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Review article

A scoping review of alterations in sensory and motor function, and body perception in women with chronic pelvic pain

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ABSTRACT

Chronic pelvic pain (CPP) affects 20% of women worldwide and is associated with substantial disability, yet its mechanisms remain unclear. Alterations in sensory or motor processing, and body perception, have been implicated in chronic pain conditions but the evidence has not been formally synthesised in CPP. This scoping review mapped the evidence for altered sensory function, motor function or body perception disturbance (BPD) in women with CPP. We searched multiple databases (up to April 2025) for studies of any design that explored these elements in women with CPP. We included 175 studies (19,457 participants). Most studies compared sensory and motor function with healthy controls, using quantitative sensory testing to assess sensory function, while a small group indirectly investigated BPD in this population. Pain-evoking sensory tests in the pelvic region consistently demonstrated reduced thresholds in people with CPP. Findings from remote body regions were less consistent, though evidence of widespread hypersensitivity and altered pain modulation suggested potential central involvement. Motor testing was limited and inconsistent. Central nervous system studies showed heterogeneous findings across conditions, including altered brain activity and evidence of altered sensorimotor processing. In qualitative studies, women described disconnection from, altered awareness of, and lack of perceived control over the pelvic region. Across all studies methods varied, with highly variable protocols and incomplete reporting limiting comparisons. Collectively, findings suggest emerging but inconsistent evidence for sensory, motor and body perception alterations in CPP. Future research should establish a theoretical framework, standardise methods and reporting, and integrate sensory, motor, and perceptual domains.

Perspective: Altered sensory function in the affected region is consistently reported in female CPP. Evidence of enhanced sensitivity in other body regions, motor changes, or changes in central nervous system structure and function is limited and inconsistent. Future research should establish a clearer conceptualisation of BPD, develop standardised methods and reporting.

Introduction

Chronic pelvic pain (CPP) affects an estimated 15–20% of women globally, with an annual healthcare impact of approximately $2.8 billion.[1] It is the leading health concern of reproductive-aged women, ranking first in disability-adjusted life years.[2] This heterogeneous condition is defined as continuous or recurrent pain perceived in pelvic structures for at least three months, or six months if cyclical.[3] It is commonly associated with psychosocial consequences, pelvic floor, urinary, bowel, sexual, or gynaecological dysfunctions, and is classified into symptom-based organ disorders with poorly understood somatic and visceral aetiologies.[4] International guidelines recommend multidisciplinary management, with physiotherapy forming a central component.[3–5] However, limited understanding of CPP subtypes hinders the identification of targeted treatment approaches. Improving our mechanistic understanding to refine phenotyping of CPP has been

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highlighted as an essential step to improve treatment precision.[6]

Disruption to sensory or motor processing, and/or the perception of the pelvic region, has been proposed as an important mechanism in the manifestation of CPP.[7–11] For instance, alterations in pelvic pressure pain thresholds, mechanical detection thresholds, and allodynia have been reported in CPP.[12–15] Schrepf et al[16] identified a "generalised sensory sensitivity" phenotype in women with CPP and chronic overlapping pain conditions, characterised by widespread allodynia and heightened sensory awareness. Neuroimaging studies demonstrate maladaptive changes within central somatosensory and motor networks in CPP,[17,18] resembling those reported in fibromyalgia[19] and chronic low back pain.[20] Alterations in sensory and motor function will change how the body is experienced, not only giving rise to a body that is more sensitive and difficult to control, but also potentially altering perceived body shape, size, position and ownership.[21]

Although the specific underpinning mechanisms remain uncertain,[18,22] pain and body perception are thought to interact bidirectionally. The presence of pain can alter self-perception,[23,24] while the pain experience itself may be shaped by dynamic, multisensory self--representations.[25,26] For example, in patients with back pain, perceiving the back as fragile and in need of protection may amplify threat cues while safety cues are overlooked when the back is moved and loaded, increasing the intensity of back pain experienced with moving and loading. Interventions addressing disturbances in body perception, altered motor function and central nervous system contributions to enhanced sensitivity (e.g., graded sensorimotor retraining and graded motor imagery) have shown potential to reduce pain and disability in chronic pain conditions.[27,28] These approaches have begun to be adapted for CPP,[29,30] but without a strong theoretical basis to support them. It remains unknown whether sensory, motor and body perception alterations are characteristic features of CPP, whether individuals with CPP perceive disturbances that would make such interventions suitable, or whether these interventions are effective in this population. Understanding any relationship between sensory, motor and body perception alterations and CPP may clarify pain mechanisms, identify clinically meaningful phenotypes, and guide the development of targeted treatments.[31]

The field lacks a systematic overview of the evidence relating to alterations in sensory and motor function, and body perception in women with CPP. A scoping review is therefore warranted to map the breadth and nature of current evidence, by characterising study types, methodological approaches, populations, and outcomes; clarifying how abnormalities of function have been conceptualised in this population; and identifying gaps to inform future research. As such, this scoping review sought to answer the following questions:

1. How are alterations in sensory and motor function, or body perception conceptualised and described in this population?
2. How are alterations in sensory and motor function, or body perception investigated and measured in this population?
3. What is the evidence for alterations in sensory and motor function, or body perception in the pelvic region of women with CPP?

Method

A preliminary search of PubMed was conducted and no published systematic reviews or scoping reviews on the topic were identified. This study was designed in accordance with the Joanna Briggs Institute Manual for Evidence Synthesis,[32] reported in accordance with PRISMA Extension for Scoping Reviews (PRISMA ScR),[33] and the PCC (Participant, Concept, Context) framework was used as recommended for scoping reviews.[34] The protocol was published *a priori* on Open Science Framework [35](https://tinyurl.com/4sfz3rcm).

Patient partner involvement

During the design of the study the primary researcher consulted with an informal advisory group to guide development. The group comprised of four women from diverse UK ethnic backgrounds with lived experience of CPP, representatives from three UK charities representing those with pelvic pain, and a gynaecological clinical academic experienced in antiracist research frameworks. Key insights gained from feedback included the selection of search terms, defining the review's broad focus, and determining the scope of extracted data, particularly whether studies reported participants' race or ethnicity and duration of symptoms.

Eligibility criteria

Participants

As alterations in sensory and motor function, and body perception may occur in any chronic pain condition, all classifications of chronic primary and secondary pelvic pain defined by the European Association of Urology (EAU) guidelines were eligible.[3] Populations with mixed chronic overlapping pain conditions were also included and described, as this is often seen in clinical practice. Populations with antenatal and perinatal pelvic girdle pain were excluded except for those with postnatal pelvic girdle pain that persisted beyond six months, where they would then be considered to have a chronic pelvic pain as per the EAU Guidelines.[3]

Concept

The overarching concept of interest was the measurement of disruption or alteration in the processing of sensory and motor information and body perception [11] in women with chronic pelvic pain. Eligible studies assessed any element of pelvic sensation, related motor function or BPD. We extracted data on the definition or conceptualisation of sensory, motor and body perceptual abnormalities in CPP, the format and content of testing, instruments used and reported outcomes. A recent conceptualisation defines BPD as comprising five key components: distorted perceptions of the affected body part's size and shape, the presence of neglect-like symptoms, diminished accuracy of proprioception, and a disrupted sense of agency over the painful region.[36] Alterations in sensory and motor function may underlie or contribute to these perceptual disturbances.[37]

We included qualitative studies that investigated how the body was perceived and experienced. We excluded studies that investigated social constructs of body appreciation, acceptance, or satisfaction with appearance. For quantitative studies, we included studies that investigated quantitative sensory testing of the pelvic region, pelvic region motor function, proprioceptive function, tactile acuity, perceptual disturbance, experimentally induced changes in body perception and multisystem tests. These included assessments that span multiple domains (sensory, motor, psychological, and functional) such as sensorimotor test batteries or multidomain questionnaires.

Context

Study context remained open, including geographical location, socioeconomic status, clinical or laboratory setting, and sampling method. Evidence was limited to studies of women assigned female at birth to capture sex-specific pelvic pain pathologies. Data were included from any setting (primary or secondary care, laboratory) and from experimental, observational and qualitative designs.

Search strategy

Following a pilot database search (see Supplementary Table 1), the

strategy was developed by the lead investigator, peer-reviewed by a medical librarian using Peer Review of Electronic Search Strategies (PRESS) guidelines,[38] and then refined in consultation with the lead investigator (Table 2). The final strategy was adapted for each of the seven databases; CINAHL plus, APA PsychINFO, Medline, SCOPUS, PubMed, CENTRAL and Web of Science (see Supplementary Tables 2–7). The primary database searches were conducted in July 2023 and updated in April 2025.

Screening and data extraction

Two authors independently screened the titles and abstracts (JB, NOC), eliminating studies that did not reference CPP and any element or theme of sensory function, motor function or BPD. We retrieved the full-text reports of the remaining records, and two review authors independently assessed them against our eligibility criteria (JB, NOC). Any disagreements regarding eligibility were resolved by a third reviewer (EK or KJC) and team discussion. Duplicate screening was then repeated with all full texts retrieved (KJC, EK, n=266).

Data extraction was duplicated to minimise error (JB, EK, MSP, KJC, LB, NOC), with the lead investigator checking and confirming the accuracy of all extracted data in Covidence.[39] In line with usual scoping review methods, we did not formally assess study quality or risk of bias.

Table 1
Summary of study eligibility criteria.

Inclusion Criteria	Exclusion Criteria
ParticipantsHuman studies onlyFemale participants (assigned female at birth)Aged 18+Chronic primary or secondary pelvic pain of at least three months' duration as per definitions from the EAU Guidelines,[3] including but not limited to urological (e.g. bladder pain syndrome, Interstitial Cystitis or chronic primary bladder pain syndrome), gynaecological (e.g. vulva, vestibular or vaginal pain syndromes, endometriosis or adenomyosis associated pain, dysmenorrhoea or chronic cyclical pelvic pain syndromes), neural (e.g. pudendal pain syndrome), sexological (e.g. genito-pelvic pain penetration disorder - GPPPD), and musculoskeletal (e.g. pelvic pain syndromes and coccydynia).	**Participants**Non-pelvic pain e.g. IBS, abdominal painAntenatal or perinatal pelvic girdle painPostnatal pelvic girdle pain < 6 monthsGastrointestinal pelvic pain syndromes
Language Any. English translations were sought.	**Language**Unable to source English translation
SettingAny experimental or clinical setting	**Setting**N/A
Study Design Primary research studies: Experimental designs (RCT, controlled clinical trials) Observational designs (descriptive studies, surveys, cohort studies, cross-sectional studies, observer-reported or patient-reported outcome studies, case studies and series) Qualitative designs: all types Systematic reviews	**Study Design** Opinion pieces BlogsConference AbstractsBrief communicationsDebate and perspectivesLetters to editors and correspondenceBook reviews and chapters
OutcomesAny measure of sensory or motor dysfunction (e.g, but not limited to; quantitative sensory testing, muscle strength or co-ordination testing) Any measure of body perception distortion (e.g. but not limited to; questionnaires, body map drawing, qualitative interviews of altered body perception)	**Outcomes**Brain imaging with no associated sensorimotor or behavioural testingStudies that pertained to body appreciation, satisfaction and attractiveness

Table 2
Search strategy.

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 "Sensory-motor 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"))

Data Synthesis

Data were synthesised narratively according to the research questions. For qualitative studies, we undertook a descriptive content-based synthesis, identifying and organising key themes related to alterations in sensory and motor function, and body perception. The number, nature, and findings of studies were compared and contrasted to highlight similarities, differences, and gaps in the evidence.

Results

The search identified 2849 articles after deduplication. Following title and abstract screening, 2583 articles were excluded. Hand searching of reference lists identified a further two papers.

The full texts of 266 articles were then assessed, resulting in the exclusion of a further 91 articles. In total, 175 articles were included in this review, comprising 160 completed studies and 15 ongoing studies. Fig. 1 outlines the search screening process.

Included studies were conducted in twenty-seven countries, with Europe, the United States of America, and Canada producing the most studies (n=65, 49, and 26 respectively). More than half of studies were funded (56%) [14,15,40–135]through a variety of grants; charity based, researcher development funds, national research funds, and public health funding groups. Two studies [136,137] were partially funded by industry research initiatives and 47 studies[13,138–183] did not report funding status. Of the 175 studies, 75 were published in the last five years.

A total of 19,457 women were studied across 11 pelvic pain conditions, with vestibulodynia the most frequent clinical condition (n=51 studies). The mean age of participants was 31.4 years (range 18–75 years). There was no information reported on participant ethnicity in 69.7% of studies (n=122).[13,15,40,41,52,55,56,59,62,64–66,69,71–75,78–82,84–88,90–92,94–96,98,99,101,103,104,106–109,111–115,117–122,124,126,128–136,139–144,146,148,149,151,153–155,157–159,161–165,167,169–173,175–204] Six studies reported participant religion and not ethnicity.[83,105,110,156,160,205] Of the 45 studies that reported ethnicity, the proportion of white or Caucasian participants was on average 78.6%, with 19.6% Asian, and 12.6% Black or African American. Nine studies reported the proportion of Native American participants (0.5% - 3.4% [44,46,47,97,100–102,138,206]), seven reported on the number of participants with a biracial ethnicity (1 – 9.6%[46,47,60,63,67,100,168]) and six on being of Pacific Islander descent (0 – 6.7% [47,97,101,102,138,206]).

The average duration of CPP symptoms ranged from 6 months to 35.9 years. Participant parity was reported by 30.8% (n=54) of studies,[13,15,40,41,43,45,46,49,53,55,57–59,61,66,68,72–74,76,84,85,89,91,93,95–97,101,103,104,115,118,120,125,130,146,148,152,156,157,161,165,167,173,179,186,189,191,193,199,205,207,208] which ranged from 0 – 4 children, with 81% nulliparous. Though a variety of measures were used to describe average participant pain intensity, this was predominantly reported using a

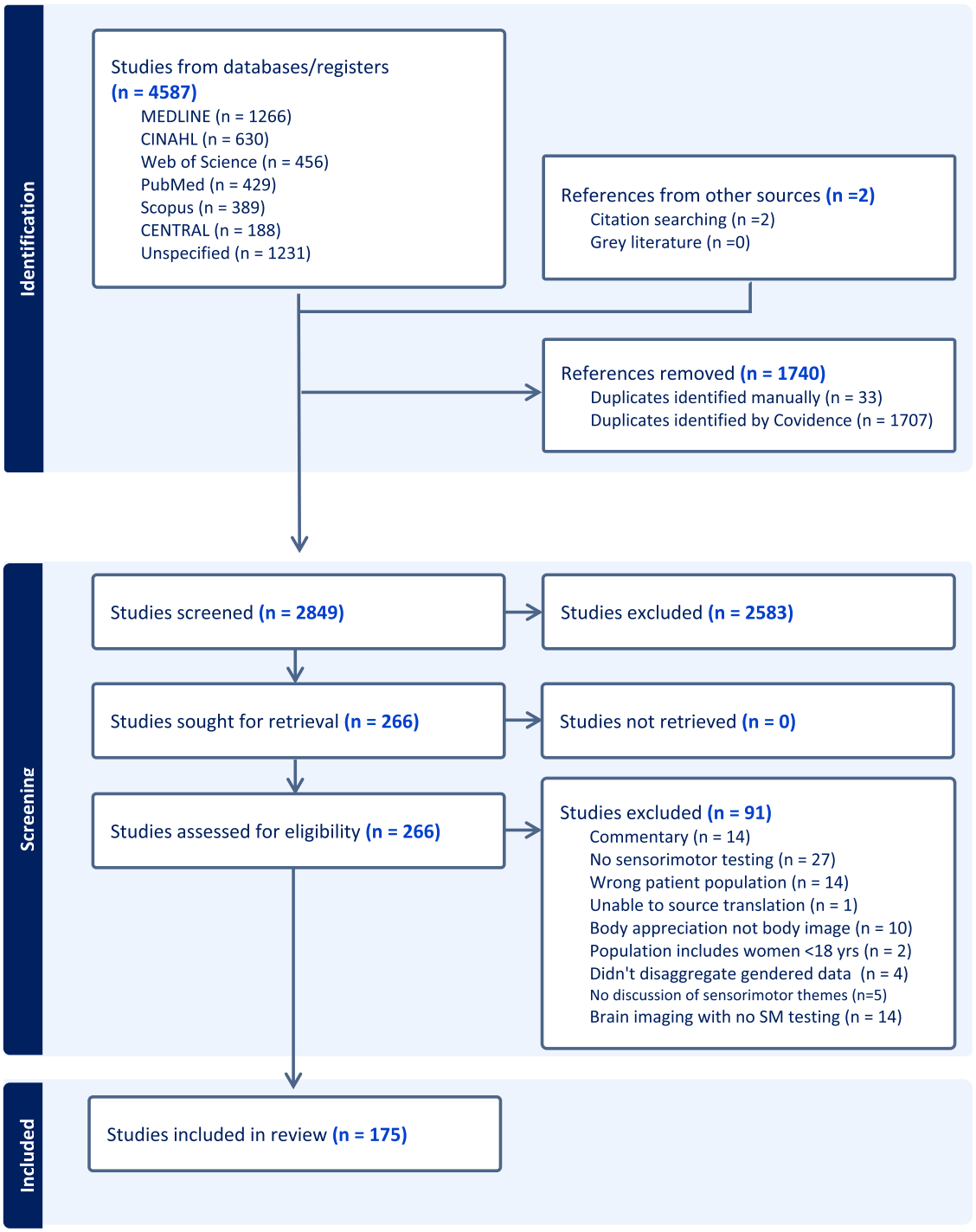

Fig. 1. Study selection process. PRISMA flow diagram showing identification, screening, eligibility assessment, and inclusion of studies in this scoping review.

Visual Analogue Scale or Numerical Rating Scale (n=82). Most studies were cross-sectional (n = 70) or case–control (n = 37) in design, with 32 randomised controlled trials investigating interventions for CPP and 6 qualitative studies. The remaining 30 studies comprised a mix of prospective and retrospective cohort studies, non-randomised controlled trials, case reports, measurement validity and reliability studies, scoping and systematic reviews, before-and-after studies, proof-of-concept studies, and questionnaire development studies (Table 3).

How are alterations in sensory and motor function, or body perception conceptualised and described in this population?

Sensory and motor dysfunction were collectively investigated as deviations in sensory and motor function relative to healthy controls. This included altered sensory thresholds, differences in cortical responses to sensory stimuli, and changes in conditioned pain modulation, alongside changes in pelvic floor motor function, tissue stiffness, and whole-body proprioception. None of the included studies explicitly defined or conceptualised BPD in this population.

Observational studies explored the presence of alterations in sensory and motor function, and body perception, and its relationship with the

Table 3
Details of included studies.

	Number of studies
Study design	
Cross sectional	70
Case control	37
Randomised controlled trial	32
Prospective or retrospective cohort	14
Qualitative	6
Non-randomised controlled trial	4
Systematic review	3
Scoping review	2
Case report	2
Measurement validity and reliability	2
Pre-post study design	1
Proof of concept	1
Questionnaire development	1
Clinical Populations *	
Vestibulodynia	51
Chronic Pelvic Pain	40
Dysmenorrhoea	38
Bladder Pain Syndrome	36
Endometriosis	31
Vulvodynia	18
Genito-Pelvic Pain Penetration Disorder (GPPPD)	17
Other	16
Adenomyosis	1
Chronic Pelvic Girdle Pain	1
Study Location	
Europe	65
USA	49
Canada	26
Brazil	9
Israel	7
Australia	4
Turkey	4
China	3
Egypt	2
Japan	1
Mexico	1
Republic of Korea	1
South Africa	1
Taiwan	1
Thailand	1
Publication Date	
2000 – 2005	14
2006 – 2010	22
2011 – 2015	24
2016 – 2020	40
2021–2025	75

*39 studies reported on multiple populations

quality, nature, and severity of pain symptoms, including associations with neuropathic pain features, visceral hypersensitivity, and presence of post-operative CPP.[14,15,54,55,58,59,62,65,68,69,71,75,77,80,82,84,87,95,96,136,138,141,147,149–151,162,163,188,197,209] The association between psychological variables such as catastrophising, depression, health anxiety, and CPP condition was explored using local and global sensory threshold testing to identify potential subgroups.[13,15,45,61,98,139,146,152,191,194,207] Pain-evoking sensory tests were used to observe behavioural responses and their modulation by the neuroendocrine system in CPP,[80,96,121,201] and the impact of menstrual phases on global proprioception, posture, and pain perception was explored.[81,184,193]

Sensorimotor testing was used to identify CPP condition subgroups and to monitor symptom progression longitudinally.[14,44,45,52,61,62,65,68,82,97,104,123,125,127,144,146,147,149,156,159,173,191,193,205] Studies used sensorimotor testing to investigate whether altered sensorimotor function was predictive of responses to perceived threat.[46,47,91,101] Potential pathological mechanisms underlying CPP were explored through observed differences in somatic and visceral sensation and central nervous system structure or function,[60,102,126–130,172] as well as genetic polymorphisms.[131,174] Three systematic reviews [164,171,196] and two scoping reviews [87,169] were identified that incorporated sensorimotor testing in the context of diagnosing and managing CPP in women.

Change in sensorimotor function was used as an outcome measure in studies of interventions for CPP (n=31). These included pelvic floor botulinum toxin injections,[106,137] auricular [112] and distal body acupuncture,[132,166] kinesiotaping,[204] interferential current therapy,[107] electromyographic biofeedback,[104,107,108,210] topical lidocaine applied to the vulva,[104,108,153,168,169] vaginal Diazepam,[116] a Spermidine–Hyaluronate gel,[199] transcutaneous electrical nerve stimulation (TENS),[116,167,208] thermotherapy,[208] motor cortical neuromodulation including anodal transcranial direct current stimulation (tDCS),[113,119,133,135,183] and low-level laser therapy (LLLT).[120,175,203] Nine studies and one review explored the benefits of manual therapies and exercise programs for improving motor function and pain.[103,109–111,114,117,118,169,170,200]

Finally, six qualitative studies aimed to investigate how CPP shapes women's perceptions of their bodies, the meanings they ascribe to their pain, and how their lived experiences influence their understanding of their symptoms.[94,115,189,195,211,212]

How are alterations in sensory and motor function and body perception investigated and measured in this population?

Sensory and motor function investigations

In total, 561 tests spanning 66 different measures were used to assess sensory and motor function in women with CPP (Table 4). Pain-evoking sensory tests were most common (n=329), including 298 pain sensitivity tests and 31 pain modulation tests. Non-painful sensory tests were measured 83 times, and there were a total of 84 motor tests, comprising 63 tests of strength or structure and 21 of control or coordination. Forty-three multisystem measures were used, including global proprioception tests and questionnaires such as the Somatosensory Amplification Scale. The most frequently used individual tests were pressure pain threshold (n=90), visceral hyperalgesia (n=30), mechanical pain threshold (n=28), and heat pain threshold (n=25).

The tools and protocols used to measure sensorimotor function varied greatly amongst the studies. For example, there were 18 different tools used to measure pressure pain threshold across the 105 studies applying this modality, and no two studies shared identical protocols when using the same specific tool.[13–15,41–46,48–54,57–59,62,65–67,69–72,74,76–78,84,85,87,89,90,92–96,98,100,101,103,104,107–109,113–115,117,118,120–123,126,127,130,131,133–135,140,143,145–147,150,151,154–156,159,162,163,166,168,170,171,173–178,181,183,184,186–189,192,194,195,200,203,204,208,211–213]

A total of 33 pelvic locations were assessed across all sensory and motor tests (See Fig. 2 below and Table 8 in the supplementary information). The most frequently tested sites were the vulva (n = 127),[13,14,43,44,48,50,53,61,62,78,83–85,101,140,143,145,150,162] particularly the vestibule (n = 49), deep pelvic floor muscles (n = 55),[41,44,49,53,61,62,64,83,95,96,101,145,162,188] and vagina (n = 21).[43,50,53,61,140,141,145] Outside the pelvis, 80 non-pelvic sites were tested (Fig. 3 below and Table 9 in the supplementary information). The back was most frequently assessed (n=120),[53,54,59,61,69,71,73,74,82,88,151,154,159,163,188] followed by the upper limb (n = 80),[13,14,43,44,49,50,52–54,61,69–71,74,79,84,88,92,93,103,123,138,139,143,147,150,151,154,159,186,188] especially the forearm (n = 21).

Central nervous system structure and function studies

A range of neuroimaging and neurophysiological tools have been used to explore different levels of processing, most commonly in women with vestibulodynia (see Supplementary Table 11). Task-based fMRI has been used to examine evoked responses to genital, visceral or remote noxious stimulation and pain anticipation;[119,121–123,125,130,172,173,201] resting-state fMRI [97,124,127,202]and effective connectivity analyses to characterise intrinsic network organisation;[123,124,202] structural MRI and voxel-based morphometry to assess grey-matter morphology;[102,122–124,126–128,148,202] diffusion tensor imaging to evaluate white-matter microstructure;[128] and arterial spin-labelling to quantify regional cerebral blood flow.[52] A smaller number of studies have employed central

Table 4
Summary of testing methods.

Sensory tests						Motor tests				Multisystem tests		Neurophysiological tests	
Pain evoking sensory tests				Non-painful sensory tests		Structural/ Strength		Coordination/ Control					
Pain evoked sensitivity tests		Pain modulation tests											
Pressure pain threshold	90	Temporal Summation	14	Mechanical detection threshold	21	Genital hiatus diameter	15	PFM relaxation (palpation)	9	Multidimensional Questionnaires	26	Somatosensory evoked potentials	4
Visceral hyperalgesia	30	Conditioned pain modulation	13	Distension perception threshold	12	PFM resting activity (EMG)	14	Postural sway	7	Proprioception assessment	8	Acoustic startle reflex	3
Mechanical pain threshold	28	Experimental pain evocation	4	Tactile acuity	9	PFM strength (palpation)	18	Standardised Mesendieck test	4	Qualitative	6	Regional cerebral blood flow (rCBF) with bladder filling/empty	3
Heat pain threshold	25			Warmth detection threshold	9	PFM max voluntary contraction (EMG)	5	Lumbopelvic stability	1	Body drawing	3	Structural brain imaging	3
Palpation (tenderness)	19			Electrical detection threshold	7	PFM tone/ spasm (palpation)	3					Gamma-band intermuscular connectivity (IMC)	2
Distension pain threshold	14			Vibration detection threshold	7	Muscle thickness	3					Bulbocavernosus reflex	1
Distension maximal capacity	14			Cold detection threshold	6	Muscle stiffness	3					Laser-evoked potential amplitude	1
Distension pain tolerance	14			Heat detection threshold	3	Muscle endurance	2					Laser-evoked potential latency	1
Electrical pain threshold	13			Visual sensitivity	3							Motor evoked potential amplitude on action	1
Cold pain tolerance	13			Auditory sensitivity	2							Motor evoked potential latency	1
Mechanical allodynia	12			Thermal sensory limen	2							Motor cortical silent period	1
Pressure pain detection time	8			Mechanical detection time	1							Resting motor evoked potential amplitude	1
Heat pain tolerance	4			Paroxysmal heat sensation	1								
Tonic heat pain	3												
Phasic heat pain	3												
Neurodynamic testing	3												
Electrical pain threshold	2												
Electrical pain tolerance	2												
Vibration pain threshold	1												
Total	**298**		**31**		**83**		**63**		**21**		**43**		**22**

physiological probes, including Transcranial magnetic stimulation to assess corticomotor excitability of pelvic floor representations,[40,119] EEG to index cortical excitability and multisensory amplification,[47,97,148] and prepulse inhibition (PPI) to evaluate sensorimotor gating.[129] Additional studies have used neurophysiological methods to examine central nervous system responses, including acoustic startle reflex testing,[80] laser-evoked potentials,[160] pudendal somatosensory evoked potentials[158] and reflex testing, and high-density EMG to assess intermuscular connectivity of the pelvic floor muscles.[64]

Qualitative studies and systematic or scoping reviews

Though not an explicit aim, the six qualitative studies explored themes consistent with sensory, motor, and body perception experiences through semi-structured interviews.[94,115,189,195,211,212] Across the five systematic and scoping reviews included in this scoping review, diverse approaches were used to assess central sensitisation and possible nociplastic pain in women with CPP.[164,169,196] In endometriosis, tools included patient-reported questionnaires (for example, the Central Sensitisation Inventory, PainDETECT questionnaire, Brief Pain Inventory, McGill Pain Questionnaire, and Visual Analogue Scales, n=14), quantitative sensory testing (QST; n=6), clinical assessments (n=2), and multimodal approaches combining these methods (n=8).[87,171]

What is the evidence for alterations in sensory and motor function, and body perception in the pelvic region of women with chronic pelvic pain?

Pelvic region and visceral testing

A total of 172 pain-evoking sensory tests were performed in the

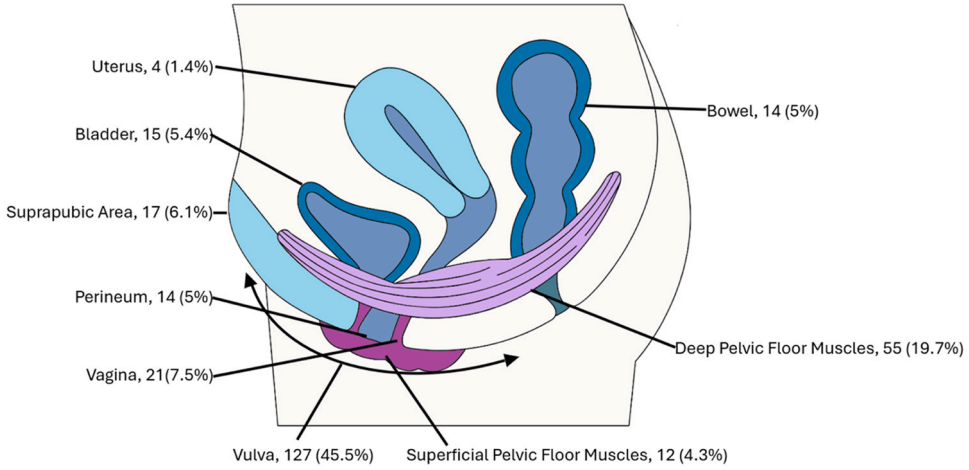

Fig. 2. Distribution of pelvic sensory and motor testing locations. Frequency of sensory and motor tests conducted at pelvic anatomical sites across included studies.

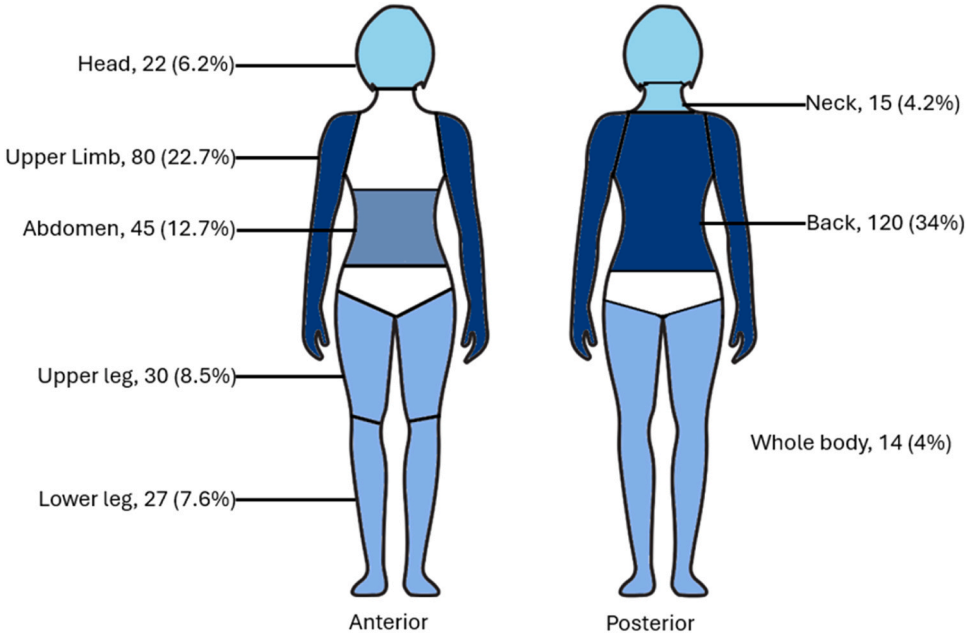

Fig. 3. Distribution of non-pelvic sensory and motor testing locations. Frequency of sensory and motor tests conducted at body sites outside the pelvic region across included studies.

pelvic region (see supplementary Table 10 for further information). Of these, 144 tests (83.7%) within 31 studies demonstrated statistically significant increases in pain sensitivity (sensory gain) relative to healthy controls in participants with bladder pain syndrome,[44,45,49,53,67,69,82,136,147] endometriosis,[71] vestibulodynia,[13,43,48,50,71,83,84,140,141,143,145,150] vulvodynia,[14] dysmenorrhoea,[49,61,68,93,101,149] and chronic pelvic pain.[15,53,62,145] In 12 studies, 28 tests (16.3%) showed no significant difference across CPP conditions.[43,44,48,49,53,62,69,78,85,101,143,188] All four pelvic-region pain tolerance tests (thermal and pressure), conducted in vestibulodynia and bladder pain syndrome only, identified significantly reduced tolerance compared to controls ($p < 0.001$ to $p = 0.02$).[13,48,69,136]

Non-painful sensory tests local to the pelvis provided mixed results, with 17 of 27 tests (63%) across 9 studies in vestibulodynia,[43,61,78,84,101,141] vulvodynia,[157] and bladder pain syndrome [82] reporting a statistically significant increase in sensitivity compared to healthy controls. The findings of local pelvic floor muscle motor function tests (stiffness, strength, endurance, resting tone, EMG activity, relaxation capacity and genital hiatus diameter with pelvic floor rest and during contraction) were mixed. In 17 of 33 motor tests (52%) across seven studies, no differences were found when compared to healthy controls in chronic pelvic pain,[53] bladder pain syndrome,[53,64] vestibulodynia,[41,83,162] GPPPD,[83,158] and dysmenorrhoea.[61]

In five of six tests (83%) of motor coordination, no statistically significant difference in pelvic floor muscle relaxation was observed when compared to healthy controls in participants with chronic pelvic pain,[53] dysmenorrhoea,[61] vestibulodynia,[83,96] and bladder pain syndrome.[53]

Local visceral sensory testing consistently showed heightened sensitivity (19 of 20 tests),[45,49,82,97,136,142,147] particularly in bladder pain syndrome where nearly all pain-evoking and non-painful tests indicated sensory gain. Findings in dysmenorrhoea,[49,61,68] endometriosis,[149] and chronic pelvic pain [53,149] were based on fewer studies and demonstrated inconsistent patterns of sensitivity across tests. Results of multisystem visceral tests were mixed, with 27 of 54 outcomes (50%) demonstrating statistically significant differences between participants and healthy controls.[52,68,102]

Distal site body testing

Across 38 studies, 219 pain-evoking sensory tests were performed on body regions beyond the pelvis, with more than half showing increased sensitivity (n=157), though results varied by site [13,14,43,44,49,50,52–54,59,61,62,65,66,69–74,84,88,92,93,103,123,138,139,143,147,150,151,154,159,163,186–188] (see supplementary Table 10 for further information). Abdominal testing consistently demonstrated hypersensitivity; in dysmenorrhoea,[61,93,159] endometriosis,[54,71,151,163] chronic pelvic pain,[59,65,73] and vestibulodynia.[150] Findings in the legs,[44,49,50,54,59,62,66,69,73,74,84,138,151,154,159,163,186,188] lumbopelvic region,[53,54,59,61,69,71,73,74,151,154,163,188] and back,[59,71,88,159] were mixed. Pain tolerance tests often showed reduced tolerance (n=13 of 19 tests, 68%),[49,52,62,70,74,84,138,147,154] and 12 of 20 pain modulation tests (60%) suggested dysregulated pain processing. This indicates possible central contributions to chronic pelvic pain in participants with bladder pain syndrome,[44,49,52,147] dysmenorrhoea,[44,49,93] vestibulodynia,[66,123] endometriosis,[151,154] and chronic pelvic pain.[62,92] Most non-painful sensory tests across the body (n=18 of 26 tests, 69%) showed no significant differences compared to healthy controls across six CPP conditions [35,57,74,76,139,143,146] (GPPPD was not assessed). Notably, two[65] of the statistically significant measures of thermal sensory limen indicated sensory loss (i.e., elevated thresholds) in participants with endometriosis and bladder pain syndrome when compared to healthy controls.

Motor function in body areas distal to the pelvic region was assessed in women with endometriosis, dysmenorrhoea, and chronic pelvic pain by six studies using 33 tests [59,71,81,163,190,193] reporting mixed results (n=18 reports of statistically significant differences). Of the 34 structural motor tests assessing muscle stiffness, thickness, and flexibility across the legs, lumbopelvic region, abdomen, and back in participants with endometriosis and chronic pelvic pain, [71]15 (44%) reported no statistically significant differences compared to healthy controls.[59,71,163] Similarly, half of the four motor control assessments, including tests of postural sway,[71,190,193] lumbopelvic stability,[71] and the standard Mensendieck test,[81] showed no differences in participants with chronic pelvic pain, bladder pain syndrome, dysmenorrhoea, and endometriosis. One study[80] in participants with bladder pain syndrome reported a statistically significant increase in startle amplitude.

Multisystem testing included the Mensendieck test of multiple domains of body function, and multidimensional questionnaires such as the Female Sexual Function Index and Somatosensory Amplification Scale. Evidence from multisystem testing outside the pelvis generally showed statistically significant differences in women with CPP, particularly in dysmenorrhoea,[101] GPPPD,[138,152] vestibulodynia,[13,48] and vulvodynia.[161]

Patterns by test modality and body region

Sufficient data to examine modality-specific patterns were available only for participants with vestibulodynia. In this group, 41 of 46 (89%) local pain-evoking and non-painful mechanical tests [13,43,48,50,78,83–85,140,143,145,150,162,188] and 12 of 15 (80%) pain-evoking and non-painful thermal tests [13,43,48,85,140,143]demonstrated statistically significantly reduced thresholds compared to healthy controls. This is consistent with peripheral sensitisation and local nociceptor hyperexcitability. Findings from distal body sites were less clear: only 2 of 5 pain-evoking and non-painful thermal [43,139,143]and 13 of 23 (57%) pain-evoking and non-painful mechanical tests [43,50,66,84,123,146,150] showed statistically significant differences.

Data from central nervous system structure and function studies

Data from brain imaging studies do not demonstrate a uniform pattern across pelvic pain conditions (see Supplementary Table 11). Most of these studies concerned women with vestibulodynia, where evidence from evoked activation, resting connectivity, structural and diffusion imaging, and corticomotor testing suggests alterations within sensorimotor–salience–limbic networks and increased corticomotor excitability. This is reportedly consistent with reorganisation of genital sensorimotor processing.[40,121–124,128,130,173] In contrast, the five studies that involved women with dysmenorrhoea report typical pain-network activation, with occasional alterations at the level of default-mode or network engagement rather than clear amplification of signals, and limited differences when compared to healthy controls.[47,97,125,172,201] In bladder pain, altered limbic–thalamic responses were observed in subgroups characterised by widespread pain or bladder-filling pain.[52] Another study reported that reduced prepulse inhibition suggested impaired central sensorimotor gating,[129] while both morphological changes and hyperactivity in pain-network regions were reported.[102] Other groups observed minimal change.[202] Neurophysiological studies provide some evidence of altered central processing across pelvic pain conditions. These included enhanced defensive startle responses in bladder pain syndrome,[80] altered pain-evoked cortical responses in dysmenorrhoea,[160] and evidence of increased sensorimotor excitability and altered neural drive to pelvic floor muscles in vestibulodynia,[158] vaginismus, and bladder pain populations.[64]

Data from qualitative studies

Though not an explicit aim of the six qualitative studies included in this review,[86,94,115,189,195,212] themes consistent with sensory, motor or perceptual disturbances were discussed by women with dysmenorrhoea, endometriosis, vestibulodynia, and chronic pelvic pain. These included a disruption of bodily integrity, self-perception, and agency. Participants described the pelvic region as a site of distress and disconnection. Some women reported a feeling of alienation from their bodies, describing a sense of "othering" of the pelvic region. Pelvic floor tension was commonly experienced and attributed to perceived threat or vulnerability, and beyond conscious control. Altered proprioception and interoceptive awareness were discussed. Participants described the pelvic region as feeling cold or numb, or as if certain areas were 'undefined', meaning they were unsure where specific areas were located, or where one area ended and another began. Conversely, some participants reported heightened discrimination of areas, enhanced spatial localisation, and had adapted strategies to interpret interoceptive cues. For example, by learning to distinguish between harmless and concerning pain, attending to bodily signals to guide actions, and developing greater awareness of internal states to reframe painful sensations.

Data from reviews

Evidence from five reviews suggested central sensitisation may be relevant across conditions,[87,164] although assessment methods were varied and not standardised. Neurophysiological testing [196] showed abnormalities in pelvic region electromyographic testing and somatosensory evoked potentials but was not considered diagnostically reliable. Treatment-focused reviews [169,171] found limited and heterogeneous evidence, and reported no intervention was consistently shown to improve symptoms including pain. Overall, the reviews highlighted ongoing uncertainty and the need for more consistent approaches to assessment and management.

Discussion

The aim of this scoping review was to examine the breadth and nature of evidence available for alterations in sensory function, motor function, and body perception in women with CPP, and to examine how it is conceptualised, described, investigated, and measured.

No study offered a detailed theoretical or conceptual model of sensory, motor and perceptual disturbances in CPP. Rather, most studies investigated altered sensory function as a potential mechanism underlying the development of pelvic pain, as a symptom reflecting its presence, as a descriptive marker of condition severity, or as a target for therapeutic intervention.

While a wide range of sensory and motor parameters have been examined, substantial methodological inconsistency and incomplete reporting limit meaningful comparison across studies. Variability in

inclusion and exclusion criteria, and specifically the involvement of other comorbid pain conditions, variation in testing protocols, stimulus parameters, outcome definitions, and the anatomical sites assessed make it difficult to synthesise findings and determine whether observed differences reflect true alterations or variations in measurement. Therefore, conclusions about the presence, nature or clinical relevance of sensory, motor, and body perception alterations in CPP remain tentative. Importantly, BPD was not defined or directly assessed, so its role in CPP remains unclear.

Interpretation of sensorimotor findings

Most studies explored alterations in sensory function as a potential mechanism underlying the development, symptoms, and maintenance of pelvic pain. Evidence of sensitisation was observed in participants with vestibulodynia, bladder pain syndrome, chronic pelvic pain, and dysmenorrhoea, reflected by significantly reduced thresholds on pain-evoking tests at the pelvis. This finding was most frequently reported in participants with vestibulodynia, where pressure pain thresholds were lower in the vulvar and pelvic floor regions, a recognised indicator of peripheral sensitisation.[214] Non-painful sensory tests, such as thermal or vibration detection in the pelvic region, also revealed heightened sensitivity, suggesting broader sensory gain that might reflect altered sensory processing.[215] There was insufficient evidence across CPP conditions to identify patterns in distal testing, or in modality-specific testing locally or at distant body sites.

Primary hyperalgesia at symptomatic sites may reflect both peripheral and central mechanisms. Local sensitivity can arise from lowered nociceptor thresholds due to ongoing tissue pathology, such as inflammation or injury. However, hypersensitivity at distal, non-pelvic sites in CPP, bladder pain syndrome, and endometriosis suggests central sensitisation, which may also contribute to local hyperalgesia. Widespread hypersensitivity is considered characteristic of central amplification of nociceptive signalling, [216] but could also reflect systemic inflammation. Findings from conditioned pain modulation and temporal summation tests were inconsistent, though altered responses in bladder pain syndrome, vestibulodynia, and dysmenorrhoea suggest disrupted central modulation. Neuroimaging suggests central nervous system involvement, with structural and functional alterations in the sensorimotor cortex, hippocampus, and basal ganglia, and enhanced responses to pain anticipation and perceived threat in GPPPD and vestibulodynia.

A small, emerging body of qualitative research offers important context to the sensorimotor findings, highlighting how altered sensory processing mirrors a lived experience of altered body awareness. Across dysmenorrhoea, endometriosis, vestibulodynia, and CPP, participants described the pelvic region as a site of disconnection and distress. Descriptions of numbness, coldness, or vagueness align with findings of local hypoaesthesia in one study.[65] Conversely, hyperawareness and precise pain localisation echo findings of heightened sensitivity in peripheral testing previously discussed. Perceived lack of pelvic floor control aligns with evidence suggestive of pelvic floor motor dysfunction.[64,83,95,217] Notably, women's use of adaptive strategies to interpret and regulate sensorimotor cues suggest these distortions may be dynamic, offering opportunities for intervention.

Comparison with other chronic pain conditions

Some findings in CPP parallel findings from other chronic musculoskeletal pain conditions, where sensory, motor and body perception alterations are better characterised. In fibromyalgia, complex regional pain syndrome (CRPS), chronic low back pain (CLBP), and osteoarthritis, altered sensory and perceptual experiences include numbness, distorted spatial awareness, impaired proprioception, dissociation, and misperceived body size, location, or swelling.[7,218–223] These distortions often correlate with greater pain, reduced tactile acuity, and disrupted proprioceptive or interoceptive function, possibly linked to altered somatosensory cortical representations.[224] Similar features were evident across CPP conditions, with dysmenorrhoea and chronic pelvic pain showing altered sensory thresholds, increased pelvic floor tone, and qualitative reports of body regions feeling "cold," "numb," or "disconnected" that mirror disembodiment, representational distortions, and tactile dysfunction reported in CRPS and CLBP.

Researchers investigating CRPS and CLBP have suggested that BPD may have a causative role in these conditions and have developed and validated tools to directly assess disrupted body perception in these populations, such as the Bath Body Perception Disturbance Scale [225] and Fremantle Back Awareness Questionnaire.[226] Moreover, interventions that potentially target body perception have also been developed and tested in people with CRPS [27]and CLBP.[28] In contrast, CPP lacks a conceptual model, shared definition, or standardised measures of BPD. Qualitative studies describe disrupted bodily integrity and agency, but these themes remain under-theorised. The Fremantle Pelvic Awareness Questionnaire [185] was recently developed to assess BPD unique to CPP, and once fully validated may allow its description and quantification.

Viceconti et al.[227] propose that BPD may represent a transdiagnostic feature of chronic pain, involving both body schema (unconscious, sensorimotor representations) and body image (conscious, perceptual-affective experiences) disruption. The findings of this review potentially align with these dual disruptions. This theoretical lens may help explain the multidimensional nature of sensorimotor changes in CPP, bridging the neurophysiological findings with patient-reported experiences. However, understanding the complexity of lived experiences with CPP requires attention to diverse contextual factors. Inadequate reporting of ethnicity and a range of other variables in this review threatens generalisability and limits development of culturally responsive tools.[228] Demographic diversity should be central to equitable and trustworthy research,[229,230] as factors such as healthcare discrimination, racialised experiences, and intergenerational trauma are known to shape pain.[231,232]

Strengths and limitations

This comprehensive scoping review covered a broad range of ideas across multiple pelvic pain conditions and was strengthened by methodological transparency and a registered protocol. Broad inclusion criteria captured diverse studies, though the absence of a standardised definition and overlapping terminology may have excluded relevant work. Some limitations should be acknowledged and among them are those related mainly to the available data; small samples, inconsistent inclusion and exclusion criteria, variable reporting of protocols and outcomes, and dominance of QST measures, particularly pressure pain thresholds, further constrained interpretation, while motor and multisystem testing were underused. The absence of evidence in certain conditions should not be interpreted as evidence of absence. Few studies examined longitudinal change, preventing assessment of causation or symptom development. Underrepresentation of subgroups such as GPPPD, vulvodynia, and non-white participants, along with incomplete sample reporting, also limit generalisability. These methodological and reporting weaknesses, alongside possible publication and language biases, mean findings should be interpreted cautiously.

Future research

Future research should develop a shared conceptual framework linking sensory, motor and body perception changes with the lived experience of CPP. As QST is central to CPP research, minimum procedural and reporting standards should be followed. Researchers should adopt established frameworks (e.g., the German Research Network on Neuropathic Pain protocols) or develop CPP-specific core outcome sets with agreed testing sites to improve reproducibility and comparability. At minimum, studies should report stimulus parameters, testing sequence, anatomical sites, positioning, priming, and menstrual phase.

Given consistent findings of reduced pelvic sensory thresholds, further cross-sectional studies are unlikely to advance understanding. Future QST research should examine longitudinal change and whether thresholds predict clinical phenotypes or relate to objective and subjective measures of sensory function and body perception. Motor coordination, proprioception, and non-painful sensory testing should be prioritised across CPP conditions. Given the theoretical relevance of altered body perception, these domains require systematic investigation across CPP conditions using validated protocols. Notably, no study directly examined altered perception of pelvic size, shape, or spatial representation, phenomena central to BPD research in CRPS and CLBP. Without direct examination of these constructs, translation of body-perception interventions (e.g., graded motor imagery) into CPP remains theoretically unsupported. Mixed-method designs that combine sensory and motor testing with phenomenological exploration may enable more meaningful interpretations of biological findings.

Evidence must be strengthened by standardisation, transparent reporting, and inclusion of diverse populations. Key gaps include pelvic-focused studies in endometriosis, distal sensory processing in vestibulodynia, and wider use of motor and non-painful sensory tests across conditions. Drawing on CRPS research, CPP studies should integrate psychometric, somatosensory, and qualitative measures to assess body perception and its clinical impact over time.

Core outcome sets and standardised protocols for measures such as pressure and heat pain thresholds will improve comparability.

Conclusion

This review identified emerging but inconsistent evidence of alterations in sensory and motor function, and body perception, across seven CPP conditions. There were signs of both peripheral and central sensitisation, but limited motor assessment and variable methods. Qualitative studies highlighted lived experiences of altered awareness and disconnection from the pelvic area. Future research should define BPD in CPP, standardise testing, and integrate sensory, motor, and perceptual domains with qualitative data to clarify the role of body perception as a mechanism or symptom of disease, a marker of progression or a target for treatment.

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CRediT authorship contribution statement

Jilly Bond: Conceptualization, Methodology, Formal analysis, Validation, Investigation, Data curation, Visualization, Writing – original draft, Writing – review & editing, Project administration, **Elmar Kal:** Investigation, Writing – review & editing, Supervision, **Malgorzata Starzec-Proserpio:** Investigation, **Benedict M Wand:** Investigation, Writing – review & editing, Supervision, **K. Jane Chalmers:** Investigation, Writing – review & editing, **Lucia Berry:** Investigation, **Neil E O'Connell:** Investigation, Writing – review & editing, Supervision.

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Conflicts of Interest

The authors report no known conflicts of interest.

Data Statement

The data for this scoping review is freely available via Open Science Framework (https://tinyurl.com/4sfz3rcm).

Study pre-registration statement

This study was preregistered on Open Science Framework in July 2023: DOI 10.17605/OSF.IO/T4NVU

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.jpain.2026.106343.

References

1. Le A, Huang G, Goddard Y, et al. The cost of chronic pelvic pain in women: a systematic review of the literature. *J Obstet Gynaecol Can*. 2021;43(5):655–656.
2. Tichenor M, Sridhar D. Metric partnerships: global burden of disease estimates within the world bank, the world health organisation and the institute for health metrics and evaluation. *Wellcome Open Res*. 2019;4:35. https://doi.org/10.12688/wellcomeopenres.15011.2.
3. Engeler D, Baranowski AP, Berghmans B, et al. European association of urology guidelines on chronic pelvic pain. *ISBN 978-94-92671-19-6 EAU Guidel Edn Presente EAU Annu Congr Milan 2023*. 2023. *ISBN 978-94-92671-19-6*.
4. Malde S, Palmisani S, Al-Kaisy A, Sahai A. Guideline of guidelines: bladder pain syndrome. *BJU Int*. 2018;122(5):729–743. https://doi.org/10.1111/bju.14399. ⟨https://onlinelibrary.wiley.com/doi/abs/10.1111/bju.14399⟩.
5. Mardon AK, Leake HB, Szeto K, et al. Treatment recommendations for the management of persistent pelvic pain: a systematic review of international clinical practice guidelines. *BJOG Int J Obstet & Gynaecol*. 2022;129(8):1248–1260.
6. Vincent K, Evans E. An update on the management of chronic pelvic pain in women. *Anaesthesia*. 2021;76:96–107.
7. Lewis J.S., Kersten P., Mccabe C.S., Mcpherson K.M., Blake D.R. 2007. Body Percept Disturb A Contrib PAIN Complex Reg PAIN Syndr (CRPS) PAIN®1331-3111119.
8. Flor H, Nikolajsen L, Staehelin Jensen T. Phantom limb pain: a case of maladaptive CNS plasticity. *Nat Rev Neurosci*. 2006;7(11):873. https://doi.org/10.1038/nrn1991.
9. Budzisz A, Jung A, Adamczyk WM, et al. Body image measured via the fremantle awareness questionnaire in individuals with and without pain: a systematic review and meta-analysis. *J Pain*. 2024;25(8). https://doi.org/10.1016/j.jpain.2024.104530.
10. Peviani VC, Miller LE, Medendorp WP. Biases in hand perception are driven by somatosensory computations, not a distorted hand model. *Curr Biol*. 2024 May 20;34(10):2238–2246. https://doi.org/10.1101/2023.12.06.570330.
11. Longo MR. Distortion of mental body representations. *Trends Cogn Sci*. 2022;26(3). https://doi.org/10.1016/j.tics.2021.11.005.
12. Jarrell J, Arendt-Nielsen L. Quantitative sensory testing in gynaecology: improving preoperative and postoperative pain diagnosis. *J Obstet Gynaecol Can*. 2013;35(6):531–535. https://doi.org/10.1016/S1701-2163(15)30911-7.
13. Sutton KS, Pukall CF, Chamberlain S. Pain ratings, sensory thresholds, and psychosocial functioning in women with provoked vestibulodynia. *J Sex Marital Ther*. 2009;35(4):262–281. https://doi.org/10.1080/00926230902851256.
14. Basha ME, Kellogg-Spadt S, Burrows LJ, et al. Thermal and mechanical pain thresholds of women with provoked localized vulvodynia: a pilot study. *J Am Osteopath Assoc*. 2019;119(3):164–172.
15. Grundstrom H, Larsson B, Arendt-Nielsen L, Gerdle B, Kjolhede P. Associations between pain thresholds for heat, cold and pressure, and pain sensitivity questionnaire scores in healthy women and in women with persistent pelvic pain. *Eur J Pain*. 2019;23(9):1631–1639. https://doi.org/10.1002/ejp.1439.
16. Schrepf A, Williams DA, Gallop R, et al. Sensory sensitivity and symptom severity represent unique dimensions of chronic pain: A MAPP research network study. *Pain*. 2018;159(10):2002–2011. https://doi.org/10.1097/j.pain.0000000000001299.
17. Kutch JJ, Labus JS, Harris RE, et al. Resting-state functional connectivity predicts longitudinal pain symptom change in urologic chronic pelvic pain syndrome: A MAPP network study. *Pain (Amst)*. 2017;158(6):1069–1082. https://doi.org/10.1097/j.pain.0000000000000886.
18. Kilpatrick LA, Kutch JJ, Tillisch K, et al. Alterations in resting state oscillations and connectivity in sensory and motor networks in women with interstitial cystitis/painful bladder syndrome. *J Urol*. 2014;192(3):947–955.
19. As-Sanie S, Kim J, Schmidt-Wilcke T, Sundgren PC, Clauw DJ, Napadow V. Functional connectivity is associated with altered brain chemistry in women with

endometriosis-associated chronic pelvic pain. *J Pain*. 2016;17(1):1–13. https://doi.org/10.1016/j.jpain.2015.09.008.
20. Brawn J, Morotti M, Zondervan KT, Becker CM, Vincent K. Central changes associated with chronic pelvic pain and endometriosis. *Hum Reprod Update*. 2014;20(5):737–747.
21. Harris LR, Carnevale MJ, D'Amour S, et al. How our body influences our perception of the world. *Front Psychol*. 2015;6:819.
22. Kutch JJ, Labus JS, Harris RE, et al. Resting-state functional connectivity predicts longitudinal pain symptom change in urologic chronic pelvic pain syndrome: A MAPP network study. *Pain*. 2017;158(6):1069.
23. Gandevia SC, Phegan CM. Perceptual distortions of the human body image produced by local anaesthesia, pain and cutaneous stimulation. Pt 2 *J Physiol*. 1999;5(14):609–616. https://doi.org/10.1111/j.1469-7793.1999.609ae.x.
24. Bouffard J, Gagné M, Mercier C. Effect of painful and non-painful sensorimotor manipulations on subjective body midline. *Front Hum Neurosci*. 2013;7:77. https://doi.org/10.3389/fnhum.2013.00077.
25. Kiverstein J, Kirchhoff MD, Thacker M. An embodied predictive processing theory of pain experience. *Rev Philos Psych*. 2022;13(4):973–998. https://doi.org/10.1007/s13164-022-00616-2.
26. Wand BM, Cashin AG, McAuley JH, Bagg MK, Orange GM, Moseley GL. The fit-for-purpose model: conceptualizing and managing chronic nonspecific low back pain as an information problem. *Phys Ther*. 2022;103(2):p151. https://doi.org/10.1093/ptj/pzac151.
27. Bowering KJ, O'Connell NE, Tabor A, et al. The effects of graded motor imagery and its components on chronic pain: a systematic review and meta-analysis. *J Pain*. 2013;14(1):3–13.
28. Bagg MK, Wand BM, Cashin AG, et al. Effect of graded sensorimotor retraining on pain intensity in patients with chronic low back pain: a randomized clinical trial. *JAMA J Am Med Assoc*. 2022;328(5):430–439. https://doi.org/10.1001/jama.2022.9930.
29. Díaz-Mohedo E, González-Roldán G, Muñoz-Gámez I, et al. Implicit motor imagery for chronic pelvic pain: a cross-sectional case–control study. *J Clin Med*. 2023;12(14):4738.
30. Lopez-Brull A, Perez-Dominguez B, Plaza-Carrasco M, et al. Online graded motor imagery is effective in women diagnosed with pelvic pain: a randomized controlled trial. *Phys Ther*. 2025;105(2):p164.
31. Viceconti A, Camerone EM, Luzzi D, et al. Explicit and implicit experience of own's body in painful musculoskeletal disorders and rheumatic diseases: a scoping review protocol of available quantitative and qualitative evidence, *2050312118820026*. Published *SAGE Open Med 2018*. 2018 Dec 18;6. https://doi.org/10.1177/2050312118820026, *2050312118820026*. Published.
32. Aromataris E., Munn Z. JBI manual for evidence synthesis. ⟨https://synthesismanual.jbi.global⟩. Updated 2020.
33. Tricco AC, Lillie E, Zarin W, et al. PRISMA extension for scoping reviews (PRISMA-ScR): Checklist and explanation. *Ann Intern Med*. 2018;169(7):467–473. https://doi.org/10.7326/M18-0850.
34. Peters MD, Godfrey C, McInerney P, Munn Z, Tricco AC, Khalil H. Scoping reviews. *JBI Man Evid Synth*. 2020;10:10–46658.
35. Bond J., Kal E., Chalmers K.J., O'Connell N. Sensorimotor distortion in persistent pelvic pain: A scoping review protocol. ⟨https://osf.io/t4nvu⟩. Published June 14th, 2023.
36. Dagenais M, Proulx C, Augière T, Roy J, Mercier C. Self-reported questionnaires assessing body perception disturbances in adults with chronic non-cancer pain: a scoping review. *Front Pain Res*. 2025:6. https://doi.org/10.3389/fpain.2025.1497328.
37. Lotze M, Moseley GL. Role of distorted body image in pain. *Curr Rheumatol Rep*. 2007;9(6):488–496. https://doi.org/10.1007/s11926-007-0079-x.
38. McGowan J, Sampson M, Salzwedel DM, Cogo E, Foerster V, Lefebvre C. PRESS peer review of electronic search strategies: 2015 Guideline Statement. *J Clin Epidemiol*. 2016;75:40–46. https://doi.org/10.1016/j.jclinepi.2016.01.021.
39. Covidence. Veritas health innovation. Covidence systematic review software.2024.
40. Antonio FI, Kannathas S, Allard D, et al. Assessment of corticomotor excitability of the pelvic floor motor representation in women with and without provoked vestibulodynia (PVD): a cross sectional, observational case-control study. *Continence*. 2023;7, 100996.
41. Antonio FI, Rodrigues MP, Mitri L, et al. Pelvic floor muscle activation in response to pressure applied at the vulvar vestibule in women with and without provoked vestibulodynia. *Continence*. 2023;7, 100995.
42. Phan VT, Stratton P, Tandon HK, et al. Widespread myofascial dysfunction and sensitisation in women with endometriosis-associated chronic pelvic pain: a cross-sectional study. *Eur J Pain*. 2021;25(4):831–840.
43. Reed BD, Sen A, Harlow SD, Haefner HK, Gracely RH. Multimodal vulvar and peripheral sensitivity among women with vulvodynia: a case-control study. *J Low Genit Tract Dis*. 2017;21(1):78–84. https://doi.org/10.1097/LGT.0000000000000267.
44. Hellman KM, Oladosu FA, Garrison EF, Roth GE, Dillane KE, Tu FF. Circulating sex steroids and bladder pain sensitivity in dysmenorrhea. *Mol Pain*. 2021;17, 17448069211035217. https://doi.org/10.1177/17448069211035217.
45. Tu FF, Kane JN, Hellman KM. Noninvasive experimental bladder pain assessment in painful bladder syndrome. *BJOG*. 2017;124(2):283–291. https://doi.org/10.1111/1471-0528.14433.
46. Kmiecik MJ, Tu FF, Clauw DJ, Hellman KM. Multimodal hypersensitivity derived from quantitative sensory testing predicts pelvic pain outcome: an observational cohort study. *Pain*. 2023. https://doi.org/10.1097/j.pain.0000000000002909.
47. Kmiecik MJ, Tu FF, Silton RL, et al. Cortical mechanisms of visual hypersensitivity in women at risk for chronic pelvic. *Pain Pain*. 2022 Jun 1;163(6):1035–1048.
48. Smith KB, Pukall CF, Chamberlain SM. Sexual and relationship satisfaction and vestibular pain sensitivity among women with provoked vestibulodynia. *J Sex Med*. 2013;10(8):2009–2023. https://doi.org/10.1111/jsm.12213.
49. Hellman KM, Roth GE, Dillane KE, et al. Dysmenorrhea subtypes exhibit differential quantitative sensory assessment profiles. *Pain*. 2020;161(6):1227–1236. https://doi.org/10.1097/j.pain.0000000000001826.
50. Giesecke J, Reed BD, Haefner HK, Giesecke T, Clauw DJ, Gracely RH. Quantitative sensory testing in vulvodynia patients and increased peripheral pressure pain sensitivity. *Obstet Gynecol*. 2004;104(1):126–133. https://doi.org/10.1097/01.aog.0000129238.49397.4e.
51. Pukall CF, Young RA, Roberts MJ, Sutton KS, Smith KB. The vulvalgesiometer as a device to measure genital pressure-pain threshold. *Physiol Meas*. 2007;28(12):1543–1550. https://doi.org/10.1088/0967-3334/28/12/008.
52. Deutsch G, Deshpande H, Lai HH, Kutch JJ, Ness TJ. Cerebral perfusion and sensory testing results differ in interstitial cystitis/bladder pain syndrome patients with and without fibromyalgia: a site-specific MAPP network study. *J Pain Res*. 2021;14:3887–3895. https://doi.org/10.2147/JPR.S343695.
53. Hellman KM, Patanwala IY, Pozolo KE, Tu FF. Multimodal nociceptive mechanisms underlying chronic pelvic pain. e1–827.e9 *Am J Obstet Gynecol*. 2015;213(6):827. https://doi.org/10.1016/j.ajog.2015.08.038.
54. Laursen BS, Bajaj P, Olesen AS, Delmar C, Arendt-Nielsen L. Health related quality of life and quantitative pain measurement in females with chronic non-malignant pain. *Eur J Pain*. 2005;9(3):267–275. https://doi.org/10.1016/j.ejpain.2004.07.003.
55. Whitaker LH, Reid J, Choa A, et al. An exploratory study into objective and reported characteristics of neuropathic pain in women with chronic pelvic pain. *PLoS One*. 2016;11(4), e0151950. https://doi.org/10.1371/journal.pone.0151950.
56. Heddini U, Bohm-Starke N, Nilsson KW, Johannesson U. Provoked vestibulodynia–medical factors and comorbidity associated with treatment outcome. *J Sex Med*. 2012;9(5):1400–1406. https://doi.org/10.1111/j.1743-6109.2012.02665.x.
57. Shafrir AL, Martel E, Missmer SA, et al. Pelvic floor, abdominal and uterine tenderness in relation to pressure pain sensitivity among women with endometriosis and chronic pelvic pain. *Eur J Obstet Gynecol Reprod Biol*. 2021;264:247–253. https://doi.org/10.1016/j.ejogrb.2021.07.029.
58. Witzeman K, Nguyen RH, Eanes A, As-Sanie S, Zolnoun D. Mucosal versus muscle pain sensitivity in provoked vestibulodynia. *J Pain Res*. 2015;8:549–555. https://doi.org/10.2147/JPR.S85705.
59. Proulx L, Brizzolara K, Thompson M, Wang-Price S, Rodriguez P, Koppenhaver S. Women with chronic pelvic pain demonstrate increased lumbopelvic muscle stiffness compared to asymptomatic controls. *J Women's Health*. 2023;32(2):239–247. https://doi.org/10.1089/jwh.2022.0198.
60. Labus JS, Mayer EA, Tillisch K, et al. Dysregulation in sphingolipid signaling pathways is associated with symptoms and functional connectivity of pain processing brain regions in provoked vestibulodynia. *J Pain*. 2021;22(12):1586–1605. https://doi.org/10.1016/j.jpain.2021.04.017.
61. Tu FF, Datta A, Atashroo D, et al. Clinical profile of comorbid dysmenorrhea and bladder sensitivity: A cross-sectional analysis. e1–594.e11 *Am J Obstet Gynecol*. 2020;222(6):594. https://doi.org/10.1016/j.ajog.2019.12.010.
62. Alappattu MJ, George SZ, Robinson ME, et al. Painful intercourse is significantly associated with evoked pain perception and cognitive aspects of pain in women with pelvic pain. *Sex Med*. 2015;3(1):14–23. https://doi.org/10.1002/sm2.52.
63. Labus JS, Mayer EA, Aagaard K, Stains J, Broniowska K, Rapkin A. Reduced concentrations of vaginal metabolites involved in steroid hormone biosynthesis are associated with increased vulvar vestibular pain and vaginal muscle tenderness in provoked vestibulodynia: an exploratory metabolomics study. *Mol Pain*. 2021;17, 17448069211041853. https://doi.org/10.1177/17448069211041853.
64. Houston M, Dias N, Peng Y, et al. Gamma-band intermuscular connectivity is associated with increased neural drive to pelvic floor muscles in women with interstitial cystitis/bladder pain syndrome. *J Urol*. 2023. https://doi.org/10.1097/JU.0000000000003554.
65. Coxon L, Vollert J, Perro D, et al. Comprehensive quantitative sensory testing shows altered sensory function in women with chronic pelvic pain: Results from the translational research in pelvic pain (TRiPP) study. *Pain*. 2023. https://doi.org/10.1097/j.pain.0000000000002955.
66. Johannesson U, de Boussard CN, Brodda Jansen G, Bohm-Starke N. Evidence of diffuse noxious inhibitory controls (DNIC) elicited by cold noxious stimulation in patients with provoked vestibulodynia. *Pain*. 2007;130(1-2):31–39. https://doi.org/10.1016/j.pain.2006.10.022.
67. Schrepf A, Bradley CS, O'Donnell M, et al. Toll-like receptor 4 and comorbid pain in interstitial cystitis/bladder pain syndrome: a multidisciplinary approach to the study of chronic pelvic pain research network study. *Brain Behav Immun*. 2015;49:66–74. https://doi.org/10.1016/j.bbi.2015.03.003.
68. Hellman KM, Datta A, Steiner ND, et al. Identification of experimental bladder sensitivity among dysmenorrhea sufferers. e1–84.e8 *Obstet Gynecol*. 2018;219(1):84. https://doi.org/10.1016/j.ajog.2018.04.030.
69. Lai HH, Gardner V, Ness TJ, Gereau IVRW. Segmental hyperalgesia to mechanical stimulus in interstitial cystitis/bladder pain syndrome: evidence of central sensitization. *J Urol*. 2014;191(5):1294–1299. https://doi.org/10.1016/j.juro.2013.11.099.
70. Harte SE, Schrepf A, Gallop R, et al. Quantitative assessment of nonpelvic pressure pain sensitivity in urologic chronic pelvic pain syndrome: a MAPP research network study. *Pain*. 2019;160(6):1270–1280. https://doi.org/10.1097/j.pain.0000000000001505.
71. Lara-Ramos A, Alvarez-Salvago F, Fernandez-Lao C, et al. Widespread pain hypersensitivity and lumbopelvic impairments in women diagnosed with

endometriosis. *Pain Med*. 2021;22(9):1970–1981. https://doi.org/10.1093/pm/pnaa463.
72. Grundström H, Larsson B, Arendt-Nielsen L, Gerdle B, Kjolhede P. Pain catastrophizing is associated with pain thresholds for heat, cold and pressure in women with chronic pelvic pain. *Scand J Pain*. 2020;20(3):635–646. https://doi.org/10.1515/sjpain-2020-0015.
73. Grundström H, Gerdle B, Alehagen S, Berterö C, Arendt-Nielsen L, Kjølhede P. Reduced pain thresholds and signs of sensitization in women with persistent pelvic pain and suspected endometriosis. *Acta Obstet Gynecol Scand*. 2019;98(3):327–336.
74. Vuontisjarvi S, Rossi H, Herrala S, et al. The long-term footprint of endometriosis: population-based cohort analysis reveals increased pain symptoms and decreased pain tolerance at age 46 years. *J Pain*. 2018;19(7):754–763. https://doi.org/10.1016/j.jpain.2018.02.005.
75. Pokkinen SM, Nieminen K, Yli-Hankala A, Kalliomaki M. Characterization of persistent pain after hysterectomy based on gynaecological and sensory examination. *Scand J Pain*. 2016;11:42–48. https://doi.org/10.1016/j.sjpain.2015.11.011.
76. Cyr M, Bourbonnais D, Pinard A, Dubois O, Morin M. Reliability and convergent validity of the algometer for vestibular pain assessment in women with provoked vestibulodynia. *Pain Med*. 2016;17(7):1220–1228. https://doi.org/10.1093/pm/pnv069.
77. Slater H, Paananen M, Smith AJ, et al. Heightened cold pain and pressure pain sensitivity in young female adults with moderate-to-severe menstrual pain. *Pain*. 2015;156(12):2468–2478. https://doi.org/10.1097/j.pain.0000000000000317.
78. Farmer M, Maykut CA, Huberman JS, et al. Psychophysical properties of female genital sensation. *Pain*. 2013;154(11):2277–2286. https://doi.org/10.1016/j.pain.2013.05.028.
79. Zhang Z, Zolnoun DA, Francisco EM, Holden JK, Dennis RG, Tommerdahl M. Altered central sensitization in subgroups of women with vulvodynia. *Clin J Pain*. 2011;27(9):755–763. https://doi.org/10.1097/AJP.0b013e31821c98ec.
80. Twiss C, Kilpatrick L, Craske M, et al. Increased startle responses in interstitial cystitis: evidence for central hyperresponsiveness to visceral related threat. *J Urol*. 2009;181(5):2127–2133. https://doi.org/10.1016/j.juro.2009.01.025.
81. Haugstad GK, Haugstad TS, Kirste UM, et al. Posture, movement patterns, and body awareness in women with chronic pelvic pain. *J Psychosom Res*. 2006;61(5):637–644.
82. Fitzgerald MP, Koch D, Senka J. Visceral and cutaneous sensory testing in patients with painful bladder syndrome. *Neurourol Urodyn*. 2005;24(7):627–632.
83. Reissing ED, Binik YM, Khalife S, Cohen D, Amsel R. Vaginal spasm, pain, and behavior: an empirical investigation of the diagnosis of vaginismus. *Arch Sex Behav*. 2004;33(1):5–17.
84. Pukall CF, Binik YM, Khalife S, Amsel R, Abbott FV. Vestibular tactile and pain thresholds in women with vulvar vestibulitis syndrome. *Pain*. 2002;96(1-2):163–175.
85. Bohm-Starke N, Hilliges M, Brodda-Jansen G, Rylander E, Torebjork E. Psychophysical evidence of nociceptor sensitization in vulvar vestibulitis syndrome. *Pain*. 2001;94(2):177–183. https://doi.org/10.1016/S0304-3959(01)00352-9.
86. Berger B, Boning A, Martin H, Fazeli A, Martin DD, Vagedes J. Personal perception and body awareness of dysmenorrhea and the effects of rhythmical massage therapy and heart rate variability biofeedback: a qualitative study in the context of a randomized controlled trail. *Complement Ther Med*. 2019;45:280–288. https://doi.org/10.1016/j.ctim.2019.04.007.
87. Gentles A, Goodwin E, Bedaiwy Y, Marshall N, Yong PJ. Nociplastic pain in endometriosis: a scoping review. *J Clin Med*. 2024;13(24):7521.
88. Iacovides S, Baker FC, Avidon I, Bentley A. Women with dysmenorrhea are hypersensitive to experimental deep muscle pain across the menstrual cycle. *J Pain*. 2013;14(10). https://doi.org/10.1016/j.jpain.2013.04.010.
89. Cardaillac C, Levesque A, Riant T, et al. Evaluation of a scoring system for the detection of central sensitization among women with chronic pelvic pain. *Obstet Gynecol*. 2023;229(5):530. e1–530. e17.
90. Cardaillac C, Trottier C, Brochard C, et al. Gut, vaginal, and urinary microbiota as potential biomarkers of sensitization in women with chronic pelvic pain. *Am J Obstet Gynecol*. 2025;233(2). https://doi.org/10.1016/j.ajog.2025.01.013.
91. Zhu M, Huang F, Xu J, Chen W, Ding B, Shen Y. Risk factors and nomogram construction for predicting women with chronic pelvic pain: a cross-sectional population study. *Heliyon*. 2024;10(14). https://doi.org/10.1016/j.heliyon.2024.e34534.
92. Demetriou L, Perro D, Coxon L, et al. Exploring the value of a well-established conditioned pain modulation paradigm in women: a translational research in pelvic pain (TRiPP) study. *Front Pain Res*. 2025:6. https://doi.org/10.3389/fpain.2025.1439563.
93. Fortún-Rabadán R, Boudreau SA, Bellosta-López P, Herrero P, Graven-Nielsen T, Doménech-García V. Facilitated central pain mechanisms across the menstrual cycle in dysmenorrhea and enlarged pain distribution in women with longer pain history. *J Pain*. 2023;24(9):1541–1554, 1.
94. Helosvuori E, Oikkonen V. Sensing pain: embodied knowledge in endometriosis. *Health (Lond)*. 2023;28(6). https://doi.org/10.1177/13634593231214938.
95. McLean L, Antonio FI, Rodrigues MP, Pukall C. Pelvic floor muscle activation amplitude at rest, during voluntary contraction, and during valsalva manoeuvre—a comparison between those with and without provoked vestibulodynia. *J Sex Med*. 2025;22(4):570–578.
96. McLean L, Antonio FI, Rodrigues MP, Pukall C. Pelvic floor muscle activation in response to pressure stimuli applied to the vulvar vestibule: an observational study comparing women with and without provoked vestibulodynia. *J Sex Med*. 2025;22(7):1158–1172.
97. Schrepf A, Hellman KM, Bohnert AM, Williams DA, Tu FF. Generalized sensory sensitivity is associated with comorbid pain symptoms: a replication study in women with dysmenorrhea. *Pain*. 2023;164(1):142–148. https://doi.org/10.1097/j.pain.0000000000002676.
98. Liao C, Tan Y, Wang K, et al. The impact and correlation of anxiety and depression on pressure pain threshold of acupoints in patients with chronic pelvic inflammatory disease. *Pain Res Manag*. 2023;2023(1), 3315090.
99. Notenboom-nas FJM, Knol-de Vries GE, Slieker-ten Hove MCP, et al. Comparing male and female pelvic floor muscle function by the number and type of pelvic floor symptoms. *Neurourol Urodyn*. 2023;42(4). https://doi.org/10.1002/nau.25149.
100. Pierce J, Harte SE, Afari N, et al. Mediators of the association between childhood trauma and pain sensitivity in adulthood: a multidisciplinary approach to the study of chronic pelvic pain research network analysis. *Pain*. 2024;164(9). https://doi.org/10.1097/j.pain.0000000000002895.
101. Reina EM, Hellman KM, Kmiecik MJ, Terkildsen MF, Tu FF. Associations between menstrual pain and sexual function: the role of visceral hypersensitivity on developing sexual pain. *J Sex Med*. 2024;22(1). https://doi.org/10.1093/jsxmed/qdae149.
102. Schrepf AD, Mawla I, Naliboff BD, et al. Neurobiology and long-term impact of bladder-filling pain in humans: a multidisciplinary approach to the study of chronic pelvic pain (MAPP) research network study. *Pain*. 2023;164(10):2343–2351.
103. Poli-Neto O, Oliveira AMZ, Salata MC, et al. Strength exercise has different effects on pressure pain thresholds in women with endometriosis-related symptoms and healthy controls: a quasi-experimental study. *Pain Med (U S)*. 2020;21(10):2280–2287. https://doi.org/10.1093/PM/PNZ310.
104. Bohm-Starke N, Brodda-Jansen G, Linder J, Danielsson I. The results of treatment on vestibular and general pain thresholds in women with provoked vestibulodynia. *Clin J Pain*. 2007;23(7):598–604. https://doi.org/10.1097/ajp.0b013e318122d1fc.
105. Grinberg K, Granot M, Lowenstein L, Abramov L, Weissman-Fogel I. Negative illness perceptions are associated with a pronociceptive modulation profile and augmented pelvic pain. *Clin J Pain*. 2018;34(12):1141–1148. https://doi.org/10.1097/AJP.0000000000000633.
106. Spruijt MA, Klerkx WM, Notten K, et al. The efficacy of botulinum toxin A injection in pelvic floor muscles in chronic pelvic pain patients: a Double-Blinded randomised controlled trial. *BJOG Int J Obstet & Gynaecol*. 2025;132(3):297–305.
107. Pereira C, Xavier VB, Lima S, Alves V. Interferential current in the treatment of vaginismus - clinical trial. *J Sex Med*. 2020;17:S268–S269. https://doi.org/10.1016/j.jsxm.2020.07.047.
108. Danielsson I, Torstensson T, Brodda-Jansen G, Bohm-Starke N. EMG biofeedback versus topical lidocaine gel: a randomized study for the treatment of women with vulvar vestibulitis. *Acta Obstet Et Gynecol Scand*. 2006;85(11):1360–1367. https://doi.org/10.1080/00016340600883401.
109. Salinas-Asensio MM, Ocon-Hernandez O, Mundo-Lopez A, et al. 'Physio-EndEA' study: a randomized, parallel-group controlled trial to evaluate the effect of a supervised and adapted therapeutic exercise program to improve quality of life in symptomatic women diagnosed with endometriosis. *Int J Environ Res Public Health*. 2022;19(3). https://doi.org/10.3390/ijerph19031738.
110. Grinberg K, Weissman-Fogel I, Lowenstein L, Abramov L, Granot M. How does myofascial physical therapy attenuate pain in chronic pelvic pain syndrome. *Pain Res Manag*. 2019;2019, 6091257. https://doi.org/10.1155/2019/6091257.
111. Haugstad GK, Haugstad TS, Kirste UM, et al. Continuing improvement of chronic pelvic pain in women after short-term mensendieck somatocognitive therapy: results of a 1-year follow-up study. e1–615.e8 *Am J Obstet Gynecol*. 2008;199(6):615. https://doi.org/10.1016/j.ajog.2008.06.019.
112. Napadow V, Edwards RR, Cahalan CM, et al. Evoked pain analgesia in chronic pelvic pain patients using respiratory-gated auricular vagal afferent nerve stimulation. *Pain Med*. 2012;13(6):777–789. https://doi.org/10.1111/j.1526-4637.2012.01385.x.
113. Mechsner S, Grünert J, Wiese JJ, et al. Transcranial direct current stimulation to reduce chronic pelvic pain in endometriosis: phase II randomized controlled clinical trial. *Pain Med*. 2023. https://doi.org/10.1093/pm/pnad031.
114. Wamontree P, Chairat N, Taksin R, Phasinam K. A comparison of the effects of court-type traditional thai massage and prasaplai in reducing primary dysmenorrhea. *J Reatt Ther Dev Divers*. 2023;6:53–58.
115. Danielsen KG, Kaarbø MB, Groven KS, Helgesen ALO, Haugstad GK, Wojniusz S. Towards improved sexual health among women with provoked vestibulodynia: experiences from a somatocognitive therapy approach. *Eur J Physiother*. 2023. https://doi.org/10.1080/21679169.2023.2168749.
116. Murina F, Felice R, Di Francesco S, Oneda S. Vaginal diazepam plus transcutaneous electrical nerve stimulation to treat vestibulodynia: a randomized controlled trial. *Eur J Obstet Gynecol Reprod Biol*. 2018;228:148–153. https://doi.org/10.1016/j.ejogrb.2018.06.026.
117. Artacho-Cordón F, Salinas-Asensio M, Galiano-Castillo N, et al. Effect of a multimodal supervised therapeutic exercise program on quality of life, pain, and lumbopelvic impairments in women with endometriosis unresponsive to conventional therapy: a randomized controlled trial. *Arch Phys Med Rehabil*. 2023;104(11). https://doi.org/10.1016/j.apmr.2023.06.020.
118. Rodríguez-Ruiz Á, Arcos-Azubel C, Ruiz-Pérez M, et al. The benefits of an integral HAMMAM experience combining hydrotherapy and Swedish massage on pain, subjective well-being and quality of life in women with endometriosis-related chronic pelvic pain: a randomized controlled trial. *Medicina*. 2024;60(10):1677.
119. Johnson EV, Bachmann M, Yani MS, et al. Reducing pain by improving brain and muscle activity with motor cortical neuromodulation in women with interstitial cystitis/bladder pain syndrome: a study protocol for a randomized controlled trial. *Trials*. 2024;25(1). https://doi.org/10.1186/s13063-024-08450-w.

120. Hasanin ME, Aly SM, Taha MM, Mahmoud LSE, Aldhahi MI. The effect of laser biostimulation at sensitized acupoints on chronic pelvic pain and quality of life in women with pelvic inflammatory disease: a randomized controlled trial. *Medicina*. 2025;61(2):354.
121. Pazmany E, Ly HG, Aerts L, et al. Brain responses to vestibular pain and its anticipation in women with genito-pelvic pain/penetration disorder. *Neuroimage Clin*. 2017;16:477–490. https://doi.org/10.1016/j.nicl.2017.07.017.
122. Sutton K, Pukall C, Wild C, Johnsrude I, Chamberlain S. Cognitive, psychophysical, and neural correlates of vulvar pain in primary and secondary provoked vestibulodynia: a pilot study. *J Sex Med*. 2015;12(5):1283–1297. https://doi.org/10.1111/jsm.12863.
123. Yessick LR, Pukall CF, Ioachim G, Chamberlain SM, Stroman PW. An investigation of descending pain modulation in women with provoked vestibulodynia (PVD): alterations of spinal cord and brainstem connectivity, 682483 *Front Pain Res (Lausanne)*. 2021:2. https://doi.org/10.3389/fpain.2021.682483.
124. Gupta A, Rapkin AJ, Gill Z, et al. Disease-related differences in resting-state networks: a comparison between localized provoked vulvodynia, irritable bowel syndrome, and healthy control subjects. *Pain*. 2015;156(5):809–819. https://doi.org/10.1097/01.j.pain.0000461289.65571.54.
125. Lee L-, Chen Y-, Li W-, et al. Adaptive neuroplasticity in the default mode network contributing to absence of central sensitization in primary dysmenorrhea. *Front Neurosci*. 2023:17. https://doi.org/10.3389/fnins.2023.1094988.
126. Bhatt RR, Gupta A, Rapkin A, et al. Altered gray matter volume in sensorimotor and thalamic regions associated with pain in localized provoked vulvodynia: a voxel-based morphometry study. *Pain*. 2019;160(7):1529–1540. https://doi.org/10.1097/j.pain.0000000000001532.
127. Clemens JQ, Kutch JJ, Mayer EA, et al. The multidisciplinary approach to the study of chronic pelvic pain (MAPP) research network*: design and implementation of the symptom patterns study (SPS. *Neurourol Urodyn*. 2020;39(6):1803–1814. https://doi.org/10.1002/nau.24423.
128. Gupta A, Woodworth DC, Ellingson BM, et al. Disease-related microstructural differences in the brain in women with provoked vestibulodynia. e1–528.e15 *J Pain*. 2018;19(5):528. https://doi.org/10.1016/j.jpain.2017.12.269.
129. Kilpatrick LA, Ornitz E, Ibrahimovic H, et al. Gating of sensory information differs in patients with interstitial cystitis/painful bladder syndrome. *J Urol*. 2010;184(3):958–963. https://doi.org/10.1016/j.juro.2010.04.083.
130. Pukall CF, Strigo IA, Binik YM, Amsel R, Khalifé S, Bushnell MC. Neural correlates of painful genital touch in women with vulvar vestibulitis syndrome. *Pain*. 2005;115(1-2):118–127. https://doi.org/10.1016/j.pain.2005.02.020.
131. Heddini U, Bohm-Starke N, Gronbladh A, Nyberg F, Nilsson KW, Johannesson U. GCH1-polymorphism and pain sensitivity among women with provoked vestibulodynia. *Mol Pain*. 2012;8:68. https://doi.org/10.1186/1744-8069-8-68.
132. Armour M, Smith CA, Schabrun S, et al. Acupuncture for the treatment of endometriosis related chronic pelvic pain. *J Altern Complement Med*. 2017;27(10):841–849.
133. Pegado R. Electrical stimulation in women with primary dysmenorrhea. ⟨https://ensaiosclinicos.gov.br/rg/RBR-56w7h2p⟩ Published 17th May 2023. Accessed 4th July 2023.
134. NCT05342402. Feasibility study for provoked vestibulodynia. Published 16th April 2022. Accessed 4th July 2023. ⟨https://clinicaltrials.gov/study/NCT05342402⟩.
135. Pegado R. Transcranial direct current stimulation in women with primary dysmenorrhea: Usability and clinical trial. ⟨https://ensaiosclinicos.gov.br/rg/RBR-56w7h2p⟩. Published 17th May, 2023. Accessed 4th July, 2023.
136. Mukerji G, Waters J, Chessell IP, Bountra C, Agarwal SK, Anand P. Pain during ice water test distinguishes clinical bladder hypersensitivity from overactivity disorders. *BMC Urol*. 2006;6:31.
137. Morrissey D, El-Khawand D, Ginzburg N, Wehbe S, O'Hare P, Whitmore K. Botulinum toxin A injections into pelvic floor muscles under electromyographic guidance for women with refractory high-tone pelvic floor dysfunction: a 6-month prospective pilot study. *Female Pelvic Med Reconstr Surg*. 2015;21(5):277–282. https://doi.org/10.1097/SPV.0000000000000177.
138. Thaler L.. Pain tolerance and thresholds in women with dyspareunia: Do pain and sex primes have differential effects? 2011. UNLV Theses, Dissertations, Professional Papers, and Capstones. 1387. https://doi.org/10.34917/3277479.
139. Granot M, Lavee Y. Psychological factors associated with perception of experimental pain in vulvar vestibulitis syndrome. *J Sex Marital Ther*. 2005;31(4):285–302. https://doi.org/10.1080/00926230590950208.
140. Lowenstein L, Vardi Y, Deutsch M, et al. Vulvar vestibulitis severity-assessment by sensory and pain testing modalities. *Pain*. 2004;107(1):47–53. https://doi.org/10.1016/j.pain.2003.09.012.
141. Bohm-Starke N. Vulvar vestibulitis syndrome – pathophysiology of the vestibular mucosa. *Scand J Sexol*. 2001;4(4):227–234.
142. Ukimura O, Hirahara N, Yamada Y, et al. Evaluation of neuroselective current perception threshold in patients with overactive bladder or interstitial cystitis indicated coexistence of hypersensitivity in bladder afferent A-delta and C fibers. *J Urol*. 2008;179(4):520. https://doi.org/10.1016/S0022-5347(08)61532-3.
143. Basha M, Kellogg-Spadt S, Ruberu M, et al. Altered somatosensory processes in patients with provoked, localised vulvodynia. *J Sex Med*. 2010;7:138.
144. Brinkert W, Dimcevski G, Arendt-Nielsen L, Drewes AM, Wilder-Smith O. Dysmenorrhoea is associated with hypersensitivity in the sigmoid colon and rectum. *Pain*. 2007;132:S46–S51. https://doi.org/10.1016/j.pain.2006.12.011.
145. Tu FF, Fitzgerald CM, Kuiken T, Farrell T, Harden RN. Comparative measurement of pelvic floor pain sensitivity in chronic pelvic pain. *Obstet Gynecol*. 2007;110(6):1244–1248. https://doi.org/10.1097/01.AOG.0000289228.23903.cc.
146. Sutton KS, Pukall CF, Chamberlain S. Pain, psychosocial, sexual, and psychophysical characteristics of women with primary vs. secondary provoked vestibulodynia. *J Sex Med*. 2009;6(1):205–214. https://doi.org/10.1111/j.1743-6109.2008.01038.x.
147. Ness TJ, Powell-Boone T, Cannon R, Lloyd LK, Fillingim RB. Psychophysical evidence of hypersensitivity in subjects with interstitial cystitis. *J Urol*. 2005;173(6):1983–1987. https://doi.org/10.1097/01.ju.0000158452.15915.e2.
148. Waldinger MD, Venema PL, van Gils APG, Schweitzer DH. New insights into restless genital syndrome: static mechanical hyperesthesia and neuropathy of the nervus dorsalis clitoridis. *J Sex Med*. 2009;6(10):2778–2787. https://doi.org/10.1111/j.1743-6109.2009.01435.x.
149. Issa B, Onon TS, Agrawal A, et al. Visceral hypersensitivity in endometriosis: a new target for treatment. *Gut*. 2012;61(3):367–372. https://doi.org/10.1136/gutjnl-2011-300306.
150. Burrows LJ, Klingman D, Pukall CF, Goldstein AT. Umbilical hypersensitivity in women with primary vestibulodynia. *J Reprod Med*. 2008;53(6):413–416.
151. Bajaj P, Madsen H, Arendt-Nielsen L. Endometriosis is associated with central sensitization: a psychophysical controlled study. *J Pain*. 2003;4(7):372–380. https://doi.org/10.1016/s1526-5900(03)00720-x.
152. Meana M, Lykins A. Negative affect and somatically focused anxiety in young women reporting pain with intercourse. *J Sex Res*. 2009;46(1):80–88. https://doi.org/10.1080/00224490802624422.
153. Verstraelen H, De Zutter E, De Muynck M. Genitofemoral neuralgia: adding to the burden of chronic vulvar pain. *J Pain Res*. 2015;8:845–849. https://doi.org/10.2147/JPR.S93107.
154. van Aken M, Oosterman J, van Rijn T, et al. Experimental pain tolerance is decreased and independent of clinical pain intensity in patients with endometriosis. *Fertil Steril*. 2018;110(6):1118–1128. https://doi.org/10.1016/j.fertnstert.2018.06.040.
155. Jarrell J, Malekzadeh L, Yang H, Arendt-Nielsen L. The significance of cutaneous allodynia in a woman with chronic pelvic pain. *J Obstet Gynaecol Can*. 2015;37(7):628–632. https://doi.org/10.1016/S1701-2163(15)30201-2.
156. Kao A, Binik YM, Amsel R, Funaro D, Leroux N, Khalife S. Challenging atrophied perspectives on postmenopausal dyspareunia: a systematic description and synthesis of clinical pain characteristics. *J Sex Marital Ther*. 2012;38(2):128–150. https://doi.org/10.1080/0092623X.2011.569641.
157. Murina F, Bianco V, Radici G, Felice R, Signaroldi M. Electrodiagnostic functional sensory evaluation of patients with generalized vulvodynia: a pilot study. *J Low Genit Tract Dis*. 2010;14(3):221–224. https://doi.org/10.1097/LGT.0b013e3181e07545.
158. Frasson E, Graziottin A, Priori A, et al. Central nervous system abnormalities in vaginismus. *Clin Neurophysiol*. 2009;120(1):117–122. https://doi.org/10.1016/j.clinph.2008.10.156.
159. Bajaj P, Madsen H, Arendt-Nielsen L. A comparison of modality-specific somatosensory changes during menstruation in dysmenorrheic and nondysmenorrheic women. *Clin J Pain*. 2002;18(3):180–190.
160. Granot M, Yarnitsky D, Itskovitz-Eldor J, Granovsky Y, Peer E, Zimmer EZ. Pain perception in women with dysmenorrhea. *Obstet Gynecol*. 2001;98(3):407–411.
161. Scarpina F, Navarra ME, Varallo G, Bernorio R. The role of interoceptive sensibility on central sensitization to pain in vulvodynia. *J Sex Med*. 2025;22(3). https://doi.org/10.1093/jsxmed/qdae203.
162. Lev-Sagie A, Rayan-Gharra N, Allouche-Kam H, Granot M. Does one measure fit all? the role of experimentally induced pain tests in the assessment of women with provoked vestibular pain. *Int J Women's Health*. 2024:1199–1210.
163. Silva de Barros A, Moreira da Cunha R, Soares Coutinho S, Lira do Nascimento S, Robson Pinheiro Sobreira Bezerra L. Musculoskeletal evaluation of the lower pelvic complex in women with endometriosis: a case-control study. *Eur J Obstet Gynecol Reprod Biol*. 2024;299:317–321.
164. Knox S, Offiah I, Hashim H. Evaluation of central sensitisation in bladder pain syndrome: a systematic review. *Int Urogynecol J*. 2024;35(6). https://doi.org/10.1007/s00192-024-05793-5.
165. Michalczyszyn LE, Penteado FA, Franco EM, Navroski EC, de Andrade GF, Lopes J. Impact of dysmenorrhea on the level of self-perception of the pelvic floor in nulliparous young women. *Braz J Phys Ther*. 2024;28, 100826.
166. Morin M. Dry needling for provoked vestibulodynia. Published 4th April, 2023. Accessed 4th July, 2023. ⟨https://clinicaltrials.gov/show/NCT05797480⟩.
167. Murina F, Graziottin A, Felice R, Radici G, Tognocchi C. Vestibulodynia: synergy between palmitoylethanolamide + transpolydatin and transcutaneous electrical nerve stimulation. *J Low Genit Tract Dis*. 2013;17(2):111–116. https://doi.org/10.1097/LGT.0b013e3182652316.
168. Cutting H., Farb D., Rapkin A., et al. Baseline characteristics of participants in a multicenter randomized clinical trial of vestibulodynia: Understanding pathophysiology and determining appropriate treatments (vestibulodynia: Update). 2023;20:II45.
169. Rains A, Bajzak K, Miller ME, et al. Multimodal and interdisciplinary interventions for the treatment of localized provoked vulvodynia: a scoping review of the literature from 2010 to 2023. *IJWH*. 2024;6. https://doi.org/10.2147/ijwh.s436222.
170. Deodato M, Grosso G, Drago A, et al. Efficacy of manual therapy and pelvic floor exercises for pain reduction in primary dysmenorrhea: a prospective observational study. *J Bodyw Mov Ther*. 2023:36. https://doi.org/10.1016/j.jbmt.2023.07.002.
171. Simpson G, Philip M, Lucky T, Ang C, Kathurusinghe S. A systematic review of the efficacy and availability of targeted treatments for central sensitization in women with endometriosis. *Clin J Pain*. 2022;38(10):640–648. https://doi.org/10.1097/AJP.0000000000001057.
172. Böttcher B, Siedentopf C, Steiger R, et al. Pain activations in patients with dysmenorrhea-an fMRI study. *Human Reprod (Oxf Engl)*. 2017;32:i257–i258.

173. Sutton KS, Yessick LR, Wild CJ, Chamberlain SM, Pukall CF. Exploring the neural correlates of touch and pain in women with provoked vestibulodynia. *Pain*. 2020; 161(5):926–937. https://doi.org/10.1097/j.pain.0000000000001778.
174. Heddini U, Bohm-Starke N, Gronbladh A, Nyberg F, Nilsson KW, Johannesson U. Serotonin receptor gene (5HT-2A) polymorphism is associated with provoked vestibulodynia and comorbid symptoms of pain. *J Sex Med*. 2014;11(12): 3064–3071. https://doi.org/10.1111/jsm.12685.
175. Mahmoud L.S.E. Laser at lumbar acupoint on pain and quality of life in chronic pelvic pain. Published 13th September, 2022. Accessed 4th July, 2023. ⟨https://clinicaltrials.gov/show/NCT05537207⟩.
176. Nelson P. Effect of spinal manipulation on vulvar pain. Published July 2019. Published 11th July, 2019. Accessed 4th July, 2023. ⟨https://clinicaltrials.gov/study/NCT04016467⟩.
177. Aramburu N.B. Effectiveness of non-invasive neuromodulation in primary dysmenhorrea: A randomized clinical trial. Published 31st January, 2024, Accessed 15th April, 2025. ⟨https://clinicaltrials.gov/study/NCT06233786⟩.
178. Chen, Xingli. Exploring the therapeutic effect and mechanism of myofascial trigger points theory in primary dysmenorrhea. Published 14th November, 2024. Accessed 15th April, 2025. ⟨https://www.chictr.org.cn/showprojEN.html?proj=246264⟩.
179. García-García B., Díaz-Arribas M.J., Urraca-Gesto M.A., Valera-Calero J.A., Ortiz-Gutiérrez R.M., Plaza-Manzano G. Effectiveness of radiofrequency in primary dysmenorrhea: A randomized controlled trial. TrialX Web site. Published July 2024. Accessed 15th April, 2025. ⟨https://staging-tx.trialx.com/clinical-trials/listings/294/efficacy-of-radiofrequency-in-primary-dysmenorrhea/⟩.
180. Antonio F.I., MacDonald A. Is repetitive transcranial magnetic stimulation effective in reducing endometriosis-associated pain. Clinical Trials Web site. Published 27th March, 2024. Accessed 15th April, 2025. ⟨https://clinicaltrials.gov/study/NCT06333353?term=Is%20Repetitive%20Transcranial%20Magnetic%20Stimulation%20Effective%20in%20Reducing%20Endometriosis-associated%20Pain&rank=1⟩.
181. Cuenca F. Motor imagery plus therapeutic exercise in women with menstrual pain: A randomized controlled trial. Published 5th November, 2024. Accessed 15th April, 2025. ⟨https://clinicaltrials.gov/study/NCT06674655?term=motor-imagery-plus-therapeutic-exercise-in-women-with-menstrual-pain&rank=1⟩.
182. Schuttert, I., Timmerman, et al. Effects of tapentadol on chronic pain and parameters of central sensitization. A prospective, open label, randomized cross-over study with pregabalin as comparator (study protocol). Published 15th November 2018. Accessed 15th April 2025. ⟨https://research.rug.nl/en/publications/effects-of-tapentadol-on-chronic-pain-and-parameters-of-central-s⟩.
183. Barreto L.M., Moreira M.A. The effects of transcranial direct current stimulation on pain, functioning and kinesiophobia in women with chronic pelvic pain: A randomized controlled clinical trial. Published 11th December, 2024. Accessed 15th April, 2025. ⟨https://ensaiosclinicos.gov.br/rg/RBR-9nsmj66⟩.
184. Hasenack Stallbaum J, Santana da Silva F, Forgiarini Saccol M, Medeiros Braz M. Postural control of women with primary dysmenorrhea in different phases of the menstrual cycle. *Fisioter Pesqui*. 2018;25(1):74–81. https://doi.org/10.1590/1809-2950/17243825012018.
185. Jones C, Kelly M, Thompson J, et al. The development of a perineal specific body perception questionnaire, based on the fremantle back awareness questionnaire, to measure body perception in individuals with persistent perineal pain. *Aust NZ Cont J*. 2023;29(2):40.
186. Fuentes-Márquez P, Valenza MC, Cabrera-Martos I, Ríos-Sánchez A, Ocón-Hernández O. Trigger points, pressure pain hyperalgesia, and mechanosensitivity of neural tissue in women with chronic pelvic pain. *PAIN MED*. 2019;20(1):5–13. https://doi.org/10.1093/pm/pnx206.
187. Terzi H, Terzi R, Kale A. The relationship between fibromyalgia and pressure pain threshold in patients with dyspareunia. *Pain Res Manag*. 2015;20(3):137–140. https://doi.org/10.1155/2015/302404.
188. Serrano-Imedio A, Calvo-Lobo C, Casañas-Martin C, Garrido-Marin A, Pecos-Martin D. Myofascial pain syndrome in women with primary dysmenorrhea: a case-control study. *Diagnostics*. 2022;12(11). https://doi.org/10.3390/diagnostics12112723.
189. Boge-Olsnes CM, Risør MB, Øberg GK. How life events are perceived to link to bodily distress: a qualitative study of women with chronic pelvic pain. *Health Care Women Int*. 2022:1–21. https://doi.org/10.1080/07399332.2022.2087076.
190. Keklicek H, Sermenli Aydin N, Can HB, Donmez Aydin D, Yilmazer Kayatekin AZ, Ulucam E. Primary dysmenorrhea and postural control: Is it a problem only during menstruation. *Gait Posture*. 2021;85:88–95. https://doi.org/10.1016/j.gaitpost.2021.01.019.
191. Haugstad GK, Wojniusz S, Kirste UM, Kirschner RS, Lilleheie I, Haugstad TSPain. psychological distress and motor pattern in women with provoked vestibulodynia (PVD) - symptom characteristics and therapy suggestions. *Scand J Pain*. 2018;18 (2):221–227. https://doi.org/10.1515/sjpain-2017-0173.
192. Aerts L, Bergeron S, Pukall CF, Khalife S. Provoked vestibulodynia: Does pain intensity correlate with sexual dysfunction and dissatisfaction. *J Sex Med*. 2016;13 (6):955–962. https://doi.org/10.1016/j.jsxm.2016.03.368.
193. Baran E, Yılmaz T. Investigation of postural sensory organization in women with and without primary dysmenorrhea in three phases of the menstrual cycle. *Gait & Posture*. 2024:109. https://doi.org/10.1016/j.gaitpost.2024.01.009.
194. Ortiz MI. Pressure pain threshold, depression and anxiety in women with primary dysmenorrhea: a prospective cohort study. *Clin Exp Obstet Gynecol*. 2024;51(11): 240.
195. Boge-Olsnes C, Bech Risør M, Øberg GK. Chronic pelvic pain sufferers' experiences of Norwegian psychomotor physiotherapy: a qualitative study on an embodied approach to pain. *Eur J Physiother*. 2022. https://doi.org/10.1080/21679169.2022.2136754.
196. Wissing MC, Van Der Wal SEI, Bongarts S, et al. The clinical value of EMG and SSEP in diagnosing chronic pelvic pain syndrome; a systematic review. *Pain Pract*. 2025; 25(4). https://doi.org/10.1111/papr.70028.
197. Özden F, Golcuk Y, Karaman ÖN, Özkeskin M. The association between urinary incontinence with pelvic pain and sensory-motor function in older women with stroke. *Neurourol Urodyn*. 2025;44(1):165–170.
198. Haugstad GK, Wojniusz S, Kirschner R, Kirste U, Lilleheie I, Haugstad TS. Somatocognitive therapy of women with provoked vulvodynia: a pilot study. *Scand J Pain*. 2019;19(4):725–732. https://doi.org/10.1515/sjpain-2019-0011.
199. Murina F, Graziottin A, Toni N, et al. Clinical evidence regarding Spermidine–Hyaluronate gel as a novel therapeutic strategy in vestibulodynia management. *Pharmaceutics*. 2024;16(11). https://doi.org/10.3390/pharmaceutics16111448.
200. Park S, Kim H, Jung J, Lee S. Effects of sacroiliac joint manipulation on autonomic nervous system and lower abdominal pain in women with primary dysmenorrhoea: A randomized controlled trial. *Medicina*. 2024;60(12). https://doi.org/10.3390/medicina60122068.
201. Böttcher B, Gizewski ER, Siedentopf C, et al. Behavioural and neural responses to aversive visceral stimuli in women with primary dysmenorrhoea. *Eur J Pain*. 2019; 23(2):272–284. https://doi.org/10.1002/ejp.1302.
202. Abreu-Mendes P, Dias D, Magno F, et al. A pilot study of functional brain magnetic resonance imaging in BPS/IC patients: Evidence of central sensitization. *Urol Res Pract*. 2024;50(1):53.
203. McLean L.. Is low level laser therapy (LLLT) effective for reducing pain experienced by women with provoked vestibulodynia? Published 21st January, 2020. Accessed 4th July, 2023. ⟨https://clinicaltrials.gov/study/NCT04234542⟩.
204. Jiménez E.S. Effects of the application of lymphatic neuromuscular taping technique in women with primary dysmenorrhea versus short-wave. Published 23rd March, 2023. Accessed 4th July, 2023. ⟨https://www.anzctr.org.au/Trial/Registration/TrialReview.aspx?id=378503&showOriginal=true&isReview=true⟩.
205. Lev-Sagie A, Wertman O, Lavee Y, Granot M. Vestibular anatomic localization of pain sensitivity in women with insertional dyspareunia: A different approach to address the variability of painful intercourse. *J Clin Med*. 2020;9(7):1–15. https://doi.org/10.3390/jcm9072023.
206. Lamvu G, Nguyen RHN, Burrows LJ, et al. The evidence-based vulvodynia assessment project. A national registry for the study of vulvodynia. *J Reprod Med*. 2015;60(5-6):223–235.
207. Spinoni M, Porpora MG, Muzii L, Grano C. Pain severity and depressive symptoms in endometriosis patients: Mediation of negative body awareness and interoceptive self-regulation. *J Pain*. 2024;25(11), 104640.
208. Machado AFP, Perracini MR, Rampazo EP, Driusso P, Liebano RE. Effects of thermotherapy and transcutaneous electrical nerve stimulation on patients with primary dysmenorrhea: A randomized, placebo-controlled, double-blind clinical trial. *Complement Ther Med*. 2019;47, 102188. https://doi.org/10.1016/j.ctim.2019.08.022.
209. Michalczyszyn LE, Penteado FA, Franco EM, Navroski EC, de Andrade GF, Lopes J. Impact of dysmenorrhoea on the level of self-perception of the pelvic floor in nulliparous young women. *Braz J Phys Ther*. 2024;28, 100826.
210. Goldfinger CA. A randomized comparison of individual cognitive-behavioural therapy and pelvic floor rehabilitation in the treatment of provoked vestibulodynia. Queen's University (Canada). *ProQuest Diss & Theses*. 2014: NS27976.
211. Berger B, Boning A, Martin H, Fazeli A, Martin DD, Vagedes J. Personal perception and body awareness of dysmenorrhea and the effects of rhythmical massage therapy and heart rate variability biofeedback-A qualitative study in the context of a randomized controlled trail. *Complement Ther Med*. 2019;45:280–288. https://doi.org/10.1016/j.ctim.2019.04.007.
212. Mills J, Shu C, Misajon R, Rush-Privitera G. 'My body is out to wreck everything I have': A qualitative study of how women with endometriosis feel about their bodies. *Psychol Health*. 2025;40(2):285–303.
213. Armour M, Smith CA. Treating primary dysmenorrhoea with acupuncture: A narrative review of the relationship between acupuncture 'dose' and menstrual pain outcomes. *Acupunct Med*. 2016;34(6):416–424. https://doi.org/10.1136/acupmed-2016-011110.
214. Weaver KR, Griffioen MA, Klinedinst NJ, et al. Quantitative sensory testing across chronic pain conditions and use in special populations. *Front Pain Res*. 2022:2. https://doi.org/10.3389/fpain.2021.779068.
215. Starkweather AR, Heineman A, Storey S, et al. Methods to measure peripheral and central sensitization using quantitative sensory testing: A focus on individuals with low back pain. *Appl Nurs Res*. 2016;29:237. https://doi.org/10.1016/j.apnr.2015.03.013.
216. Nijs J, George SZ, Clauw DJ, et al. Central sensitisation in chronic pain conditions: latest discoveries and their potential for precision medicine. *Lancet Rheumatol*. 2021;3(5):e383–e392.
217. Kadah S, Soh S, Morin M, Schneider M, Heron E, Frawley H. Is there a difference in pelvic floor muscle tone between women with and without pelvic pain? A systematic review and meta-analysis. *J Sex Med*. 2023;20(1):65–96.
218. Augière T, Metral M, Simoneau M, Mercier C. Preserved tactile distance estimation despite body representation distortions in individuals with fibromyalgia. *Front Pain Res*. 2024:5. https://doi.org/10.3389/fpain.2024.1414927.
219. Tanaka S, Nishigami T, Ohishi K, et al. "But it feels swollen!": The frequency and clinical characteristics of people with knee osteoarthritis who report subjective knee swelling in the absence of objective swelling. *PR9*. 2021;6(4). https://doi.org/10.1097/pr9.0000000000000971.

220. Brumagne S, Cordo P, Verschueren S. Proprioceptive weighting changes in persons with low back pain and elderly persons during upright standing. *Neurosci Lett*. 2004;366(1):63. https://doi.org/10.1016/j.neulet.2004.05.013.
221. Moseley GL. I can't find it! distorted body image and tactile dysfunction in patients with chronic back. *Pain Pain*. 2008;140(1):239. https://doi.org/10.1016/j.pain.2008.08.001.
222. Lewis JS, Kersten P, Mcpherson KM, et al. Wherever is my arm? impaired upper limb position accuracy in complex regional pain syndrome. *Pain*. 2010;149(3). https://doi.org/10.1016/j.pain.2010.02.007.
223. Lewis JS, Schweinhardt P. Perceptions of the painful body: The relationship between body perception disturbance, pain and tactile discrimination in complex regional pain syndrome. *Eur J Pain*. 2012;16(9):1320. https://doi.org/10.1002/j.1532-2149.2012.00120.x.
224. Acapo S, Osinski T, Rulleau T, Dupeyron A, Nizard J. Assessment of body perception disturbances in complex regional pain syndrome: a systematic review using the COSMIN guideline. *Eur J Pain*. 2022;26(10):2060. https://doi.org/10.1002/ejp.2032.
225. Ten Brink AF, Halicka M, Vittersø AD, Jones HG, Stanton TR, Bultitude JH. Validation of the bath CRPS body perception disturbance scale. *J Pain*. 2021;22(11):1371–1384.
226. Wand BM, Catley MJ, Rabey MI, O'Sullivan PB, O'Connell NE, Smith AJ. Disrupted self-perception in people with chronic low back pain. further evaluation of the fremantle back awareness questionnaire. *J Pain*. 2016;17(9):1001. https://doi.org/10.1016/j.jpain.2016.06.003.
227. Viceconti A, Camerone EM, Luzzi D, et al. Explicit and implicit own's body and space perception in painful musculoskeletal disorders and rheumatic diseases: a systematic scoping review. *Front Human Neurosci*. 2020;14:83.
228. Buchanan NT, Perez M, Prinstein MJ, Thurston IB. Supplemental material for upending racism in psychological science: strategies to change how science is conducted, reported, reviewed, and disseminated. *Am Psychol*. 2021. https://doi.org/10.1037/amp0000905.supp.
229. Network TE, O'Connell NE, Belton J, et al. Enhancing the trustworthiness of pain research: A call to action. *J Pain*. 2025;28, 104736.
230. Palermo TM, Alderfer MA, Boerner KE, et al. Editorial: Diversity, equity, and inclusion: reporting race and ethnicity in the journal of pediatric psychology. *J. Pedi. Psych*. 2021;46(7):731. https://doi.org/10.1093/jpepsy/jsab063.
231. Hood AM, Morais CA, Fields LN, et al. Racism exposure and trauma accumulation perpetuate pain inequities—advocating for change (RESTORATIVE): a conceptual model. *Am Psychol*. 2023;78(2):143. https://doi.org/10.1037/amp0001042.
232. Wallace B, Varcoe C, Holmes C, et al. Towards health equity for people experiencing chronic pain and social marginalization. *Int J Equity Health*. 2021;20(1). https://doi.org/10.1186/s12939-021-01394-6.