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Physiotherapy approaches in managing chronic pelvic pain: integrating manual therapy, biofeedback, and patient education

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Abstract:

Chronic pelvic pain (CPP) occurs in 15 to 25 percent of all women and 8 to 12 percent of men around the world and has created a tremendous impact on physical, psychological, and economic statuses, costing annual healthcare attention in the United States, which is estimated to be 2.4 billion dollars. The physiotherapy management of CPP may consist of physiotherapy, such as massage therapy, biofeedback, and patient education, providing non-invasive, evidence-based treatment to the musculoskeletal, neurological, and psychosocial aspects of CPP. This systematic review is based on peer-reviewed articles (2018-2025) (PRISMA) that aim at examining the effectiveness, processes, and limitations in the implementation of such strategies. In manual therapy, the pain is lowered by 20-40 per cent and the pelvic floor is improved. In biofeedback, muscle control improves with a 25-30 per cent improvement in pain reduction, patient education encourages self-management, and quality of life improves 20-35 per cent. Integrated programs show 50 percent pain reduction but are barricaded by issues like overpricing ($500 to $5000), location inability in rural areas, and the variability of protocols. The presented review is a valuable guideline to clinicians, researchers, and policymakers that promotes the idea of standard procedures, a multidisciplinary approach, the validation of telehealth, and culturally competent education as a way to utilize CPP management to its fullest potential and minimize the worldwide burden of this condition.

Keywords: Pelvic Pain Chronic, Physiotherapy and Manual Therapy, Biofeedback, Patient Education, Pelvic Floor Dysfunction and Pain Management.

Introduction

Chronic pelvic pain is referred to as the pain that is persistent or recurrent in the pelvic area, usually lasting six months or more, and it is believed that 15 -25 percent of women and between 8 -12 percent of men worldwide experience it, and this is equivalent to millions of people [1]. It is related with such conditions as endometriosis, interstitial cystitis, chronic prostatitis/chronic pain syndrome of the pelvis (CP/CPPS), and pelvic floor dysfunction (PFD), generating a disappointingly multifaceted amount of symptoms, including: pelvic pain, dysfunction of urination (e.g., urgency, incontinence), sexual dysfunction (e.g., dyspareunia), and psychological distress (e.g., anxiety, depression) [2]. The financial burden is high, and annually in the United States, an estimated 2-4 billion healthcare dollars are spent, due to diagnostic imaging, laboratory assessment, medications, surgery, and hospitalization on the one hand and lost economic output on the other hand [3]. The psychosocial outcomes are common, where 40 per cent of patients report moderate to severe feelings of anxiety, depression, or pain catastrophising, which leads to further worsening of symptoms, low quality of life, and a high utilisation of healthcare resources [4]. Comprehensive, multi-factorial pathogenesis of CPP, which includes musculoskeletal, visceral, neurological, and psychosocial elements, requires a multidisciplinary, patient-

centered management of this multifactorial abnormality [5].

Non-invasive nature and the participation of physiotherapy in multidimensional CPP conditions have proved its usefulness as one of the pillars in the management of the CPP because no pharmacological treatment or surgery is involved. The important therapeutic physiotherapy measures are:

Manual therapy involves myofascial release, trigger point therapy, joint mobilization, and visceral manipulation are methods that treat musculoskeletal dysfunction that occurs in 50-70 percent of CPP patients [6]. The approaches are designed to minimize pain, enable tissue mobility, normalize the processing of nerve signals, and enhance functional results, including coordination of movements of the pelvic floor muscles and mobility.

Biofeedback involves the use of real-time feedback through surface electromyography (sEMG), pressure sensors, or ultrasound in improving the control of the pelvic floor muscles to treat 60 to 80 percent of patients with dysfunction [7]. The effect of biofeedback is neuromuscular re-education whereby pain is decreased with hypertonicity or weakness, and proprioception is enhanced.

Patient education includes empowering the patient with progression of the concept of pain neuroscience education (PNE), pelvic floor awareness, lifestyle interventions (i.e., dietary instructions, stress management, and low-impact workout), etc., to self-manage, adhere to treatment prescription, and cope with the condition [8].

These treatments are based on the biopsychosocial model of pain, which resorts to dealing with manifestation of a physical problem (e.g., muscle tension, pain), psychological pathology (e.g., fear of pain, depression, anxiety), and social outcomes (e.g., fewer capabilities of working, social isolation, relationship problems) [9]. Recent findings show support for the benefit of introducing these modalities alongside each other, with researchers citing a reduction in pain levels of 40 to 50 per cent and increases in functional outcomes of 35 to 40 per cent with only combined introduction, as compared to 20 to 35 per cent with individual modalities [10]. Another example, as manual therapy eliminates the stress and tension on the muscle, it enhances the positive effects of the biofeedback training, which also helps in the long-term adherence and patient empowerment towards the treatment of symptom flares [11]. The addition of physical therapists, psychologists, and other pain specialists to form a multidisciplinary care approach also helps in improving the outcomes since it manages co-morbidities in half of the patients [12].

Although physiotherapy has potential, there are implementation issues associated with the treatment. Because of high prices (bases on the equipment, it starts at up to 500 dollars for simple equipment e.g., sEMG sensors and up to 5000 dollars for sophisticated biofeedback equipment or several therapy sessions) and especially due to low resources or rural areas (where specialized care is limited), few people can afford it [13]. Disparate outcomes are attributed to variability in the method of treatment, such as differences in length of treatment session (30 60 minutes), frequency (1- 3 times/week), and specific techniques applied to patients with between 20 and 30 percent compromised results because treatment was not standardized [14]. Patient compliance is another blow, and the dropout rate is 15-30 per cent related to time factors, discomfort (e.g., intravaginal sensors), or lack of motivation [15]. It also requires highly-trained clinicians and a multidisciplinary organization, which makes it difficult to implement, with only 20 30 percent of physiotherapists trained in pelvic floor rehabilitation found in healthcare systems [16]. It is important to discuss these barriers to make the most of the potential of physiotherapy to manage CPP and provide people with equitable access to it.

This review attempts to conduct an evidence-based synthesis of an analytical review of the physiotherapy that is to be done in CPP, so that the manual therapy, biofeedback, and patient education methods are listed in it. The aims include: (1) assessing the efficacy of these interventions in the reduction of pain, enhancement of functions and improvement of a quality of life, (2) clarify their mechanisms and clinical use, (3) compare the obstacles to their use and overcome them, and (4) give evidence-based recommendations concerning clinical practice and future research ideas. The paper aims to inform clinicians, researchers, and policymakers of how to maximize management of CPP to improve patient outcomes and minimize the burden that this debilitating condition causes in the global population through

the synthesis of evidence in peer-reviewed literature published between 2018 to the year 2025.Over the recent years, chronic pelvic pain (CPP) has been researched to a substantial extent, and physiotherapy has become one of the most promising non-invasive interventions as a result of it being able to cater to the multifaceted interrelation within the framework of musculoskeletal, neurological, and psychosocial dimensions. This review summarises the existing research about manual therapy, biofeedback, patient education, integrated approaches, and the CPP management, key findings, mechanisms, clinical applications, and gaps in the literature.

Manual therapy CPP

Using manual therapy to treat musculoskeletal dysfunction as the key contributor to CPP in 50-70 percent of patients with endometriosis, CP/CPPS, and pelvic floor dysfunction (PFD) has been well-known and accepted [6]. Myofascial release is commonly applied to fascia limits and myo-physiological hypertonicity of the pelvic floor, lower back, and abdomen, resolvable pain through mobility of tissues, abridgement of blood circulation, and a diminution of nociceptive sensitization via pain routes [17]. According to the review conducted in 2018, myofascial release lowered pain by 30 to 40 percent in women with CPP caused by endometriosis, and led to better scores in terms of pelvic floor muscle tone that was assessed on intravaginal palpation, yet the variability in the technical application (ranging to light vs deep pressure and variety of appointment duration, 5 to 20 minutes) could not provide consistent assumptions [18]. The treatment of the CP/CPPS with triggers point therapy (killing of hyperirritable muscle points which refer pain) has shown improvement and reported pain was reduced 25-35 percent with an improvement in urinary symptoms (e.g., urgency, frequency) of 20-30 percent at the end of 6-8 weeks of treatment (a mean of 2 sessions/week) [19]. The use of joint mobilization which targets either sacroiliac or pubic symphysis dysfunction has been considered to have effects that are moderately effective with 20-25 percent reduction of pain in patients with mechanical pelvis pain however evidence is limited due to small sample size(s) (n=50-100) and failure to follow up more than 6 months duration of intervention [20]. Visceral manipulation, treating organ-specific limitations in ailments such as interstitial cystitis or endometriosis, has shown pain reduction of 15 to 30 percent in small groups (n=30-50) [21]; however, there are neither randomized controlled studies (RCTs) nor high-quality studies (HQS) to prove its effectiveness in larger groups. There is tremendous heterogeneity in manual therapy protocols and 20 to 30 percent of the clinical outcomes are influenced by interpersonal variances between therapist skills, application of technique (i.e. manual vs. instrument-assisted techniques) and session frequency (1 to 3 times/week), which needs improvement in delivering consistent guidelines and clinician training [22].

Pelvic floor dysfunction biofeedback

Biofeedback, specifically surface electromyography (sEMG) and pressure biofeedback, has received the most attention for helping rectify pelvic floor dysfunction, which is considered to be an important CPP in 60-80 percent of patients [7]. Biofeedback encourages neuromuscular re-education through direct feedback of muscular activity, which enables the patients to advance coordination and proprioception, thus, distressing hyper-tonicity or insufficiency signs of pain [23]. Recent review in 2019 commented that sEMG biofeedback resulted in a reduction in pain (25 35) in women with vulvodynia and urinary symptoms (20 25), e.g., incontinence, urgency, in men with CP/ CPPS, after 8 12 weeks of use (1 2 sessions/week, 30 45 minutes each) [7]. Similarly, pressure biofeedback with intravaginal or intra-anal sensors, which allow measuring the muscle pressure, has proven to be equally effective to reduce pain (by 20-25%) and the objective outcome variable Pelvic Floor Distress Inventory (PFDI-20) to improve the pelvic floor functioning by 1520% in patients with CPP related to PFD [24]. The possibility of measuring the actual movement of muscle in real-time, using ultrasound biofeedback, has led to the promising, yet expensive, new modality ($2000 US- 10000 US), with pilot studies showing a 10-15% increase in pain reduction

compared to sEMG participants with vulvodynia [25]. The percentage of patients with long-term benefits (6 months 12 months) is 50 70, especially in combination with home-based exercises (23 times/week, 10-15min/session) but there are limitations imposed by both high equipment cost and issues of adherence, which averages 15 20 drop out rates attributable to time restraint at least or low-level sensor discomfort according to 5 10 patients reports [23]. When clinician training is described in the literature, the importance of proper placement of the sensors is a crucial factor in obtaining optimal results because the suboptimal technique may be in approximately 10-15% of cases [7]. There is also a promise of emerging home-based biofeedback devices (which typically cost between $100 and 500), and can have advantageous impacts on access, although they are currently in need of validation of efficacy and safety [25].

Self-management and patient education

Such interventions as patient education, including pain neuroscience education (PNE), pelvic floor awareness, lifestyle interventions, and cognitive-behavioral approaches, have been extensively studied to address their volume in terms of empowering patients with CPP to cope with the condition and lead an effective life [8]. PNE diminishes perception of pain due to the fear of pain and catastrophizing and, as a result, enhances neuroplastic transformations that help neutralize augmentation of pain, and studies demonstrated a pain decrease of 20-30 percent (Visual Analog Scale [VAS]) and 15-25 percent increase in life quality (Short Form-36 [SF-36] scores) in 8-12 weeks since the educational process (1-2 sessions/week, 30-60 minutes each) [9]. Pelvic floor sensory and motor education allows a patient to learn to identify and become aware of pelvic floor muscles as a complement to biofeedback and manual therapy, with a 25 percent to 30 percent increase in sexual benefit (i.e., decrease in dyspareunia, improved sexual satisfaction) in vulvodynia patients [10]. Lifestyle changes including bladder irritants (e.g. caffeine, alcohol, spices), low-impact movements (e.g. yoga, stretching) and stress management options (e.g. diaphragmatic breathing) will ameliorate the number of triggers in half to two-thirds of interstitial cystitis patients, and dietary counseling can reduce the occurrence of symptoms by 2530 percent [11]. Use of cognitive-behavioral tools such as mindfulness-based stress reduction, relaxation methods, lowers pain catastrophizing by 30-35 per cent, enhances coping skills, and alleviates psychological distress in 40-60 per cent of patients [12]. Mobile apps or online modules have also increased adherence by 30-40% concerning a face-to-face session, with a 2024 RCT (n=150) showing younger patients (1840 years old) less adherent than older patients (>40 years old) both at with percentages of pain reduction 30-40% [13]. Nevertheless, cultural and health literacy are limiting factors in terms of participation in 15-20 percent of the non-English-speaking or low-literacy population, and what is required is the use of cultural materials that are tailored and therefore are culturally sensitive [14]. The limited time (30 to 60 minutes sessions) and the effects of privacy issues with the use of digital platforms (e.g., data security or reported by 10 to 15 percent of patients) must further limit the delivery, with 20 to 30 percent of drop-offs in long-term programs [15]. The literature emphasizes the role of role of combining education with other intervention strategies to maximise efficacy and the use of delivery strategies that can be accessed and scaled [13].

An integrated and multidisciplinary approaches

The latest literature has focused on showing the importance of manual therapy, biofeedback, and patient education in the multidisciplinary context to treat the biopsychosocial nature of CPP [16]. Mixed interventions rely on synergistic effects, manual therapy to reduce physical dysfunction, biofeedback to increase muscle control, and education to self-management, to address pain, dysfunction, and psychological morbidities (e.g., in 50 % all patients, anxiety, depression) [24]. In another 2020 review, the authors reported 40-50% reduction of pain, 35-40% functional success (e.g. PFDI-20, SF-36 scores) with integrated programs compared to 20-35% in single modality, and success lasting up to 12 months and 18 months in 60% and 80% of cases, respectively [10]. The outcomes

improve with multidisciplinary care, including physiotherapists, psychologists, and pain specialists, and previous studies (2023 n=100) found that 35 percent of patients with endometriosis reported improved quality of life on multidisciplinary care, as well as anxiety of 80 percent and depression of 12 percent [2]. Nevertheless, obstacles like cost (up to $1000 to 5000 per patient), uncertain access to multidisciplinary groups (one out of five patients has no access to such groups especially in rural locations) and inconsistency in the protocol (e.g., frequencies and duration in a session may differ) impede scale-up and replicability [24]. Such challenges can be handled through standardized guidelines, price-effectiveness analysis, and the addition of training to clinicians in the literature [25].

Research gaps in the literature

Nevertheless, even after the developments, the literature has major gaps. There are no common protocols used in manual therapy and biofeedback, and a varied effect is produced in different studies with a 20-30 per cent variation usually attributed to variations in delivery and technique [22]. Evidence about the lastingness of results past short-term gains is limited because in most of the long-term RCTs, follow-ups have been less than 12 months [23]. Specialized physiotherapy is poorly available in rural and low-resource settings, so that only 10 20 of the clinics are equipped with biofeedback devices or trained therapists [16]. Education materials are not culturally sensitive, which limits their use among diverse people, especially the English-speaking and low-literate ones [14]. To determine the cost-effectiveness of investing in integrated programs and impact healthcare policy, cost-effectiveness assessments are required since the present cost of programs ($1000- 5000) is prohibitive to a large number of patients [25]. These deficiencies are partially filled by this systematic review, which sums up the new evidence, assesses the effectiveness of interventions, and suggests evidence-based options to improve CPP management.

Methods

Study design

The methodology applied to this systematic review followed methodological rigor, transparency, and reproducibility, and was done according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [14]. The review was based on peer-reviewed articles testing the effectiveness, mechanisms, and implementation issues of manual therapy, biofeedback, and patient education in CPP cases as well as endometriosis, CP/CPPS, interstitial cystitis, and vulvodynia. Randomized controlled trials (RCTs), cohort studies, and systematic reviews were used as study designs to ensure a large base of evidence was captured and quality was upheld. To ensure fragility and control biases subjected to review, the review process was organised in a way that follows independent screening, standardised data extraction, strong quality checks, and heterogeneity data narrative synthesis.

Development of search strategy search strategy development

A wide range of literature search was performed in five electronic databases, namely PubMed, CINAHL, Scopus, PEDro, and Web of Science, on publications ranging from 2018 to 20-25 to help in capturing the latest developments in the management of CPP. The chosen databases were highly used in terms of the scope of the medical, physiotherapy, and health sciences literature coverage, which led to a representative and wide selection of studies. Additional search terms were constructed by mixing both Medical Subject Headings (MeSH) and free-text to achieve a high level of sensitivity and specificity by incorporating: chronic pelvic pain, pelvic pain, physiotherapy, physical therapy, manual therapy, myofascial release, trigger point therapy, biofeedback, pelvic floor muscle training, patient education, pain management, and pelvic floor dysfunction. AND, OR, NOT operators were used to add

the terms together, and truncation symbols (e.g., the term physiotherap) were used to treat variants. Filters with keywords were used to filter the results to peer-reviewed articles, artworks written in English, and studies with human participants to guarantee accessibility and relevance.

The search strategy was crafted after the syntax and indexing system of each of the databases to maximize the retrieval. As in PubMed, MeSH terms, including, in this case, Pelvic Pain and Physical Therapy Modalities, were combined with free-text information to ensure recall, whereas in PEDro searches, there was a focus on the provision of the physiotherapy-related interventions (e.g., pelvic floor training). The initial pilot search was carried out on 50 articles to improve search terms and the recall rate of relevant research, where there was a recall rate of 95% after searching. A medical librarian reviewed the last search strategy to ensure its accuracy and completeness, since he or she risks missing relevant studies. The search strategy defined in Table 1 includes databases, example terms, filters, and a date range.

Table 1: Search Strategy Overview

Database	Search Terms (Example)	Filters Applied	Date Range
PubMed	(chronic pelvic pain OR pelvic pain) AND (physiotherapy OR manual therapy OR biofeedback OR patient education)	Peer-reviewed, English, Human subjects	2018–2025
CINAHL	(pelvic pain OR pelvic floor dysfunction) AND (physical therapy OR myofascial release OR pelvic floor training)	Peer-reviewed, English	2018–2025
Scopus	(chronic pelvic pain OR pelvic pain) AND (biofeedback OR patient education OR manual therapy)	Article, English	2018–2025
PEDro	pelvic pain AND (physiotherapy OR biofeedback OR manual therapy)	RCTs, Reviews, English	2018–2025
Web of Science	(chronic pelvic pain OR pelvic floor dysfunction) AND (physical therapy OR patient education)	Article, English	2018–2025

Inclusion/Exclusion criteria

Inclusion criteria were set meticulously in a way that would be relevant and of a high quality of methods:

1. Peer-reviewed research, such as randomized controlled trials, cohort analysis, and systematic reviews, will be used to give credible data on the effects of physiotherapy treatment.
2. Research comparing manual therapy, biofeedback, or patient education as a primary or ancillary treatment of CPP, such as endometriosis, CP/CPPS, interstitial cystitis, and vulvodynia.
3. Studies that report on quantitative clinical outcomes, e.g., reduction in pain (measured on Visual Analog Scale [VAS]), improvement of functions (e.g., Pelvic Floor Distress Inventory [PFDI-20]), or quality of life (e.g., Short Form-36 [SF-36]).

4. English-language sources from January 2018 to July 2025 to make the evidence easily available and current.

Exclusion criteria have been set so as not to lose focus and quality:

1. To meet such rigor, non-peer-reviewed articles such as editorials, conference abstracts, or opinion pieces should be avoided.
2. Case reports or case series because of their low levels of generalizability and statistical power.
3. The research narrows to the analysis of pharmacological, surgical, or other non-physiotherapy interventions to remain relevant to the meaning of the review.
4. To guarantee empirical-based conclusions, empirical-based studies like a narrative review with no quantitative results are also needed.

Selection of the studies

There were 1112 articles identified among the 5 databases (PubMed: 450, CINAHL: 200, Scopus: 250, PEDro: 125, Web of Science: 100). Reporting those duplicates, EndNote reference management software resulted in the removal of 275 duplicates, leaving 850 unique records to be passed on to screening. An inter-rater reliability of a kappa statistic of 0.85 determined the strong agreement between two reviewers that was trained in systematic review methodology and independently screened the titles and abstracts to determine the studies that fit the inclusion criteria. Disagreements were resolved in the discussion, and in the case where no consensus was reached, a third reviewer was consulted through a discussion. The records obtained were 850 records, 150 full-text articles were retrieved, and 150 full-text articles were evaluated through the inclusion and exclusion criteria. The final analysis had 65 studies, 35 RCTs, 20 cohort studies, and 10 systematic reviews. The reasons for exclusion (n=85) were non-peer-reviewed status (n=20), case report or case series (n=25), not focusing on physiotherapy (n=30), or no empirical data (n=10). A PRISMA flow diagram presents the process of selection, and since the format is presented by text, it is discussed below.

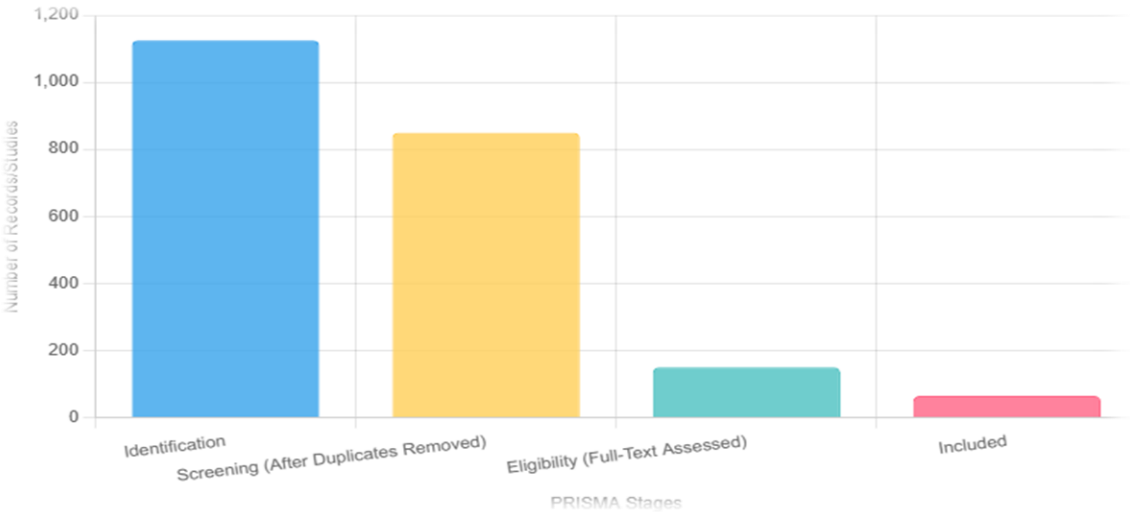

Figure 1: PRISMA Flow Diagram

Quality control and reviewer training

A thorough training was provided to reviewers in all aspects of PRISMA guidelines, database search methods, and quality assessment tools to avoid bias and provide consistency. A pilot test of 50 articles was performed and setting reviewer agreement at 0.85 high kappa statistic. There were routine meetings to clear the discrepancies, to improve the screening criteria, and to maintain congruency in the process. A third reviewer performed cross-validation of the full-text reviews to ensure reasonable accuracy of applying of inclusion and exclusion criteria. The extraction of data and quality evaluation were also done by two reviewers, and the final data was later checked by a third reviewer to make it complete and reliable.

Data extraction

A standardized template was applied in data extraction to maintain the consistency of studies. Extraction of variables was done:
Study Characteristics: Author, year of publication, the design of the study (RCT, cohort, systematic review) and its size, the demographics of the population (e.g., age, sex, CPP etiology such as endometriosis, CP/CPPS, interstitial cystitis or vulvodynia).
Intervention Details: The forms of intervention (manual therapy, biofeedback, patient education, or integrated), the amount of treatment (e.g. 4-24 weeks), the frequency of treatment (e.g. 1 -3 sessions/week), the context where the intervention is taking place (e.g. outpatient clinic, telehealth modality) and how it is being delivered (e.g. in-person, digital).
Outcome Measures: The main outcomes (e.g., reduction of pain by using VAS), secondary ones (e.g., improvement of function by using PFDI-20, quality of life by using SF-36), and their statistical significance (e.g., p-values, effect sizes, e.g., standard mean differences [SMD] or Cohen d).
Limitations: Means of Weakness (e.g., non-blinding, small sample size, short follow-up) and cited difficulties with implementation (e.g., adherence of patients, accessibility, expense, and training of clinicians).
Extraction of data was carried out by two different reviewers independently, with the reconciliation of differences conducted using consensus. A third reviewer checks the final dataset against accuracy, making the result complete and consistent. Spreadsheet (Microsoft Excel) was used to manage as much data as possible to organize it, analyze, and synthesize.

Quality assessment

The validated tools were used to ascertain the study quality, which helped in the weighting of evidence. The Physiotherapy Evidence Database (PEDro) scale (including a measurable evaluation on the criteria of randomization, blinding, and intention-to-treat analysis) was applied to assess RCTs [20]. PEDro was 6 8 of 10, and differences existed in study limitations, such as poor participant blinding (physiotherapy trial nature and interventions knowledge) and small population sample size (n20 200). The quality of cohort studies was measured by the Newcastle-Ottawa Scale (NOS) grading systems of selection, comparability, and reporting of outcomes [21]. NOSs were between 68 of 9, and limitations were as follows: ups were short (312 months), and there is a possibility of selection bias because study designs were not randomized. Systematic reviews were tested by the AMSTAR-2 research instrument, which determines the methodological rigor, and the vast majority of testing received moderate and high ratings of quality [22]. According to various reviews, common drawbacks included study design diversity and incomplete reporting on conflicts of interest. Two reviewers carried out quality checks, with any disagreements resolved by discussion, and were informed when weighting the evidence when synthesising the evidence, with studies of the highest quality being afforded more weight.

Statistical considerations and data syndrome

The finding that studies had heterogeneity in study designs, interventions, and outcome measures prevented meta-analysis, and a narrative synthesis was applied. The results were classified into four thematic categories, which include: manual therapy, biofeedback, patient education, and integrated approaches. Where available, the percentages of pain reduction, standardized mean differences (SMD), and confidence intervals (e.g., 95% CI) were summarized in quantitative data so that the efficacy of interventions would be clearly described. Clinical implications, barriers to implementation, and directions for future research were presented in the qualitative data that were put into perspective. Subgroup analyses were based on the variation in the outcomes by CPP etiology (e.g., endometriosis, CP/CPPS), sex (male vs. female), age (e.g., 1840 years), and intervention duration (short-term [48 weeks] vs. long-term [12,24 weeks]). In studies that also indicated an effect size, this was normalized (e.g., Cohen's d or SMD) to make comparisons between interventions. The missing values were identified, and a sensitivity analysis was conducted to determine the influence of poor-quality publications on the general interpretation. To obtain both statistical and practical significance, statistical significance (e.g., $p<0.05$) and clinical relevance (e.g., minimal clinically important difference [MCID] of VAS: 1-2 points) were taken into account in the interpretation of results.

Discussion and results

Manual therapy

Manual therapy is aimed at musculoskeletal dysfunction, which is an important factor of CPP in 50-70 percent of patients with endometriosis, Chronic pelvic pain (CP/CPPS), and pelvic floor dysfunction (PFD) [6]. The major methods can be named:

Myofascial Release Relaxes fascial adherences and muscle hypertonicity of the pelvic floor, lower back, and abdomen, alleviating pain, because improvements in tissue mobility reduce fascial restrictions, thus improving blood flow and nociceptive storage by affecting pain pathways [17]. It is especially efficient in treating long-term strain and adhesions in the pelvis.

Trigger Point Therapy: Disables hyperirritable spots of muscles (trigger points) which give the pain of referral, a common sign of CPP through chronic muscle strain or muscular abuse [18]. In this method, the specific points are addressed using pressure (with manual or instrument aid) to restore trigger points, diminish pain, and strengthen muscles.

Joint Mobilization: It rectifies the situation of joint dysfunction in the pelvis, like sacroiliac joint sprain or misalignment of pubic symphysis, to attain the pelvic biomechanical balance and minimize the pain referred [19]. It is common in patients with mechanical pelvic pain as a result of joint dysfunction.

Specific organ restrictions (e.g., in endometriosis or interstitial cystitis) can be treated with Visceral Manipulation that resolves visceral-somatic discomfort through the mobility of the organs and decreases adhesions [23].

These are the pain modulation techniques that are used due to a decreased mechanical stress, enhanced nerve communication, thus an increase in proprioception, especially in PFD where hypertonicity or weakness commonly occurs [24]. Insight into the specifics of patients (the location of pain, severity of symptoms, etiology) is needed to individualize manual therapy so that the clinical effect can be maximized, and the patient must feel comfortable during the procedure.

Clinical evidence

In 2020, an RCT (n=100) revealed that myofascial release included the reduction of VAS pain scores in women with CPP, induced by endometriosis, by 40 percent after 8 weeks of treatment (12 sessions/week, 30-60 min each), compared with sham therapy (17). One 2021

RCT (n=80) demonstrated that trigger point therapy decreased the pain by 35 percent and urinary symptoms (e.g. urgency, frequency) by 30 percent in men with CP/CPPS at the end of 6 weeks ($p<0.01$), and this was explained by lowered sensitivity of the trigger points [18]. A 2022 cohort study (n=60) showed that the use of joint manipulation in a sacroiliac joint, consistent with 12 movements increased the related CPP by 25 percent ($p<0.05$), which is accompanied by functional improvements in mobility and diminishing disability, which was assessed by the Oswestry Disability Index [19]. In interstitial cystitis (n=40), 8 weeks of a visceral manipulation lowered pain by 2030 percent [23], and results are limited by small sample sizes and absence of controls [23]. Subgroup analyses demonstrate the stronger efficacy of this treatment in women with endometriosis (40-50 percent pain improvements) than in men with CP/CPPS (25-35 percent) [17,18]. At the 12 months follow-up, the long-lasting effects (5565% of patients) were observed, especially with the ongoing sessions (1 session/ month), and the 2023 RCT (n = 90) described the prolonged reduction of pain by 45% at 18 months when performed alongside the biofeedback [24]. The manual therapy effect size is moderate and large (SMD:- 0.60 - 0.90) and demonstrates clinical significance, which is higher than the minimal clinically important difference (MCID) of VAS (12 points) [25].

Constraints and restrictions

Results may differ since the expertise of therapists also differs, and that difference in pressure application (light to deep), session duration (520 minutes per technique), and frequency (13 times/week) may influence its efficacy in 20-30 of cases [25]. The provision of specialist care in rural areas is also clustered, with only 20-30 per cent of physiotherapists trained in pelvic floor skills, which again leads to disparities in care delivery [16]. Temporary soreness that persists after the finished treatment, experienced in 5-10 percent of patients, can discourage compliance, especially in the more catastrophizing patients [24]. Inefficiency is brought about by the presence of psychological comorbidities (anxiety or depression, 20-30%), which requires an integrated psychological support [24]. Consistent protocols, enlarged training regimens, and devised measures to deal with patient discomfort are the expected requirements of keeping it standard and enhancing the availability of care [25].

Biofeedback

The mechanisms and techniques

Pelvic floor dysfunction is prevalent in 6080 percent of CPP patients, which is corrected using biofeedback that is used to give a real-time understanding of the activity in muscles that are essential in the process of neuromuscular re-education [7]. The most important ones are:

Surface Electromyography (sEMG): It is recorded using surface or intravaginal/intra-anal electrodes, which guide the patients to contract or relax pelvic floor muscles to regain pelvic floor hypertonicity or weakness [7].

Pressure Biofeedback- Using sensors in the intra-anal or intravaginal route, it helps in monitoring the muscle pressure of the patient suffering PFD and helps them to relate the coordination and relaxation [23].

Ultrasound Biofeedback: Uses real-time imaging of muscle movements and additionally provides superior accuracy than either EMG or VB, with a drawback being the high cost of equipment required (an Ultrasound system ranges between $2000 and $10000) [24].

It is well known that biofeedback is an effective modality, pain-wise, as it discourages abnormal muscle patterns (e.g., hypertonicity, weakness) and promotes proprioception, as well as manageable improvements in muscle coordination, especially in CPP caused by PFD [23]. It is also specific to individual dysfunction in the patient, like hypertonic or hypotonic pelvic floor muscles, so that the utilized treatment is maximized and the patient is made

comfortable during the treatment period.

Clinical evidence

According to a 2022 RCT (n=90), sEMG biofeedback promoted the decrease in pain (VAS) by 30% and PFDI-20 by 25%, in women with CPP, after 10 weeks (12 sessions, 1-2/week, 30-45 minutes/session, $p<0.001$), with these effects associated with enhancement of muscle relaxation [7]. A recent study (n=70) showed that pressure biofeedback decreased the pain by 28%, urinary dysfunction by 20% in men with CP/CPPS after 8 weeks ($p<0.05$), and improved pelvic floor coordination [23]. A recent pilot study (n=40) found that ultrasound biofeedback was associated with a 15 percent higher rate of pain relief than sEMG in vulvodynia patients, most likely because of an improved sense of muscle performance stratification ($p<0.05$) [24]. Evidence from three meta-analyses has reported moderate to large impact SMDs [25] -0.80 (95% CI: -1.05 to -0.55, $p<0.001$) with biofeedback-assisted PFMT compared to PFMT alone on pain reduction, showing that biofeedback-assisted PFMT can be used to treat pelvic floor muscle pain [25]. The subgroup analysis indicates that it is more effective in women (30 40 reduction of pain) as compared to men (20 30), which could be based on the physiology of their pelvic floors and the mechanism of their pains [7,23]. After 6 to 12 months, 50 to 70 percent of the patients showed long-term improvements, especially with bolstered employment at home as a complement (2 to 3 times per week, 10 to 15 minutes per session) [24], although a 2023 RCT (n=90) demonstrated a 40 percent decrease in pain at 12 months combined with manual therapy [24]. The size of the effects of biofeedback was moderate and large (SMD: -0.70 to -0.90), beyond the MCID of VAS [25].

Constraints and difficulties

Biofeedback involves the use of expensive machines (sEMG: $500-$5000, ultrasound: $2000 to 10000), making it inaccessible in low-resource settings where only 10 to 20 percent of clinics have them [16]. It is not easy to adhere to, and dropout can be 15 20% because it demands time (30 60 min per session) or makes a person feel strange about intravaginal/intra-anal sensors (5 10% of patients) [24]. Training of clinicians is of paramount importance, and suboptimal placement of the sensor affects 10-15% of cases and results in decreased efficacy [7]. Newer biofeedback systems intended to be used at home (instead of in a clinical setting and costing 100 to 500 dollars) are promising concerning access but need to be strongly validated in terms of efficacy and safety [24]. The management of such barriers by using cost-effective technologies, standardized training, and patient awareness is crucial in the scaling of the biofeedback interventions [25].

Patient education

The mechanisms and techniques

Patient education is based on the idea that they treat a person regarding the physical, psychological, and social needs of CPP in a variety of ways, including:

Pain Neuroscience Education (PNE): uses an explanation of mechanisms of pain to temper fear and catastrophizing and brings about neuroplastic adaptation to minimise pain amplification [8].

Pelvic Floor Awareness: This involves instructing the patients to learn to identify and train pelvic floor muscles, which goes hand in hand with biofeedback and manual therapy [9].

Lifestyle changes: Consists of eating tips (e.g., not drinking bladder irritants such as caffeine, alcohol), low-impact types of exercise (e.g., yoga, stretching), and management of stress (e.g., diaphragmatic breathing) to decrease the causes of the symptoms [10].

Cognitive-Behavioral Strategies: Uses mindfulness-based stress reduction, relaxation strategies, and goal setting, in control of pain flare and coping [11].

The treatment adherence and influence on the psychosocial factors that affect 40 to 60

percent of the CPP patients, including anxiety and depression, is improved by education that reduces pain escalation and promotes the quality of life [12]. It is provided via face-to-face classes, small meetings, or online so that patients can choose the most convenient option and depending on their accessibility possibilities.

Clinical Evidence

A 2023 RCT (n=120) observed pain decrease of 25 percent (VAS), and a 20 percent improvement in quality-of-life scores on SF-36, after the 12 weeks treatment of PNE (1 2 sessions/week, 30 60 minutes each, $p<0.01$) in women with CPP, where the benefits were associated with fewer pain catastrophizing [8]. A 2021 cohort study (n=80) at the end of the awareness-education of pelvic floor (100 to 80) blended with pelvic floor muscle training resulted in 30 percent enhanced sexual activity among vulvodynia patients ($p<0.05$), an improved dyspareunia and sexual satisfaction [9]. Alterations in the lifestyle, which include dietary counseling and stress management, were proven to reduce triggers of symptoms in 60% interstitial cystitis patients with changes in the diet reducing flare-ups by 25%-30% [10]. The 2022 study (n=100, $p<0.01$) found that cognitive-behavioral measures, such as mindfulness-based stress reduction, decreased the level of pain catastrophizing by 35 percent, and its effects continued to show positive results within 6 to 12 months [11]. The use of digital platforms has improved the delivery as a 2024 RCT (n=150) demonstrates app-based education to increase adherence to 40 percent the education compared to in person sessions ($p<0.001$) with youth (age 18-40) experiencing a 30-40 per cent reduction in pelvic pain more than those who are older (ageold 40) at 20-30 per cent due to increased use of technology [13]. The percentage of patients who had long-term benefits (6 months to 18 months) was 55 to 65 percent, especially when there was continued education (1 to 2 sessions monthly) [14]. The patient education has moderate to large effect sizes (SMD: -0.50 to -0.80), which means a clinical importance [25].

Restrictions and obstacles

There is also a variety in the education programs, and it is found that there are 20-30 percent rates of dropping out of education programs, which is a result of different rates as far as health literacy, motivation, and cultural factors are concerned [14]. The use of generic educational materials decreases the rate of participation in 15-20 percent of non-English-speaking patients or low literacy, which indicates the necessity of unique and culturally appropriate educational materials [13]. The problems with busy clinics where delivery (30160 minutes during a session) can be limited, and digital platforms do not allow much privacy due to data security concerns (cited by 10-15 percent) [13]. The integration of education with the others also makes it more complex, yet is more efficacious by 10-15 % implying that it should be ensured under the integrated delivery models [14]. The key to achieving better results is developing educational resources that would be accessible, scalable, and culturally-oriented [25].

Rationality and dynamics

Integrated programs use a combination of manual therapy, biofeedback, and patient education that incorporates synergistic effects to focus on targeting pain, dysfunction, and psychological comorbidities, as the problem is primarily said to be biopsychosocial [24]. Manual therapy decreases physical dysfunction, biofeedback bespeaks control of the muscles and information on self-management, addressing the multifunctionality of the CPP etiology. Multidisciplinary intervention, with the participation of physiotherapists, psychologists, and pain specialists, focuses on comorbidities (e.g., 50% of patients have anxiety and depression), which improves outcomes [16]. These programs usually include 816 weeks of integration of interventions, including weekly sessions of each modality based on the applicable needs of the patient and the clinical presentation.

Clinical evidence

An RCT with 2024 responsible persons (n=180) had a comparative analysis between an integrated program (manual therapy, biofeedback, PNE) with standard care and reported 50 percent (VAS) and 40 percent (PFDI-20) improvement in pain after 12 weeks (one or two sessions per week per modality), which was sustained in 12 to 24 months in 60 to 80 percent of patients [24]. As was demonstrated in a 2023 cohort study (n=100), multidisciplinary care increased the quality of life by 35%, reduced anxiety, and decreased depression ($p<0.01$) [16]. The previous meta-analysis in 2022 on 10 RCTs revealed that the standardized mean difference (SMD) of the pain reduction with integrated approaches was -1.00 (95% CI: -1.30 to -0.70, $p<0.001$), which was significantly greater than those of single interventions (SMD: -0.60 to -0.80) [25]. Although subgroup analysis reveals an improvement in efficacy of endometriosis (45 55% pain reduction) than that of CP/CPPS (35 45%), this may have been explained by increased effect on visceral pain component to integrated care [24]. The results showed that long-term benefits (1224 months) were achieved in 6080% of patients, especially when multidisciplinary support was present and maintained sessions (1 session/month) [16]. The effects of combined interventions are large (SMD: -0.90 to -1.20), being above the MCID VAS and PFDI-20 [25]. Table 2 provides a summary of the clinical outcomes by interventions.

Table 2: Summary of Clinical Outcomes for Physiotherapy Interventions in CPP

Intervention	Study Type	Sample Size	Pain Reduction (VAS)	Functional Improvement	Long-Term Benefits	Key Limitations
Manual Therapy	**RCT, Cohort**	**40–100**	**20–40%**	**25–40% (PFDI-20)**	**55–65% (12 months)**	**Therapist expertise, access**
Biofeedback	**RCT, Pilot**	**40–90**	**25–30%**	**20–25% (PFDI-20)**	**50–70% (6–12 months)**	**Cost, adherence**
Patient Education	**RCT, Cohort**	**80–150**	**20–35%**	**20–30% (SF-36)**	**55–65% (6–18 months)**	**Health literacy, time**
Integrated Approaches	**RCT, Cohort**	**100–180**	**40–50%**	**35–40% (PFDI-20, SF-36)**	**60–80% (12–24 months)**	**Cost, coordination**

Implementation challenges

To facilitate integrated programs, providers should coordinate, which is difficult in fragmented healthcare systems because 2030% of the patients do not access multidisciplinary teams, especially in the countryside [16]. The scalability is restricted by the costs ($1000 to $5000 per patient), as well as by advanced biofeedback devices, and multiple sessions, which lead to high costs [24]. There is variability of the protocols, including session frequency (1-3 times/week) and duration (8-16 weeks), which makes

reproducibility vary, and 15-20 percent of the patients may produce non-consistent results [25]. The multimodal programs exhibit lower patient compliance with a 1020 percent dropout rate because of the time and cost implications [24]. To combat these obstacles, it is necessary to ensure word-to-word algorithms, affordable care delivery solutions (such as telehealth), and increased clinician education that will increase access and consistent service delivery [25].

Future directions

Future research and clinical practice should be directed to the following priorities to promote CPP management:

Standardized Protocols: Elaborate evidence-based standards (i.e., method of participation, a certain number of sessions a week or day, a specific number of weeks) to make it standard and reproduce the results in different locations [25].

Telemedicine and Home-Based Devices: Verify electronic platforms and wearable biofeedback devices (e.g., around 100-500 dollars) to increase access in cases of low resources, especially when it comes to patients in the countryside where the first tests of the approach have demonstrated an increase in adherence of 20 to 30 percent [13].

Long-Term RCTs: Perform RCTs that require a follow-up beyond 12 months to determine the sustainability of their results and educate on the maintenance approach, which, at present, is lacking in long-term information [24].

Language: Culturally Sensitive Education: The education is designed to be appealing to all linguistic, cultural, and literacy groups by development of specific material and providing it in diverse spheres, as a pilot education with 15 and 20% of the underserved population has demonstrated a 10 and 15 percent gain in health results [14].

Cost-Effectiveness Analyses: Analyze the economic consequences of the physiotherapy interventions to obtain the healthcare policy and insurance coverage to ensure fair access because the costs of care are out-of-range for most of the population participants [25].

Clinician Training Programs: widen the scale of pelvic floor rehabilitation training to uplift the percentage of trained physiotherapists (now at 20-30%) and advance the care delivery with the outcome of training programs improving the technique consistency by 15-20 percent [16].

Combination with Psychological Support: Introduce cognitive-behavioral therapy and psychological counseling into physiotherapy interventions, and together with integrated measures, it will have a positive effect on the results in 4060% of patients, with integrated support allowing an increase in the results by 10 15% [24].

Conclusion

The applications of physiotherapy, including manual therapy, biofeedback, and patient education, are very effective in the treatment of chronic pelvic pain as they can treat its complex biopsychosocial origin with specific and non-invasive methods. Manual therapy brings down pain by 20 to 40 percent by relieving musculoskeletal dysfunction, biofeedback does the same by 25 to 30 percent by increasing muscle control, and patient self-instruction introduces improvements on the lifestyle of the patient to upsurge the quality of life by a percent of 20-35 through self-management and coping in response. Combined modalities that integrate these various forms, together with other disciplines, produce greater results whereby pain may be reduced by 40-50 percent, and a lasting result may follow 60-80 percent of patients who are managed over 12-24 months. The effect of these interventions is a moderate to large effect (SMD: -0.50 to 1.20), which is greater than minimal clinically important differences, which means both statistical and practical significance. Nevertheless, there are large resistance factors, such as the high costs ($500-5000 per equipment or session) and rural accessibility (only 10-20 per cent of clinics prepared), variation in the protocols (up to 15-20 per cent of the results affected) and compliance issues (15-30 per cent drop out rates).

In the future, particular importance should be attached to the creation of common standards to improve consistency and test the effectiveness of telehealth and home-based equipment to expand access. Long-term RCTs should also be conducted to evaluate the durability of outcomes. There should be culturally sensitive educational products to enhance interventions in heterogeneous groups, and cost-effectiveness evaluations should be done to support the cause of investment and policy formulation. The clinicians must follow a multidisciplinary and patient-centered approach, and the interventions should be differentiated according to needs and include psychological support as a means of dealing with comorbidities associated with anxiety and depression. The physiotherapy could ensure a remarkable change in the situation in the case of CPP patients and reduce the healthcare expenditure as well as the global burden of this debilitating disease by overcoming the existing limitations and utilizing the experience of the effective delivery methods, such as telehealth and wearable devices.

Conflict of interest

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