in blood flow could contribute to improvements in the typical symptoms in GSM observed after PFMT in the study group: dryness, vaginal atrophy and the impact of dyspareunia on sexual function (Mercier *et al.* 2019, 2020).

Overview of available evidence on the effects of pelvic floor muscle exercises in the treatment of different conditions related to dyspareunia.

Considering the above, it appears that PFMEs may have a place in the treatment of dyspareunia. So far in the present narrative literature review, potential rationales for integrating PFMEs into the treatment of dyspareunia have been explored. This section focuses on trials that have incorporated PFMEs in the treatments investigated. Table 1 presents some examples of studies providing evidence to support the use of PFMEs in different conditions related to dyspareunia. Pelvic floor muscle exercises were analysed either as the main intervention or as part of multimodal therapy in different conditions related to dyspareunia. The majority of the papers identified incorporated PFMEs as part of a broader intervention, including elements such as education, manual therapy, dilator insertion techniques and electrophysical agents (e.g. electrotherapy or radiofrequency). When PFMEs were implemented, these were mostly delivered in a supervised manner (at least at the beginning). Concentration on body awareness, coordination and correct relaxation was often highlighted (Rajalaxmi *et al.* 2018; Ghaderi *et al.* 2019; Bardin *et al.* 2020, 2023; Pereira *et al.* 2020; Morin *et al.* 2021). Moreover, it should be noted that classical PFMEs components for strengthening and endurance were also widely present among the trials included.

All of the studies presented in Table 1 reported positive results that favoured therapy involving PFMEs for several different outcomes, such as pain intensity, sexual function, symptom severity and inconvenience, as well as muscular morphometry and function. As depicted in Table 1, five of the 10 studies reported the occurrence or absence of side effects, and none noted any side effects following interventions incorporating PFMEs. Additionally, a recent systematic review of the impact of PFMT on sexual function also reported results supporting the effectiveness of these exercises in terms of improvements in the sexual pain domain (Jorge *et al.* 2024).

Evidence supporting other mechanisms by which pelvic floor muscle exercises affect the symptoms of dyspareunia

Pelvic floor muscle training performed as part of a biofeedback-driven intervention focusing on the development of accurate perineal area sensory function and PFM motor control may be beneficial in the treatment of dyspareunia. There is evidence of sensorimotor distortion in dyspareunia (Sutton *et al.* 2009; Kao *et al.* 2012; Coxon *et al.* 2023), and some suggestion that treatments aimed at restoring the accuracy of body awareness result in improvements in persistent pain (Bagg *et al.* 2022). This section goes beyond the scope of the narrative literature review to provide an overview of other potential mechanisms by which PFMEs may alter symptoms in dyspareunia-related conditions.

An internal model of the self is built through predictions derived from somatoperception, i.e. our experience of basic sensations including temperature, touch, nociception and visceral interoception, as well as a sense of ownership of our bodies (Longo 2015; Viceconti *et al.* 2020). A disruption or alteration in the normal processing of sensory information or motor functions in an area can lead to sensorimotor distortion (Wand *et al.* 2016). This may take the form of changes in the self-perception of body shape and size, and the sensations of pressure and temperature, and can affect motor control (Moseley *et al.* 2012). In pelvic pain, this may lead to changes in the perception of the internal and external pelvis. A large multicentre study of women with persistent pelvic pain who also had dyspareunia reported significant somatosensory distortion in the abdominopelvic region (Coxon *et al.* 2023). Alterations in the thermal, vibration and pressure-pain thresholds were observed in various groupings, with mechanical hyperalgesia the most common sensory phenotype. Widespread diminished pressure-pain thresholds and a high number of global pain sites have been observed in women with dyspareunia, which suggests a more-central pain mechanism (Terzi *et al.* 2015). This is supported by evidence of higher Central Sensitization Inventory scores, particularly in women with endometriosis and deep dyspareunia (Orr *et al.* 2020), and a negative genital image was found to be strongly associated with an increased likelihood of reporting dyspareunia (Pazmany *et al.* 2013).

Recent evidence suggests that incorporating graded sensorimotor training into treatment for chronic LBP, which was designed to alter how people process the sensory information from their painful area and how easily they move it, improves participants' function and pain at 12 weeks (Bagg *et al.* 2022). A small case series of women with dyspareunia described using similar treatments with mirror-based genital visualization and self-palpation proprioception exercises, which were intended to improve body perception alongside standard pelvic floor myofascial physiotherapy techniques (Pandochi *et al.* 2018). These authors reported immediate improvements in pain and sexual dysfunction, which persisted for 6 months. Somatocognitive

therapy incorporates genital self-perception treatment within education and sensory exercises, and its efficacy is being explored in a variety of persistent pelvic pain conditions, including symptoms of dyspareunia (Kaarbø *et al.* 2023).

Despite the movement away from prescribing PFMEs, physiotherapy treatment pathways for pelvic pain repeatedly contain elements of graded motor and sensory training that encompass these exercises. Examples include teaching an embodied understanding of genital anatomy and functional control of the pelvic floor through range (Bø *et al.* 2014), and tissue sensory accuracy through desensitization exercises, followed by graded exposure to any challenging stimuli, including loading of the PFMs (Vandyken & Hilton 2017) as the accuracy of self-perception improves. Since the body makes constant, nuanced predictions about the state of its tissues, pain is thought to occur as an embodied experience of a prediction error, or a perception of tissue threat (Kiverstein *et al.* 2022; Wand *et al.* 2023). If sensorimotor function is distorted, there is potential for a greater degree of uncertainty about the safety of tissues, which could drive the experience of pain. Theoretically, the accuracy of how fit for purpose bodily tissues are perceived to be could be enhanced by performing non-threatening exercises using novel sensory input while encouraging a focus on biofeedback (Wand *et al.* 2023), which may improve pain in turn. Much remains unknown about sensorimotor distortion in pelvic pain, and further work is required to understand the impact of treatments directed at the restoration of body perception in this area, but the rehabilitation of distorted interoception or poor internal awareness employing muscular exercises remains a longstanding pillar of physiotherapy practice.

Discussion

The present narrative literature review outlines an evidence-based rationale for using PFMEs to treat dyspareunia with no side effects and improved outcomes beyond strengthening. Pelvic floor muscle exercises appear to be a valid intervention for dyspareunia, especially when implemented with a specific aim, under supervision, and with a focus on precise contraction, relaxation and awareness, as opposed to automatic or non-specific execution. Depending on the condition related to dyspareunia and the treatment aim, PFMEs may improve muscle contractility and relaxation, enhance strength and endurance (preventing further overload and, thus, a potential increase in tension), improve blood flow, and benefit vaginal mucosal tissue condition and elasticity. Additionally, these could contribute to improvements in awareness of and motor acuity in the region.

Safety and the potential for harmful effects seem to be the primary concern when discouraging the use of PFMEs in conditions like dyspareunia. However, if implemented with proper education, instruction and supervision (at least during the initial assessment), and with a specific aim in mind, interventions incorporating PFMEs appear to be safe since no adverse events were reported in the literature reviewed (Table 1). Moreover, none of the studies included in Table 1 reported worse outcomes following PFME intervention after treatment compared to the baseline and/or control group.

The evidence suggests that the association between pain and PFM function is not straightforward: there are a number of physiological mechanisms to consider when deciding on treatment; and interventions may affect many mechanisms. Therefore, it is important to recognize that PFMEs may be useful depending on the predominant mechanism involved in any given pain presentation. These should be viewed as one of many possible modalities rather than a panacea with a one-size-fits-all application for every woman with PFM disorders. Moreover, it must be acknowledged that treating only the pelvic floor may not be sufficient, and interventions that include a top-down approach to centrally desensitize pain are necessary (Harte *et al.* 2018; Brumagne *et al.* 2019; Schrepf *et al.* 2020; Padoa *et al.* 2021). Nevertheless, PFMEs may play a role in physiotherapy interventions by serving as an important element of the multimodal treatment of dyspareunia. The present authors do not advocate that Kegel exercises involving dozens of repeated and sustained contractions should now become an essential part of dyspareunia therapy. However, discouraging PFMEs solely on the basis of the notion that they may be harmful in some cases involving pelvic pain (likely only when implemented incorrectly) may result in overlooking a nuanced point, and could lead to the dismissal of a potentially therapeutic treatment modality. The present paper demonstrates that PFMEs incorporating contractions may help muscle tone return to a theoretical normal value, enhance awareness, coordination, relaxation (following the performed contraction) and blood flow. All of these factors may contribute to achieving

the specific goals of dyspareunia treatment for an individual during the physiotherapy process. This perspective aligns with current concepts in other musculoskeletal pain conditions, such as LBP, osteoarthritis, neck pain and even rotator cuff pathologies, where physical activity and exercise interventions are preferred instead of bed rest (Verbunt *et al.* 2008; Lin *et al.* 2020; NICE 2020).

Clinical relevance

The present narrative literature review highlights the practical value of PFMEs in the multimodal physiotherapy treatment of dyspareunia, and provides a nuanced perspective and evidence-based guidance for healthcare professionals. This form of treatment has a variety of different applications, including the management of pain, and is used effectively within multimodal therapy without any reported side effects. Clinicians should tailor treatments to meet the specific needs of each patient, and PFMEs involving repeated contractions may not be a treatment of choice for each individual presenting with dyspareunia. The data presented above underscore the importance of acquiring a nuanced understanding of the literature and the way in which it is interpreted by clinicians, both on social media and in clinical settings, and our responsibility not to overlook potentially beneficial treatments. Clinicians are encouraged to adopt a balanced perspective that avoids oversimplification of a complex area of the literature. Rather than debating whether PFMEs are inherently good or bad for individuals with dyspareunia, considering the underlying rationale for their implementation to achieve therapeutic objectives may allow us to provide effective, evidence-based and individualized therapy.

Limitations

Some limitations of the present narrative literature review need to be highlighted, and among these is its narrative design. Although the authors intended to conduct broad searches, these were not specifically designed to address the topic, and therefore, they cannot rule out that some potentially relevant evidence may be missing. Moreover, some of the studies identified employed multimodal therapies and different dosages of PFMEs, and so the specific influence of PFMEs or training alone is difficult to ascertain. Another issue is related to potential harmful adverse events, which are often not well reported in physiotherapy studies (Carlesso *et al.* 2010). In fact, some of the studies included did not report the occurrence or absence of side effects in the interventions examined. Therefore, in order to further strengthen the conclusion about the safety of PFMEs, it is crucial that both research studies and clinicians implementing PFMEs in the population with dyspareunia thoroughly report any adverse events observed after treatment.

Conclusions

The present results suggest that PFMEs can contribute to multimodal treatment of dyspareunia. It is crucial to view these as a versatile tool applicable in various forms and for different objectives that extend beyond mere strengthening. Contrary to the common belief that PFMEs involving contractions are contraindicated in conditions related to dyspareunia, these have been widely implemented in research studies reporting positive results and the safety of the interventions implemented. We encourage clinicians to be mindful when making generalized statements, especially on social media, discouraging the use of PFMEs in conditions related to dyspareunia: they may overlook nuanced points within the literature and eliminate a potentially beneficial intervention. Future research incorporating PFMEs in treatment protocols should meticulously document the details and aims of this form of treatment, and any possible adverse events, to contribute to the growing body of evidence supporting the use of these diverse exercises in the multimodal physiotherapy treatment of dyspareunia.

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Weronika Solomon is a Polish physiotherapist and entrepreneur who graduated from Poznań University of Medical Sciences, Poznań, Poland, with both Bachelor's and Master's degrees. She also graduated from Tor Vergata University of Rome with a Master's degree in pelvic floor disorders, where she now teaches pelvic pain management. She is the co-owner of the Fisiomed Studio di Fisioterapia private practice in Adrano, Italy. Since university, Weronika has been particularly interested in pelvic pain and women's health. She teaches various courses across Europe, and is deeply engaged in research, frequently participating as a speaker at national and international conferences.

Jilly Bond is a pelvic health physiotherapist, doctoral researcher and educator with a specialist interest in pelvic pain. She worked in the National Health Service for nearly a decade before developing and leading a private hospital pelvic health service, and now works clinically near Cardiff, Wales. Over the past decade, Jilly has collaborated on numerous international pelvic pain research projects, sat on the POGP Board of Trustees, and is a regular speaker at national and international conferences on pelvic pain. She is in the process of completing a PhD looking at sensorimotor distortion in pelvic pain at Brunel University London and the University of South Australia, Adelaide, South Australia, Australia.

Małgorzata "Gosia" Starzec-Proserpio is a women's health physiotherapist, researcher and educator with international experience gained in Poland, the Czech Republic, Norway, Spain and Canada. She has dedicated her career to advancing perineal and pelvic health for women, and worked at leading women's health and sexology centres in Poland. Currently, Małgorzata divides her professional and personal life between Poland and Canada, where she is conducting a postdoctoral fellowship focused on pelvic pain at the Pelvic Health Research Laboratory at the Université de Sherbrooke. She is passionate about bridging the gap between research and practice to make science more engaging, accessible and user-friendly.

Search strategies used to identify studies for this review

No specifically designed search strategy was adopted for this article. However, the included studies were derived from other comprehensive searches conducted by the authors for the purpose of other reviews. Additionally, complementary searches were carried out in PubMed in December 2023, using a combination of keywords associated with dyspareunia, physiotherapy, and pelvic floor exercises.

SEARCH 1 PROSPERO CRD42022384450 (https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42022384450) conducted in January 2023 and updated in December 2023

PUBMED

#1 vulvodynia[Title/Abstract] OR vestibulodynia[Title/Abstract] OR vestibulitis[Title/Abstract] OR dyspareunia[Title/Abstract] OR "interstitial cystitis"[Title/Abstract] OR (Pelvic N2 (chronic[Title/Abstract] OR pain*[Title/Abstract] OR myalgia*[Title/Abstract] OR myofascial[Title/Abstract] OR "muscle tenderness"[Title/Abstract] OR "floor trigger point*"[Title/Abstract] OR "floor tension*"[Title/Abstract])) OR "genito-pelvic pain"[Title/Abstract] OR (penetration N2 disorder*[Title/Abstract]) OR (pain* N2 (bladder[Title/Abstract] OR vulvar[Title/Abstract] OR anorectal[Title/Abstract] OR anal[Title/Abstract])) OR (levator N2 syndrom*[Title/Abstract]) OR "proctalgia fugax"[Title/Abstract]

#2 ((((("Vulvodynia"[Mesh]) OR "Dyspareunia"[Mesh]) OR "Vulvar Vestibulitis"[Mesh]) OR "Cystitis, Interstitial"[Mesh]) OR "Pelvic Pain"[Mesh]

#3 #1 OR #2

#4 randomised[Title/Abstract] OR randomized[Title/Abstract]

#5 #3 AND #4

EMBASE

#1 (vulvodynia OR vestibulodynia OR vestibulitis OR dyspareunia OR 'interstitial cystitis' OR (pelvic NEAR/2 (chronic OR pain* OR myalgia* OR myofascial OR 'muscle tenderness' OR 'floor trigger point*' OR 'floor tension*')) OR 'genito-pelvic pain' OR (penetration NEAR/2 disorder*) OR (pain* NEAR/2 (bladder OR vulvar OR anorectal OR anal)) OR (levator NEAR/2 syndrom*) OR 'proctalgia fugax':ab,ti) AND [embase]/lim

#2 ('vulvodynia'/mj OR 'vulvar vestibulitis'/mj OR 'dyspareunia'/mj OR 'pelvic pain'/mj OR 'cystalgia'/mj OR 'anal pain'/mj OR 'proctalgia fugax'/mj) AND [embase]/lim

#3 #1 OR #2

#4 (randomised OR randomized:ta,ab) AND [embase]/lim

#5 #3 AND #4

MEDLINE via EBSCO

#S1 AB (vulvodynia OR vestibulodynia OR vestibulitis OR dyspareunia OR “interstitial cystitis” OR (Pelvic N2 (chronic OR pain* OR myalgia* OR myofascial OR “muscle tenderness” OR “floor trigger point*” OR “floor tension*”)) OR “genito-pelvic pain” OR (penetration N2 disorder*) OR (pain* N2 (bladder OR vulvar OR anorectal OR anal)) OR (levator N2 syndrom*) OR “proctalgia fugax”) OR TI (vulvodynia OR vestibulodynia OR vestibulitis OR dyspareunia OR “interstitial cystitis” OR (Pelvic N2 (chronic OR pain* OR myalgia* OR myofascial OR “muscle tenderness” OR “floor trigger point*” OR “floor tension*”)) OR “genito-pelvic pain” OR (penetration N2 disorder*) OR (pain* N2 (bladder OR vulvar OR anorectal OR anal)) OR (levator N2 syndrom*) OR “proctalgia fugax”)

#S2 (MM "Dyspareunia") OR (MM "Vulvar Vestibulitis") OR (MM "Vulvodynia") OR (MM "Cystitis, Interstitial") OR (MM "Pelvic Pain")

#S3 #1 OR #2

#S4 TI randomi#ed OR AB randomi#ed

#5 S3 AND S4

CINAHL via EBSCO

#S1 TI (vulvodynia OR vestibulodynia OR vestibulitis OR dyspareunia OR “interstitial cystitis” OR (Pelvic N2 (chronic OR pain* OR myalgia* OR myofascial OR “muscle tenderness” OR “floor trigger point*” OR “floor tension*”)) OR “genito-pelvic pain” OR (penetration N2 disorder*) OR (pain* N2 (bladder OR vulvar OR anorectal OR anal)) OR (levator N2 syndrom*) OR “proctalgia fugax”) OR AB (vulvodynia OR vestibulodynia OR vestibulitis OR dyspareunia OR “interstitial cystitis” OR (Pelvic N2 (chronic OR pain* OR myalgia* OR myofascial OR “muscle tenderness” OR “floor trigger point*” OR “floor tension*”)) OR “genito-pelvic pain” OR (penetration N2 disorder*) OR (pain* N2 (bladder OR vulvar OR anorectal OR anal)) OR (levator N2 syndrom*) OR “proctalgia fugax”)

#S2 (MM "Vulvodynia") OR (MM "Dyspareunia") OR (MM "Vulvar Vestibulitis") OR (MM "Interstitial Cystitis") OR (MM "Pelvic Pain")

#S3 #1 OR #2

#S4 TI randomi#ed OR AB randomi#ed

#S5 S3 AND S4

AMED via EBSCO

#S1 TI (vulvodynia OR vestibulodynia OR vestibulitis OR dyspareunia OR “interstitial cystitis” OR (Pelvic N2 (chronic OR pain* OR myalgia* OR myofascial OR “muscle tenderness” OR “floor trigger point*” OR “floor tension*”)) OR “genito-pelvic pain” OR (penetration N2 disorder*) OR (pain* N2 (bladder OR vulvar OR anorectal OR anal)) OR (levator N2 syndrom*) OR “proctalgia fugax”) OR AB (vulvodynia OR vestibulodynia OR vestibulitis OR dyspareunia OR “interstitial cystitis” OR (Pelvic N2 (chronic OR pain* OR myalgia* OR myofascial OR “muscle tenderness” OR “floor trigger point*” OR “floor tension*”)) OR “genito-pelvic pain” OR (penetration N2 disorder*) OR (pain* N2 (bladder OR vulvar OR anorectal OR anal)) OR (levator N2 syndrom*) OR “proctalgia fugax”)

#S2 TI randomi#ed OR AB randomi#ed

#S3 S1 AND S2

APA PsycInfo via EBSCO

#S1 TI (vulvodynia OR vestibulodynia OR vestibulitis OR dyspareunia OR “interstitial cystitis” OR (Pelvic N2 (chronic OR pain* OR myalgia* OR myofascial OR “muscle tenderness” OR “floor trigger point*” OR “floor tension*”)) OR “genito-pelvic pain” OR (penetration N2 disorder*) OR (pain* N2 (bladder OR vulvar OR anorectal OR anal)) OR (levator N2 syndrom*) OR “proctalgia fugax”) OR AB (vulvodynia OR vestibulodynia OR vestibulitis OR dyspareunia OR “interstitial cystitis” OR (Pelvic N2 (chronic OR pain* OR myalgia* OR myofascial OR “muscle tenderness” OR “floor trigger point*” OR “floor tension*”)) OR “genito-pelvic pain” OR (penetration N2 disorder*) OR (pain* N2 (bladder OR vulvar OR anorectal OR anal)) OR (levator N2 syndrom*) OR “proctalgia fugax”)

#S2 MM "Dyspareunia"

#S3 S1 OR S2

#S4 TI randomi#ed OR AB randomi#ed

#S5 S3 AND S4

SPORTDiscus via EBSCO

#S1 TI (vulvodynia OR vestibulodynia OR vestibulitis OR dyspareunia OR “interstitial cystitis” OR (Pelvic N2 (chronic OR pain* OR myalgia* OR myofascial OR “muscle tenderness” OR “floor trigger point*” OR “floor tension*”)) OR “genito-pelvic pain” OR (penetration N2 disorder*) OR (pain* N2 (bladder OR vulvar OR anorectal OR anal)) OR (levator N2 syndrom*) OR “proctalgia fugax”) OR AB (vulvodynia OR vestibulodynia OR vestibulitis OR dyspareunia OR “interstitial cystitis” OR (Pelvic N2 (chronic OR pain* OR myalgia* OR myofascial OR “muscle tenderness” OR “floor trigger point*” OR “floor tension*”)) OR “genito-pelvic pain” OR (penetration N2 disorder*) OR (pain* N2 (bladder OR vulvar OR anorectal OR anal)) OR (levator N2 syndrom*) OR “proctalgia fugax”)

#S2 DE "PELVIC pain"

#S3 S1 OR S2

#S4 TI randomi#ed OR AB randomi#ed

#S5 S3 AND S4

COCHRANE LIBRARY

#1 MeSH descriptor: [Vulvodynia] this term only

#2 MeSH descriptor: [Dyspareunia] this term only

#3 MeSH descriptor: [Cystitis, Interstitial] this term only

#4 MeSH descriptor: [Pelvic Pain] this term only

#5 MeSH descriptor: [Vulvar Vestibulitis] this term only

#6 (vulvodynia OR vestibulodynia OR vestibulitis OR dyspareunia OR “interstitial cystitis” OR (Pelvic NEAR/2 (chronic OR pain* OR myalgia* OR myofascial OR “muscle tenderness” OR “floor trigger point*” OR “floor tension*”)) OR “genito-pelvic pain” OR (penetration N2 disorder*) OR (pain* NEAR/2 (bladder OR vulvar OR anorectal OR anal)) OR (levator NEAR/2 syndrom*) OR “proctalgia fugax”):ti,ab,kw (Word variations have been searched)

#7 (randomised OR randomized):ti,ab,kw (Word variations have been searched)

#8 #1 OR #2 OR #3 OR #4 OR #5

#9 #6 OR #8

#10 #9 AND #7

SEARCH 2 https://doi.org/10.17605/OSF.IO/AJN3H conducted in July 2023

The following databases were searched: SCOPUS, Medline, CINAHL, APA Psychinfo, PubMed, CENTRAL, and Web of Science.

Population search terms	vulvodynia OR vaginismus OR dyspareunia OR endometriosis OR adenomyosis OR “Interstitial Cystitis” OR Coccydynia OR “Bladder pain syndrome” OR IC/BPS OR “Persistent genital arousal” OR Vestibulodynia OR Dysmenorrhoea OR “Proctalgia Fugax”) OR ((pelvic OR pelvis OR myofascial pelvic OR bladder OR anal) N2 Pain)
Outcome search terms	“self image” OR “embodiment" OR "percept* distortion” OR “Hypersensitivity” OR Illusion* OR “Tactile acuity” OR “Sensory motor integration” OR “Sensorymotor integration” OR “sensorimotor” OR “sensori-motor” OR “sensory perception” OR “somatosens*” OR “interocept*” OR “genital self-image” OR "somatocognitive therapy" OR “Quantitative sensory testing” OR “propriocept*” OR “(sensory N2 (“assessment” OR “testing” OR “characteristics”)) OR “pressure pain threshold” OR (“body” N2 (“image” OR “model” OR “sense” OR “perception” OR “awareness”))

SEARCH 3 complementary searches carried out in PubMed in December 2023

Population	**#1** vulvodynia[Title/Abstract] OR vestibulodynia[Title/Abstract] OR vestibulitis[Title/Abstract] OR dyspareunia[Title/Abstract] OR "pelvic floor myalgia"[Title/Abstract] OR "pelvic floor muscle tenderness"[Title/Abstract] OR "pelvic floor trigger point*"[Title/Abstract] OR "pelvic floor tension*"[Title/Abstract] OR "genito-pelvic pain"[Title/Abstract] OR “vulvar pain”[Title/Abstract] **#2** "Vulvodynia"[Mesh] OR "Dyspareunia"[Mesh] OR "Vulvar Vestibulitis"[Mesh] **#3** #1 OR #2
Intervention	**#4** physiotherapy[Title/Abstract] OR “physical therapy”[Title/Abstract] OR “pelvic floor therapy”[Title/Abstract] OR “pelvic floor exercise*”[Title/Abstract] OR “pelvic floor training”[Title/Abstract] OR “pelvic floor muscle exercise*”[Title/Abstract] OR “pelvic floor muscle training”[Title/Abstract]
#3 AND #4	