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Role of Manual Therapy in Supporting Quality of Life in Women with Primary Dysmenorrhea

A Scoping Review

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Abstract

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This scoping review aimed to identify manual therapy approaches supporting the quality of life in women with primary dysmenorrhea and chart the scope and characteristics of existing evidence while identifying research gaps. Primary dysmenorrhea is a highly prevalent and disabling condition that substantially affects the quality of life among women but remains underreported and often dismissed in healthcare and sociocultural contexts. Consequently, many women experience delayed or inadequate care and seek complementary or alternative support, highlighting the need to explore the potential role of manual therapy.

Studies published in English, German, or Swedish between January 2010 and July 2025 were included. Four databases were searched: CINAHL, ScienceDirect, PEDro, and Google Search Engine. The study selection for this scoping review followed the PRISMA-ScR framework, resulting in 18 randomised controlled trials. The quality of the included studies was assessed using the JBI critical appraisal tool, and data were synthesised using abductive content analysis.

Three intervention categories were identified: movement-based, hands-on, and adjunctive therapies. These were linked to three domains: health and well-being, pain experience and impact, as well as academic role functioning. Overall, the pain outcomes, as well as the psychological and physical health aspects were most frequently assessed, whereas sleep, menstrual-related symptoms, as well as academic role functioning, were reported less consistently. Several studies applied multimodal interventions combining exercise, taping, relaxation, or manual techniques, limiting comparability. Interventions showed substantial heterogeneity in type, delivery, and outcome measures. Some approaches were associated with improvements in pain outcomes and selected quality-of-life domains, whereas broader dimensions were assessed less frequently. The methodological variability and risks of bias limit the strength of the evidence. Further well-designed studies with clearly defined protocols and consistent quality-of-life outcomes are needed to clarify the role of manual therapy in supporting the quality of life in women with primary dysmenorrhea.

Keywords: primary dysmenorrhea, dysmenorrhea, manual therapy, osteopathy, physiotherapy, quality of life, HRQOL

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1 Introduction

Primary dysmenorrhea (PD), defined as painful menstrual cramps (Coco 1999; Proctor and Farquhar 2006), is a highly prevalent condition that substantially impairs quality of life (QoL) worldwide, affecting physical functioning, mental health, social participation, education and work attendance (Mardon et al. 2024), and overall life satisfaction (Armour et al. 2020; Iacovides, Avidon, Bentley and Baker 2014). Prevalence estimates reach up to 94% (Barcikowska, Wójcik-Bilkiewicz, Sobierajska-Rek, Grzybowska, Waż and Zorena 2020), yet PD receives limited policy attention (Howe et al. 2023). Its economic burden includes healthcare costs, reduced productivity, and absenteeism from work and education (O’Shea, Varua, Duffy, Eathorne and Armour 2026; Åberg and Le 2023). Although longitudinal data remain scarce (Cameron, Mikocka-Walus, Sciberras, Druitt, Stanley and Evans 2024), consistently high prevalence in recent studies (Barbosa-Silva et al. 2024; Liu, Wang, Wu, Wang and Fang 2024) confirms PD as an ongoing global health concern.

Dysmenorrhea is prospectively associated with increased risk of chronic and widespread pain (Li, Kreher, Jusko, Chapman, Bonham and Seplaki 2021) and recognised within the chronic pelvic pain spectrum, although outcomes, particularly QoL and life impact, are inconsistently measured (Ghai, Subramanian, Jan, Pergialiotis, Thakar and Doumouchtsis 2021). Dysmenorrhoeal pain is also linked to depression and anxiety (Cameron et al. 2025).

Due to the gender pain gap, in which women’s pain is frequently normalised or psychologised (Samulowitz et al. 2018 cited in Laughey, Vincent, Iyer, Cobo and Slater 2025; Stieger, Asadauskas, Luedi and Andereggen 2025) and influenced by early gender biases in pain perception (Cohen, Cobb and Martin 2014), PD remains undertreated. Menstrual stigma is embedded in institutional and policy contexts, where norms of concealment shape public discourse on menstruation (Olson, Alhelou, Kavattur, Rountree and Winkler 2022). Cultural

norms that minimise menstrual pain may further delay help-seeking and engagement with care (Holst et al. 2022).

Digital self-management tools such as menstrual tracking applications are increasingly used, yet their accessibility, quality, and evidence base remain uneven, which may limit their usefulness for effective dysmenorrhea management (Trépanier et al. 2023).

Although research on PD is increasing, much of it relies on cross-sectional designs (Barbosa-Silva et al. 2024; Ju, Jones and Mishra 2014). Few reviews have addressed menstrual health more broadly (Fennie, Moletsane and Padmanabhanunni 2022; Howe et al. 2023; Åkerman, Wångborg, Persson and Klingberg-Allvin 2025) or dysmenorrhea specifically (Black, Perry, Walton, Semprini and Armour 2025; Ummah and Ismarwati 2024). Research on manual therapy (MT) has largely focused on pain outcomes (Armour et al. 2019a; Cai, Liu, Jing, Yin, Kong and Guo 2024; Li, Sun, Wang, Wang and Yu 2024; Rigal, Bonnet, Vieira, Carvalhais and Lopes 2025; Upganlawar, Patil and Dhage 2023; Yong, Westra, Patel, Kratt and Rowane 2022) while QoL outcomes remain comparatively underexplored (Fuentes-Aparicio, Cuenca-Martínez, Muñoz-Gómez, Mollà-Casanova, Aguilar-Rodríguez and Sempere-Rubio 2023; Pawalia, Panihar, Yadav and Joshi 2022).

Evidence-based healthcare emphasises integrating best available evidence with patient values and shared decision-making, particularly when evidence is limited (Bronfort, Haas, Evans, Leininger and Triano 2010), as in the case of MT for PD. Although MT is well-established in musculoskeletal care (Draper-Rodi, Newell, Barbe and Bialosky 2024), it is increasingly explored for dysmenorrhea management (González-Mena, Leirós-Rodríguez and Hernandez-Lucas 2024; Li et al. 2024). Therefore, this thesis explores how MT approaches have been used to support QoL in women with PD. Specifically, this scoping review (ScR) aims to systematically map and describe MT approaches supporting QoL in women with PD and to clarify the scope and characteristics of the existing evidence while identifying gaps for future research.

2 Theoretical background

This ScR focuses on three main concepts: 'primary dysmenorrhea' in women, 'quality of life', and 'manual therapy', which also served as the key terms for data selection. The references included in the theoretical background were identified through systematic searches across multiple databases using these key terms in various combinations. In addition, reference lists of relevant studies were manually screened, and this iterative process continued until the thesis was finalised.

2.1 Primary Dysmenorrhea

Primary dysmenorrhea is a common menstrual disorder characterized by recurrent, cramp-like lower abdominal pain occurring just before or during menstruation (Coco 1999; Proctor and Farquhar 2006), with a global prevalence of up to 94% among women of reproductive age (Barcikowska et al 2020). This condition can significantly impact daily functioning, mental health, and overall quality of life, affecting work and school attendance (Holst et al. 2022; Mardon et al. 2024), healthcare use, and overall well-being (Armour et al. 2019b; Åberg and Le 2023).

2.1.1 Clinical Presentation and Underlying Mechanisms

Among women of reproductive age, this condition is common and typically develops 6 to 12 months after menarche, when ovulatory cycles first occur. Menstrual pain is usually localised to the lower abdomen or pelvis and occurs during menstruation, most frequently within the first 8 to 72 hours of bleeding. (Proctor and Farquhar 2006.) Pain commonly begins within hours of the onset of menstruation and intensifies as menstrual flow becomes heaviest during the first one to two days of the cycle. Furthermore, PD is defined by the absence of underlying reproductive pathology. (Coco 1999.)

Epidemiologically, PD often improves during a woman's 20s and after childbirth (Weissman et al. 2004 cited in Proctor and Farquhar 2006). Despite its high occurrence, it is frequently underreported in medical consultations, even when it

significantly limits daily activities (Coco 1999). However, longitudinal evidence indicates that dysmenorrhea originating in adolescence is associated with an increased risk of chronic pain in adulthood, alongside adverse mental health and functional consequences (Reid-McCann et al. 2025).

Prevalence estimates for PD range from 16% to 94% varying widely across populations and study designs, including general population samples, and young women across different regions (Armour et al. 2019b; Armour et al. 2020; Barbosa-Silva et al. 2024; Barcikowska et al. 2020; Fernandez, Barea and Chanavaz-Lacheray 2020; Ju et al. 2014; Liu et al. 2024; Wang et al. 2022). Several risk factors appear associated with PD prevalence, including marital status, family history of dysmenorrhea, younger age (<25 years), low or high Body Mass Index (BMI) (Ju, Jones and Mishra 2015), nulliparity, sedentary lifestyle, weight loss attempts, exercise frequency, and menstrual blood flow intensity (Karout, Soubra, Rahme, Karout, Khojah and Itani 2021), as well as short duration of and poor sleep and psychological symptoms such as stress and anxiety (Barbosa-Silva et al. 2024; Wang et al. 2022). Taken together, findings indicate marked heterogeneity in both prevalence estimates and risk factor profiles (Barbosa-Silva et al. 2024), supporting the view that PD is multifactorial and rarely attributable to a single cause (Latthe, Mignini, Gray, Hills and Khan 2006). Key aspects of PD are presented in Table 1.

Table 1. Key Aspects of Primary Dysmenorrhea (Armour et al. 2019b; 2020; Barbosa-Silva et al. 2024; Barcikowska et al. 2020; Coco 1999; Fernandez et al. 2020; Ju et al. 2014; 2015; Karout et al. 2021; Latthe et al. 2006; Liu et al. 2024; Proctor and Farquhar 2006; Reid-McCann et al. 2025; Wang et al. 2022).

Variable:	Key Information:
Epidemiology and Prevalence	<ul style="list-style-type: none"> • young women in reproductive age. • absence of underlying pelvic pathology. • range: 16-94% of menstruating population; variation depend on differences in region and assessment methods, physical, environmental and lifestyle factors.
Pathophysiology	<ul style="list-style-type: none"> • elevated prostaglandins. • inflammatory and biochemical factors. • neurophysiological changes. • brain and structural changes. • genetic and lifestyle influences.
Common symptoms	<ul style="list-style-type: none"> • pain characteristics: lower abdominal, back, thigh and pelvic pain, menstrual cramps (before/during menstruation). • gastrointestinal symptoms: nausea, vomiting, diarrhoea. • systemic symptoms: headache, fatigue, mood changes, anxiety, irritability. • other: increased appetite.
Risk factors:	<ul style="list-style-type: none"> • family history. • age < 25. • nulliparity. • sleep quality and duration. • heavy/ clotted menstrual flow. • low and high BMI. • sedentary lifestyle. • psychological symptoms (stress, anxiety, depression).

Regarding symptoms and diagnostic criteria, PD typically presents as recurrent, sudden episodes of cramping pain during menstruation (Coco 1999).

Associated symptoms often include back and thigh pain, headache, mastalgia (Barbosa-Silva et al. 2024), nausea, diarrhoea, vomiting (Proctor and Farquhar 2006), as well as fatigue, mood changes, anxiety, irritability, and changes in appetite (Barbosa-Silva et al. 2024; Karout et al. 2021). Diagnosis is usually based on symptom history and medical background (Coco 1999). However,

pelvic examination or ultrasound may be necessary to distinguish PD from secondary dysmenorrhea (Burnett and Lemyre 2017 cited in Christensen 2024), which is caused by conditions such as endometriosis, fibroids, pelvic inflammatory disease, or intrauterine contraceptives (Proctor and Farquhar 2006). Unlike PD, secondary dysmenorrhea can emerge later in reproductive life, sometimes first appearing in a woman's 30s or 40s (Proctor and Farquhar 2006).

The pathophysiology of PD involves both peripheral and central mechanisms. Peripherally, elevated prostaglandin levels - particularly prostaglandin F_{2α} released during endometrial shedding - increase uterine contractions, reduce blood flow, and sensitize nociceptors, resulting in ischemia and cramping (Coco 1999). Higher prostaglandin concentrations are also associated with heavier menstrual bleeding and altered coagulation (Willman 1976 cited in Bofill Rodriguez, Lethaby and Farquhar 2019), while symptoms may improve after childbirth (Weissman et al. 2004 cited in Proctor and Farquhar 2006). Leukotrienes may further amplify inflammation and cramping pain (ACOG committee opinion no. 760 cited in McKenna and Fogleman 2021). Centrally, women with PD show increased pain sensitivity both during and outside menstruation, indicating central sensitization similar to chronic pain conditions (Vincent, Warnaby, Stagg, Moore, Kennedy and Tracey 2011). Cyclical hormonal fluctuations further influence pain sensitivity. Higher oestrogen levels during the follicular phase are associated with enhanced endogenous pain inhibition (Amin et al. 2005 cited in Stieger et al. 2015), whereas progesterone withdrawal in the late luteal phase may increase inflammatory activity and pain sensitivity (Martin 2009 cited in Stieger et al. 2015). During menstruation, when oestrogen and progesterone are lowest, reduced endogenous pain modulation contributes to heightened pain perception (Fillingim et al. 2009 cited in Stieger et al. 2015). This is supported by neuroimaging evidence demonstrating cyclical brain changes associated with PD (Tu et al. 2013; Wang et al. 2020). Genetic contributions have been suggested, including heritability and associations with iron deficiency and restless legs syndrome, with inflammatory and hormonal gene variants under investigation (Aguirre Durán, Martínez Arias, Diez de Los Ríos de la Serna and Dominguez Valentin 2023; Aouad et al. 2022).

Musculoskeletal and postural factors show inconsistent associations, with some links to sacral curvature but largely null findings for posture, muscle activation, and core endurance (Del Prado-Álvarez et al. 2024; Walicka-Cupryś, Pelc, Pal, Rosowska, Pasierb and Płonka 2023; Zhang, Li, Yang, Sun and Wu 2023).

Overall, PD appears to result from a multifactorial interaction of biochemical, central, genetic, and structural factors, reflecting its complexity as a chronic pain disorder.

2.1.2 Conventional Treatment Approaches and Their Limitations

Conventional treatment for PD such as non-steroidal anti-inflammatory drugs (NSAIDs) act by reducing prostaglandin levels and are more modestly effective in decreasing heavy menstrual bleeding (Bofill Rodriguez et al. 2019). Non-steroidal anti-inflammatory drugs, such as ibuprofen, naproxen and diclofenac, inhibit cyclo-oxygenase to reduce prostaglandin synthesis (Ferries-Rowe et al. 2020 cited in Christensen 2024). Paracetamol may be used when NSAIDs are contraindicated but is generally less effective (Kirsch et al. 2024). COX-2 inhibitors have demonstrated efficacy, yet concerns regarding cardiovascular risks have limited their use in several countries (Marjoribanks et al. 2003 cited in Proctor and Farquhar 2006).

Hormonal therapies, particularly combined oral contraceptives (COCs), have been promoted as a treatment for PD since the 1960s and have been shown to moderately reduce pain, though with increased risk of adverse effects (Schroll, Black, Farquhar and Chen 2023). Additional benefits may include lighter bleeding, improved acne, mood regulation, and increased bone density (Berner et al. 2015 cited in McKenna and Fogleman 2021). However, side effects such as thromboembolic risk (Manzoli et al. 2012 cited in Iacovides, Avidon and Baker 2015), bloating, anxiety, acne and weight gain (Proctor and Farquhar 2006) may limit acceptability. Moreover, COCs are associated with adverse effects including irregular bleeding, headache, and nausea (Schroll et al. 2023).

Despite these options, many individuals report limited effectiveness, side effects, or reluctance to use pharmacological treatments (Armour et al. 2019b;

Holst et al. 2022; Karout et al. 2021). Less than 37% seek medical consultation, with most relying on informal sources (Armour et al. 2019b; Karout et al 2021). Among those treated, 62-77% primarily self-medicate, and around half continue to experience persistent symptoms (Fernandez et al. 2020; Karout et al. 2021).

Comparative evidence between NSAIDs and COCs shows no meaningful difference in pain relief, and adverse events remain poorly reported (Schroll et al. 2023). Consistent with these findings, a longitudinal study found no association between COC use and period pain severity (Cameron et al. 2024). Holst et al. (2022) highlight the medicalisation of menstrual health, with hormonal contraception frequently offered as a standard solution despite patient distrust, limited diagnostic assessment, and commonly reported adverse effects.

Consequently, non-pharmacological strategies such as relaxation techniques, heat application, and herbal remedies are commonly used, and complementary or alternative care is sometimes sought in response to dissatisfaction with conventional medical approaches (Holst et al. 2022; Kirsch et al. 2024). Even when healthcare experiences are positive, there is a strong demand for improved educational resources to support informed menstrual health management (Fernandez et al. 2020). Together, these findings highlight persistent challenges in engagement, acceptability, communication, and the alignment of conventional care with women's needs in PD management.

2.2 Quality of Life in Women with Primary Dysmenorrhea

Quality of life refers to individuals' perception of their physical, psychological, and social well-being (Eurostat 2023). In women with PD, QoL is therefore commonly assessed using patient-reported outcome measures (PROMs), capturing individuals' own perceptions of health status and functional impact (National Collaborating Centre for Primary Care 2004; Piontek, Gabes, Kann, Fechtner and Apfelbacher 2024).

Quality of life is widely recognised as a multidimensional construct that extends beyond purely economic measures such as Gross Domestic Product. To reflect

this broader understanding, Eurostat (2023), the statistical office of the European Union, has developed a comprehensive framework incorporating both objective living conditions and subjective well-being. These indicators encompass material resources alongside individuals' lived experiences and self-reported perceptions, typically collected through large-scale surveys. For example, in 2022, 62.8% of women in the EU reported feeling happy always or most of the time. (Eurostat 2024.) Drawing on research and policy developments, the framework outlines eight key domains and one overarching dimension of overall life experience, including health, education, social relationships, safety, environment, governance, and life satisfaction, as shown in Figure 1.

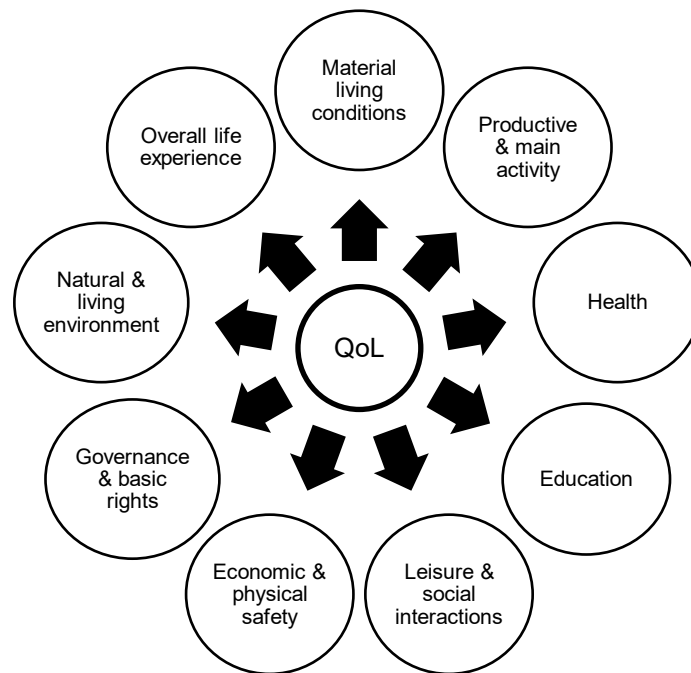


Figure 1. Core Domains of QoL identified by Eurostat (2023).

This holistic and multidimensional framework allows for a more comprehensive understanding of well-being beyond economic indicators, which is particularly relevant for the context of PD, as the condition influences multiple QoL domains, including physical functioning, mental health, social participation, and overall life satisfaction (Iacovides et al. 2014; Quick, Mohammad-Alizadeh-Charandabi and Mirghafourvand 2019). Accordingly, exploring how MT may support these broader aspects of QoL allows for a more comprehensive perspective on its potential benefits beyond pain reduction.

2.2.1 Multidimensional Aspects of Quality of Life

Primary dysmenorrhea has substantially effect on life satisfaction and physical and functional aspects of life disrupting daily activities (Iacovides et al. 2014), education, work (Mardon et al. 2024), and social participation (Armour et al. 2020; Cameron et al. 2024). Greater pain severity is associated with increased absenteeism and reduced productivity, with experiences further shaped by cultural norms and individual pain tolerance (Holst et al. 2022; Karout et al. 2021). Despite these impacts, menstrual pain is often normalized, leading to underestimation of its clinical significance and delayed care-seeking (Armour et al. 2019b; Fernandez et al. 2020). Workplace interventions addressing menstrual health remain scarce and insufficiently evaluated, highlighting the need for stronger evidence to inform policy (Howe et al. 2023). This gap persists despite clear evidence that menstrual symptoms substantially affect work participation and productivity, contributing to a considerable economic burden through absenteeism and presenteeism (Mardon et al. 2024).

Sociocultural stigma surrounding menstruation continues to limit open discussion and participation in social and professional life, contributing to dismissal by families, healthcare providers, and broader society (Holst et al. 2022). Across divers contexts, menstrual experiences are shaped by stigma, social restrictions, and restricted access to accurate information (Hennegan, Shannon, Rubli, Schwab and Melendez-Torres 2019). Educational support within families differs according to cultural and socioeconomic background, and many girls relying on mothers, peers, or media sources that may provide incomplete or inaccurate guidance (Fennie et al. 2022; Karout et al. 2021). Inequities are further intensified by limited access to menstrual products and supportive facilities (Hennegan et al. 2019; Holst et al. 2022), with broader societal and structural influences on menstrual health also highlighted in recent research (Ramaiyer et al. 2023).

Psychological well-being is also adversely affected, with PD associated with higher levels of stress, anxiety, and depression (Cameron et al. 2024; 2025; Ju et al. 2014; Rogers et al. 2021). In this context, chronic pain and psychological distress interact bidirectionally (Beal, Dorn, Sucharew, Sontag-Padilla, Pabst

and Hillman 2014; Zhao, Wu, Kang and Wang 2021), amplifying pain perception, daily interference and thereby creating a reinforcing cycle (Rogers, Ahamadeen, Chen, Mosher, Stewart and Rand 2023). Although causal pathways remain unclear (Wang and Cheng 2020), evidence consistently demonstrates that heightened psychological distress intensifies perceived pain (Rabinowitz, Sayer and Delahant 2023; Rogers and Farris 2022), a relationship also well documented in chronic pain literature (Bäckryd and Alföldi 2023; Latthe et al. 2006). Moreover, stress-related neuroendocrine responses may contribute to PD by altering hormonal regulation and prostaglandin activity (de Moraes, Avila, Firão, Soares de Sousa and Driusso 2025). Beyond physiological mechanisms, family dynamics, particularly maternal care and overprotection, are associated with adolescents' QoL, with overprotection linked to poorer psychosocial outcomes (Azurah, Sancu, Moore and Grover 2013).

Digital self-management tools offer accessible opportunities for symptom tracking and self-management, potentially improving functional outcomes, reducing symptom severity and stigma by normalizing conversations around menstruation (Özcan, Burger, Derksen, Peute, Huirne and De Leeuw 2024), yet most lack of clinical validation and evidence-based guidance, limiting their reliability (Alwhaibi et al. 2025). (Trépanier et al. 2023.)

Overall, the physical and functional burden of PD underscores the need for improved awareness, education, and a departure from the continued normalization of menstrual pain. Although mHealth tools offer accessible support, their clinical relevance remains limited and requires further development to meet the needs of women with PD (Alwhaibi et al. 2025; Trépanier et al. 2023). Shame and dismissive attitudes continue to discourage healthcare seeking, leading many women to rely on informal social networks for information, which also presents opportunities to challenge stigma and reshape menstrual narratives (Fennie et al. 2022; Ramaiyer et al. 2023).

2.2.2 Measuring Quality of Life

Health-related quality of life (HRQOL) and functional outcomes in PD are commonly assessed using PROMs, which reflect individuals' own perceptions

of their health status (National Collaborating Centre for Primary Care 2004) as summarized in Table 2.

Table 2. Summary of Key PROMS for QoL and Pain in Women with PD (Brooks et al. 1977; Li et al. 2012; Mizuta et al. 2023; Moos 1968; Negriff et al. 2009; Piontek et al. 2024; Ware et al. 1993:Chapter 3:2-10; Ware et al. 1995:11-12).

Instrument:	What It Measures:	Key Features:
Short Form Health Survey (SF-36)	Generic HRQOL across physical and mental health domains	Measuring eight domains: physical, role-physical, pain, general health, vitality, social, role-emotional, mental; provides domain and summary scores
Short Form Health Survey (SF-12)	Generic HRQOL covering eight health domains derived from the SF-36	12-item PROM that uses a subset of SF-36
Adolescent Dysmenorrhic Self-Care Scale (ADSCS)	Self-care behaviours during menstruation	Focus on self-management strategies
Dysmenorrhea Symptom Interference Scale (DSI)	Impact of dysmenorrhea on daily activities (physical, social, mood)	Two versions (on-menses/off-menses); 8 items, 5-point scale
Menstrual Distress Questionnaire (MDQ)	Menstrual cycle symptomatology across physical, emotional, and behavioural domains	47-item PROM with eight symptom scales (pain, concentration, behaviour change, autonomic reactions, water retention, negative affect, arousal, control)
Menstrual Symptom Questionnaire (MSQ)	Menstrual pain and associated menstrual symptoms	24-item PROM; originally based on spasmodic (menstrual) and congestive (premenstrual) symptom patterns, but now understood to measure overlapping menstrual symptom groups
Menstrual Attitude Questionnaire (MAQ)	Attitudes toward menstruation and their relationship to menstrual symptoms and behaviour	33-item (originally 46-item) PROM with five subscales (menstruation as debilitating, bothersome, natural/positive, anticipation of onset, and denial of menstrual effects)
Functional and Emotional Measure of Dysmenorrhea (FEMD)	Functional disabilities and emotional consequences associated with dysmenorrhea	14-item PROM with two subscales; Functional scale: impact on daily activity, concentration, social participation, routine functioning; Emotional scale: stress, perceived loss of control, confusion, emotional impact on relationships
Numerical Rating Scale (NRS)	Pain intensity on 0–10 point scale	Categorized: mild (1–3), moderate (4–7), severe (8–10)
Visual Analog Scale (VAS)	Pain intensity on 0–10 cm scale	Similar to NRS, continuous measure
Short-Form McGill Pain Questionnaire (SF-MPQ)	Sensory and affective qualities of pain	15 pain descriptor (11 sensory, 4 affective) rated 0–3 Likert scale

Among the PROMs used to assess HRQOL, generic instruments such as the Short Form Health Survey (SF-12 and SF-36) are most frequently applied in dysmenorrhea research (Arora, Yardi and Gopal 2014; Doğan, Eroğlu and Akbayrak 2020; Kannan, Chapple, Miller, Claydon-Mueller and Baxter 2019; Vargedes, Fazeli, Boening, Helmert and Berger 2019). The SF-36 is a PROM developed in the 1980s that evaluates perceived health across eight physical and mental domains. Scores can be reported for each domain or combined into Physical Component Summary (PCS) and Mental Component Summary (MCS) scores, providing both detailed and overall indicators of QoL. (Ware, Kosinski and Keller 1993:Chapter 3:2-10.) In comparison, the SF-12 is a shortened, generic PROM developed as a practical alternative to the SF-36 for large surveys and longitudinal studies and it includes twelve items representing the same eight health domains and reproduces PCS and MCS scores (Ware, Kosinski and Keller 1995:11-12).

Beyond generic measures, a recent systematic review (SR) by Piontek et al. (2024), applying COnsensus-based Standards for the selection of health Measurement Instruments (COSMIN) criteria, identified the ADSCS and DSI as the most appropriate PD-specific PROMs. The ADSCS assesses adolescents' self-care behaviours, whereas the on-menses DSI evaluates symptom interference across daily life domains such as physical activity, sleep, work, leisure, social participation, and mood (de Moraes et al. 2025; Piontek et al. 2024). Earlier efforts to capture menstrual symptomatology more broadly led to the development of the MDQ, which measures a wide range of menstrual-related symptoms (Moos 1968; Moos and Leiderman 1978 cited in Moos 1968). Subsequently, the MSQ was introduced as a 24-item dysmenorrhea-specific PROM distinguishing spasmodic and congestive symptom patterns, although later evidence demonstrated frequent overlap between these patterns, limiting this classification (Chesney and Tasto 1975; Webster et al. 1979 cited in Negriff, Dorn, Hillman and Huang 2009). Negriff et al. (2009) identified a three-factor structure (abdominal pain, negative affect/somatic complaints, and back pain), with significant associations between menstrual symptoms and depressive symptoms across all factors, highlighting the psychosomatic dimension of menstrual symptom reporting. In addition, the MAQ was

developed to assess attitudes toward menstruation and their relationship to menstrual symptoms and behavioural responses (Brooks, Ruble and Clark 1977). To capture both functional and emotional aspects of dysmenorrhea, Li et al. (2012) developed the FEMD, a 14-item patient-reported questionnaire that comprises two interrelated subscales reflecting functional disability and emotional responses to dysmenorrhea.

Finally, for pain intensity, common scales include the NRS and VAS, both ranging from no pain to severe pain and often categorized into mild, moderate, or severe levels (Barbosa-Silva et al. 2024; Barcikowska et al. 2020; Fernandez et al. 2020; Mizuta et al. 2023). The SF-MPQ further captures qualitative aspects by rating sensory and affective pain descriptors (Melzack 2018 cited in Mizuta et al. 2023).

2.3 Manual Therapy

In practice, MT encompasses a range of hands-on techniques delivered by trained healthcare professionals, including physiotherapists, chiropractors, osteopaths, and massage therapists (Draper-Rodi et al. 2024). Common interventions include joint mobilisation and manipulation, soft tissue techniques, massage, stretching, and muscle energy techniques. These approaches aim to improve tissue extensibility, increase joint range of motion, reduce pain, and promote relaxation, with techniques ranging from high-velocity, low-amplitude thrusts (HVLA) to gentler non-thrust mobilisations and neuromuscular-based methods. (Bise, Piva and Erhard 2017.)

Manual therapy is embedded within complex therapeutic encounters and grounded in a biopsychosocial framework, recognising that pain and function are influenced by biomechanical, neurophysiological, psychological, and contextual factors (Bishop, Torres-Cueco, Gay, Lluich-Girbés, Beneciuk and Bialosky 2015; van Dijk, Köke, Elbers, Mollema, Smeets and Wittink 2023). Contemporary perspectives therefore conceptualise MT not merely as the application of techniques, but as a context-dependent and communicative clinical process shaped by therapeutic alliance and patient expectations,

supporting a person-centred approach to care (Bronfort et al 2010; Draper-Rodi et al. 2024).

Although no international clinical guidelines currently exist for MT in PD, physiotherapy guidelines for chronic musculoskeletal pain recommend a biopsychosocial approach, aligning with modern MT theory that emphasises multidimensional influences on pain experience and treatment outcomes (Bishop et al. 2015; van Dijk et al. 2023).

2.3.1 Overview of Manual Therapy

Manual therapy in the late 19th and early 20th centuries was primarily practiced by bonesetters and only gradually acknowledged by parts of the medical profession, despite continued professional scepticism and limited scientific support. Within this evolving context, several distinct yet related approaches emerged. (Pettman 2007.)

Osteopathy developed as a hands-on medical system grounded in body function and self-healing principles, gaining public acceptance while remaining contested within conventional medicine (Pettman 2007). It emphasizes the relationship between structure and function and a holistic view of health (Paulus 2013; Zegarra-Parodi, Baroni, Lunghi and Dupuis 2022). Clinical studies report improvements in HRQOL, particularly in pain, physical function, social participation, and mental health, although outcomes vary across trials (Saracutu, Rance, Davies and Edward 2018).

Chiropractic likewise emerged in the late 19th century as a manual approach focused on spinal subluxations and nerve function and expanded rapidly despite medical opposition and theoretical debate. At the same time, massage evolved within nursing and medical contexts and later became professionally organised through the Society of Trained Masseuses, which eventually developed into the Chartered Society of Physiotherapy. Subsequently, manipulation became increasingly incorporated into medical and physiotherapy education, with emphasis on careful differential diagnosis to distinguish spinal

from visceral causes of symptoms, thereby shaping modern orthopaedic MT practice. (Pettman 2007.)

Physical therapy, later also termed physiotherapy, developed from organised massage and remedial exercise and remained closely linked to medical practice. Over time, it incorporated spinal manipulation, mobilisation, oscillatory techniques, joint glides, distraction, compression, and biomechanically guided assessment of joint motion. Physiotherapy was also shaped by the Swedish medical gymnastics tradition established by Per Henrik Ling, who demonstrated that passive and active exercise could have beneficial therapeutic effects. (Pettman, 2007.) Consequently, movement became recognised as the core concept of physiotherapy, linked to functional ability, multidimensional wellbeing, and QoL (WCPT 2011 cited in Wikström-Grotell and Eriksson 2012). Within this evolving context, MT further expanded to include adjunct modalities such as patient education, transcutaneous electrical nerve stimulation (TENS) (Elboim-Gabyzon and Kalichman 2020), and kinesiotaping (KT) (Celenay, Kavalci, Karakus and Alkan 2020; Dayican et al. 2024).

Among these modalities, TENS is a non-invasive modality delivering electrical stimulation through surface electrodes to reduce pain, although evidence regarding its effectiveness remains mixed (Teoli, Dua and An 2025). In the context of PD, TENS may reduce uterine pain by inhibiting nociceptive transmission, improving blood flow, and modulating prostaglandin-related uterine activity (Vance et al. 2014; Moran et al. 2011 cited in Elboim-Gabyzon and Kalichman 2020).

Similarly, KT is an elastic therapeutic taping method developed to support natural movement and physiological processes by lifting the skin to enhance fluid dynamics, reduce pressure, and assist muscle function. In this way, it aims to decrease pain, improve circulation and lymphatic flow, influence fascial and soft tissue activity, and support joint function during acute, sub-acute, chronic, rehabilitative, and preventative contexts. (Kase, Wallis and Kase 2013.)

2.3.2 Therapeutic Mechanisms and Contextual Factors in MT

Manual therapy outcomes are influenced by contextual factors such as patient expectations, the therapeutic alliance, communication, and the clinical environment, which contribute meaningfully to treatment effects (Coronado and Bialosky 2017; Draper-Rodi et al. 2024; Zegarra-Parodi et al. 2022). These elements are particularly important in chronic pain, where neurophysiological and contextual mechanisms often outweigh technique-specific effects (Bishop et al. 2015; Coronado and Bialosky 2017). Within evidence-based healthcare, this highlights the importance of integrating clinical expertise with patient values and shared decision-making, particularly when evidence is limited or heterogeneous (Bronfort et al. 2010).

In this context, treatment effects may be enhanced through aligned expectations, empathetic communication, and supportive therapeutic interactions (Cedraschi et al. 1996; Thompson and Sunol 1995 cited in Slater et al. 2024), while behavioural and psychological components can contribute to improvements in pain, function, and overall well-being (de C Williams et al. 2020 cited in Slater et al. 2024).

Beyond contextual influences, contemporary perspectives suggest that MT effects are not solely biomechanical. Rather, MT may interact with biomechanical, neurophysiological, psychological, and contextual domains of the pain experience. (Keter, Hutting, Vogsland and Cook 2023.) MT has been shown to decrease inflammatory biomarkers, although these changes have not been linked to clinical outcomes (Crane et al 2012; Degenhardt et al 2012 cited in Kerry et al. 2024).

Within this multidimensional framework, it is relevant to consider conditions characterised by interacting inflammatory and neurophysiological mechanisms. Given that PD is characterised by inflammatory activation (Martin 2009 cited in Stieger et al. 2015), altered endogenous pain modulation (Fillingim et al. 2009 cited in Stieger et al. 2015) and heightened central pain sensitivity (Tu et al. 2013; Wang et al. 2020), interventions that influence neurophysiological and contextual pain mechanisms, such as MT, may be of potential relevance.

However, MT has been criticised for limited effectiveness when applied in isolation and for uncertainties surrounding manual assessment (Rabey, Hall, Hebron, Palsson, Christensen and Moloney 2017). Consequently, contemporary perspectives emphasize MT as part of a multimodal treatment approach, integrating manual techniques with exercise, education, and psychosocial support (Coronado and Bialosky 2017; Keter et al. 2023; Rabey et al. 2017). Such approaches align with evidence-based care models that emphasise the integration of best available evidence with patient values and shared decision-making, particularly when treatment evidence is uncertain (Bronfort et al. 2010). This patient-centred and relational focus may strengthen therapeutic relationships by promoting engagement, autonomy, and trust (Agarwal 2018; Clarke, Ells, Thombs and Clarke 2017), potentially contributing to broader improvements in QoL.

3 Purpose and aims

The purpose of this thesis is to explore how manual therapy approaches have been used to support quality of life in women with primary dysmenorrhea. This Scoping review aims to systematically map and describe manual therapy approaches that support quality of life in women with primary dysmenorrhea and to clarify the scope and characteristics of the existing evidence while identifying gaps for future research.

Research questions:

1. What types of manual therapy approaches are used to support quality of life in women with primary dysmenorrhea?
2. How do these manual therapy approaches impact quality of life in women with PD?

4 Methods

This section outlines the methodological framework, search strategy, study selection process, quality appraisal, and data analysis procedures used in this ScR.

This ScR follows the Arksey and O'Malley framework, refined by Levac, Colquhoun and O'Brian (2010) and Peters et al. (2021a), with modifications to dual reviewer screening and stakeholder consultation due to the scope and practical constraints of a master's thesis (Figure 2).

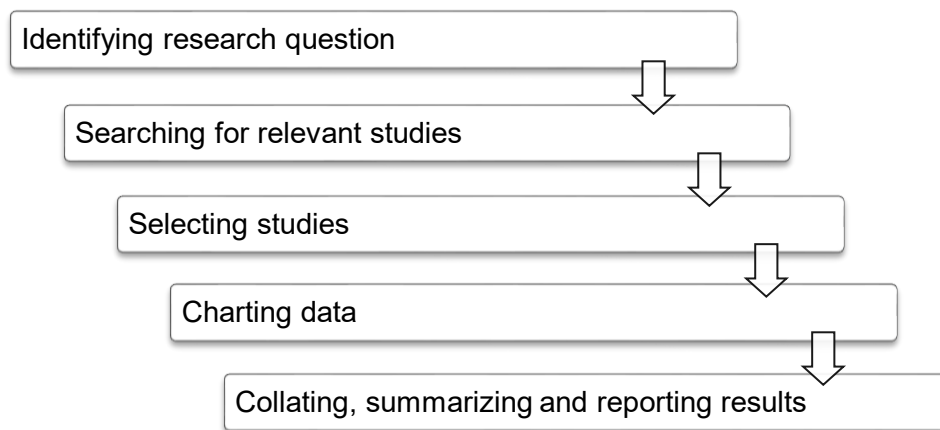


Figure 2. Methodological Framework for ScRs, adapted from Arksey and O'Malley (Levac et al. 2010).

The methodology is further guided by the Joanna Briggs Institute (JBI) guidance and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist (Rodger, Admani and Thomas 2024). These frameworks ensure a structured, transparent, and reproducible approach to ScRs (Grant and Booth 2009; Peters et al. 2021b; Rodger et al. 2024). A predefined protocol outlining the objectives, research questions, eligibility criteria, and data extraction methods supports methodological integrity.

4.1 Scoping Review Approach

This master's thesis adopts an exploratory ScR to systematically identify and chart the existing literature on how MT approaches are used to support QoL in women with PD. Scoping reviews are particularly useful for exploring complex and under-researched health topics, mapping diverse forms of evidence, and clarifying key concepts - especially where interventions are heterogeneous or knowledge gaps exist (Grant and Booth 2009; Peters et al. 2021a).

Unlike SRs, which are designed to evaluate the effectiveness of specific interventions or the relationship between defined exposures and outcomes (Mathew 2021), ScRs address broader and more exploratory research questions. They offer a preliminary synthesis of the volume, scope, and nature of available studies and help to inform future research priorities and policy decisions (Levac et al. 2010; Tricco et al. 2016). While SRs aim for exhaustive synthesis, ScRs are systematic, transparent and reproducible in identifying, extracting and presenting data, distinguishing them from traditional narrative reviews that are more selective and author-dependent (Munn, Peters, Stern, Tufanaru, McArthur and Aromataris 2018).

Given the limited body of research and the broad, exploratory nature of the topic, a SR was deemed unsuitable. Instead, a ScR methodology was chosen to map existing interventions, identify key strategies, and highlight gaps in the knowledge base (Peters et al. 2021a). The research questions and methodological approach were developed iteratively, consistent with established ScR frameworks (Levac et al. 2010; Munn et al. 2018; Tricco et al. 2016), which acknowledge that research aims may evolve as familiarity with the literature deepens.

4.2 Search strategy

Scoping reviews require a comprehensive and systematic searching to map the breadth of existing evidence (Grant and Booth 2009). For this review, an initial pilot search (Rodger et al. 2024; Silvia et al. 2022) was conducted across all

databases accessible through Metropolia University of Applied Sciences using the PCC (Population, Concept, Context) framework. This first search tested the primary key terms 'primary dysmenorrhea', 'quality of life' and 'manual therapy' to assess the volume and relevance of existing literature presented in Figure 3.

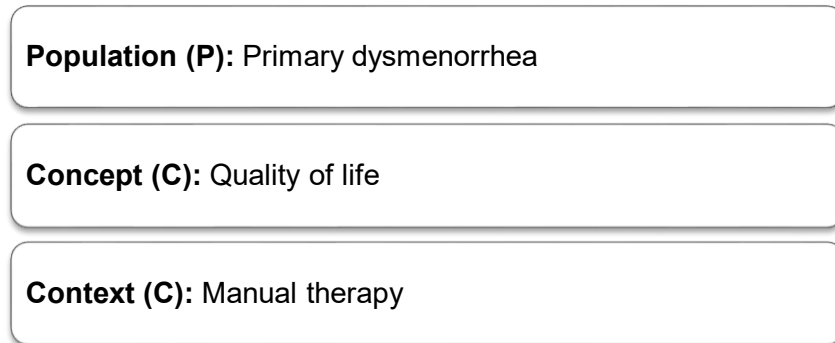


Figure 3. Key Concepts using PCC Framework.

A second pilot search refined the approach by incorporating additional synonyms and controlled vocabulary, such as MeSH and CINAHL Headings (Appendix 1), identified through background reading and consultation with an experienced librarian (4 August 2025). Controlled terms increased precision, while free-text terms captured newer or non-indexed studies (Burchell 2024; deMars and Perruso 2022). Boolean operators and truncation were applied according to each database's technical requirements (Appendix 2). Several combinations were tested, and an initial high-yield sample was screened by title and abstract to evaluate relevance.

To compare search efficiency, all string IDs were tested across all accessible databases, and results were documented in Excel. Because each database differs in filters, controlled vocabularies, and syntax, the search strings were adjusted to each database. Screening the first twenty results from high-yield strings helped refine relevance criteria and familiarised the author with the screening process. During the second pilot search, no non-English results were retrieved from the databases, so non-English searching was performed exclusively through Google Search Engine. This structured, iterative testing ensured a sensitive, yet specific search strategy aligned with ScR guidelines

(Levac et al. 2010; deMars and Perruso 2022) and ensured a comprehensive coverage of sources on MT to support QoL in women with PD. Table 3 presents the final search strings applied in the database search.

Table 3. Final Search Strings, Filters and corresponding Databases.

Database:	Search String ID:	Search string key terms:	Filter:
CINAHL n = 27	A	("dysmenorrhea" OR "primary dysmenorrhea" OR "painful menstruation" OR "menstrual pain" OR "menstrual cramps") AND ("quality of life" OR "health-related quality of life" OR "HRQOL" OR "life quality") AND ("musculoskeletal manipulations" OR "manual therapy" OR "manipulation therapy" OR "spinal manipulation" OR "soft tissue therapy" OR "hands-on treatment" OR "osteopathic manipulation" OR "osteopathic treatment" OR "osteopathic medicine" OR "osteopathy" OR "physical therapy modalities" OR "physical therapy" OR "physiotherapy" OR "physical therapy techniques" OR "massage" OR "lymphatic drainage")	1/1/2010 to 2/9/2025
PEDro n = 38	H	Abstract & Title: Dysmenorrhea; Therapy: stretching, mobilisation, manipulation, massage	From 2010
Science Direct n = 311	B	("dysmenorrhea" OR "primary dysmenorrhea" OR "painful menstruation") AND ("quality of life") AND ("manual therapy" OR "soft tissue therapy" OR "osteopathic manipulation" OR "physical therapy")	2010 to 2025

To complement this, the key search words applied for Google Search Engine are presented separately in Table 4.

Table 4. Search Keywords for Grey Literature Across all included Languages.

Google Search Engine	
Language:	Key terms:
English n = 19	primary dysmenorrhea, quality of life, manual therapy
German n = 3	Primäre Dysmenorrhö, Lebensqualität, Manuelle Therapie, Physiotherapie, Osteopathie, Massage, Lymphdrainage
Swedish n = 5	primär dysmenorré, menstruation, livskvalitet, manuell terapi, fysioterapi, osteopati, massage, lymfmassage

Language-specific keyword combinations were used for each of the three languages in Google Search.

4.3 Data Selection

The data selection process was carried out between 2 September and 9 September 2025 using the free version of Rayyan as the primary screening tool. Rayyan is a web-based application developed by the Qatar Computing Research Institute that supports SRs by using text-mining methods to semi-automate record screening, while also providing features such as deduplication and efficient organization of references (Rayyan 2025; Valizadeh et al. 2022). A total of 423 records were identified from databases and other sources. Of these, 376 records were retrieved through database searching (CINAHL n = 27, PEDro n = 38, Science Direct n = 311), and an additional 47 records were identified from other sources, including Google Search Engine (n = 27) and reference list screening of reviews retrieved during database searches (n = 20). For these reviews, the same screening criteria were applied manually to identify eligible primary studies.

Grey literature was identified using Google Search Engine with the predefined keywords (Table 4). The first two pages of results were screened by title and meta-description. Irrelevant results, such as commercial websites, were excluded and not counted in the PRISMA flowchart. Potentially relevant records (n = 27) were uploaded to Rayyan for further screening.

The inclusion and exclusion criteria were developed alongside the theoretical framework and refined throughout both pilot searches to ensure alignment with the research questions. During the first pilot search, relevant studies were screened at both abstract and full-text level to understand how PD was defined and how age ranges were used in existing cross-sectional and longitudinal research. As this thesis was conducted by a single author, all screening was performed independently. The criteria were further refined during the second pilot search, which also helped identify additional literature for the background section and methodological sources. The final selection criteria are presented in Table 5.

Table 5. Complete List of Study Selection Criteria and Rationale.

Category:	Inclusion criteria:	Exclusion criteria:	Rationale:
Population	Fertile women in reproductive age diagnosed with PD	Women diagnosed with secondary dysmenorrhea or other pelvic pathologies; mixed studies without separate/ distinct results for PD	PD is most prevalent in younger women but may persist later (McKenna and Fogleman 2021; Fernandez et al. 2020); restriction to PD avoids pathological confounding (Mizuta et al. 2023).
Intervention	MT interventions including massage, soft tissue techniques, muscle relaxation, taping, electrotherapy	Interventions unrelated to MT (e.g. acupuncture, radiofrequency, self-massage, yoga, aquatic and aerobic exercise, HIIT, ball exercise)	Reflects multimodal pain management integrating MT and exercise, relevant to physiotherapy and osteopathic practice (Bishop et al. 2015).
Comparator	Any comparator (e.g., usual care, sham, no intervention, other therapies, or exercise)	None	Allows for a broad comparison
Outcomes	Studies reporting QoL and pain outcomes or related psychosocial/ functional measures	Studies lacking QoL or relevant outcome measures; studies only focusing on pain	QoL is central to the research question and captures PD's multidimensional impact (Iacovides et al. 2015)
Study design	Primary research studies, quasi-experimental, observational);	Reviews are not included but used to identify additional eligible primary studies	Primary studies ensure original evidence
Publication date	Studies published between January 2010 and July 2025	Studies before 2010	Recent studies apply updated standards (Cuschieri 2019) and improved QoL measures (Brito, Martins, Frota, Moreira and do Nascimento 2023; Chen et al. 2021); older studies are less comparable.
Language	English, Swedish, and German; other languages if an English abstract is available	Studies in other languages without English abstract	Reduces language bias and reflects regional diversity (Hannah, Haddaway, Fuller and Amano 2024); matches author's language proficiency

An overview of the study selection timeline, including dates for each stage, is presented in Table 6.

Table 6. Study Selection Timeline.

Date	Activity
2/9/2025	Study selection initiated; abstract and title screening plus labelling
4/9/2025	Second round of abstract and title screening
5/9/2025	Grey literature search
6/9/2025	Double screening of grey literature and uploading to Rayyan
7-8/9/2025	Abstract & title screening of reviews for additional records and double-checking for accuracy
9/9/2025	Full-text screening completed

All 423 records were uploaded into Rayyan. Prior to title and abstract screening, 42 duplicates were removed: 35 duplicates and seven records that were verified as non-duplicates but excluded due to irrelevance to the PCC framework. When duplicates were identified, the version with the most complete bibliographic information was retained, prioritising records containing DOI or PMID, full abstracts, and correct author details. This process resulted in 381 records remaining for title and abstract screening.

The 381 records were screened manually at title and abstract level, leading to the exclusion of 345 records. To enhance transparency and consistency, a structured abstract screening tool based on predefined inclusion and exclusion criteria was developed (Polanin, Pigott, Espelage and Grotzpetter 2019). The tool included guiding questions related to study design, publication year, language, population, intervention, and outcomes (Table 7).

Table 7. Title and Abstract Screening Tool for this Study (informed by Polanin et al. 2019)

Abstract screening tool – guiding questions:
1. Is the study primary research?
2. Is the study published after 2010?
3. Is the article published in English, Swedish, or German, or in another language provided that an English abstract is available?
4. Does it explicitly mention women with primary dysmenorrhea?
5. Does it describe an intervention involving manual therapy?
6. Does it report quality of life or related psychosocial/functional measures as either a primary or secondary outcome?

Records were classified as include, exclude, or maybe. Screening was conducted twice on separate days by the same reviewer to reduce the risk of oversight. Double independent screening, although recommended as best practice by Polanin (2019), was not feasible within the scope of this Master's thesis. Six records were initially classified as maybe due to uncertainty regarding population or outcomes and were subsequently reassessed. Records that did not explicitly exclude secondary dysmenorrhea were retained at this stage. Pilot testing demonstrated that relevance could rarely be determined by titles alone; therefore, titles and abstracts were screened simultaneously.

Following title and abstract screening, 36 records were assessed at full text level. Of these, four could not be obtained through the university library system and were excluded. One record represented an ongoing trial without accessible full text and was therefore excluded. This left 31 full texts assessed for eligibility. Full-text screening was conducted using the complete set of inclusion and exclusion criteria alongside the abstraction tool. Eight records were excluded at this stage: five for wrong outcomes, one for wrong intervention, one duplicate trial registration, and one feasibility study without outcome analysis. The study selection process is illustrated in the PRISMA 2020 flowchart (Page et al. 2021) presented in Figure 4.

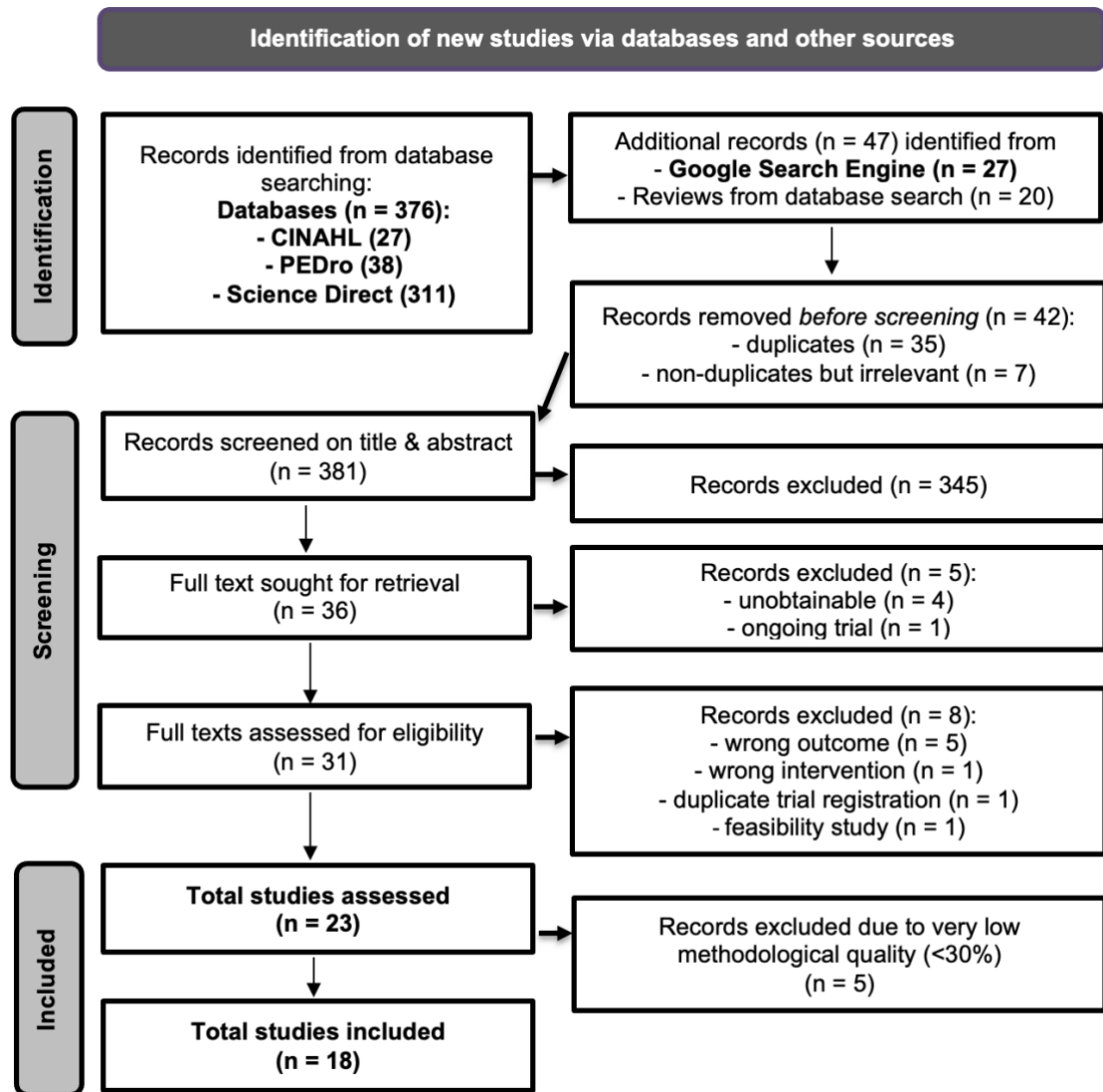


Figure 4. PRISMA 2020 Flow Diagram of the Study Selection Process (adapted from Page et al. 2021).

Twenty-three studies proceeded to quality appraisal. Five were excluded due to very low methodological quality (<30%), resulting in a final inclusion of 18 studies.

4.4 Data Assessment

Evidence synthesis uses multiple sources - including published studies and grey literature - to provide a comprehensive understanding of the topic. While this broad approach can inform future research, it is time-intensive, and traditional ScRs often exclude formal quality appraisal, potentially increasing the risk of bias (Silva et al. 2022). Peters et al. (2021a) highlight that although

quality appraisal is not mandatory in ScRs, applying structured risk-of-bias assessment in line with contemporary methodological guidance (e.g. JBI, PRIMSA-ScR) can strengthen rigour, transparency, (Tricco et al. 2016) and practical value of the review for decision-making. The absence of methodological quality appraisal has been identified as a challenge, as it interferes with the assessment of the reliability and strength of the evidence presented (Brien, Lorenzetti, Lewis, Kennedy and Ghali 2010; Silvia et al. 2022) and may reduce the perceived trustworthiness of the results, thereby limiting their uptake in policy and clinical contexts (Grant and Booth 2009). Therefore, a structured quality appraisal of all 23 included studies was conducted using the revised JBI critical appraisal checklist for randomized controlled trials (RCTs), as all included studies were RCTs. The revised JBI RCT tool supports judgment-based assessment of risk of bias and does not provide numerical scoring systems or cut-off thresholds (Barker et al. 2023). Therefore, overall quality categories in this review were explicitly defined by the author. Checklist items are organised into validity constructs (internal validity and statistical conclusion validity) and bias domains: selection (Q1-3), intervention (Q4-6), outcome measurement (Q7-9), and retention (Q10) (Barker et al., 2023). Items are assessed at the study level (Q1-6, Q13), outcome (Q7-9), and result (Q10-12) levels (Barker et al., 2023). Appraisal outcomes are presented in Table 8.

Table 8. Presentation of Results following Critical Appraisal using the Revised JBI Critical Appraisal Tool for RCTs (Barker et al. 2023).

Study Author & Year	JBI tool	INTERNAL VALIDITY										STATISTICAL CONCLUSION VALIDITY			Total scores/ risk of bias	Quality scores in %
		1	2	3	4	5	6	7	8	9	10	11	12	13		
Mahishale et al. 2013	RCT	U	U	Y	U	U	N	N/A	Y	Y	N	N	U	N	3/11 (high)	3/13 (23%)
Arora et al. 2014	RCT	U	U	Y	U	U	N	N/A	Y	Y	U	U	Y	Y	3/11 high	5/13 (39%)
Chaudhuri et al. 2014	RCT	Y	Y	N	N	N	N	N/A	Y	Y	N	N	U	N	4/11 high	4/13 (31%)
Schwerla et al. 2014	RCT	Y	Y	Y	U	U	N	N/A	Y	Y	Y	N	U	Y	6/11 moderate	7/13 (54%)
Azima et al. 2015	RCT	Y	U	Y	N	N	N	N/A	U	Y	N	N	U	Y	3/11 (high)	4/13 (31%)
Sutar et al. 2016	RCT	U	N	N	N	N	N	N/A	U	Y	N	U	N	U	1/11 high	1/13 (8%)
Bai et al 2017	RCT	Y	Y	Y	Y	Y	N	N/A	U	U	U	Y	U	Y	5/11 moderate	7/13 (54%)
Gurpreet et al. 2016	RCT	U	N	U	U	U	N	N/A	Y	Y	N	U	U	N	2/11 high	2/13 (15%)
Tharani et al. 2018	RCT	U	U	U	U	U	N	N/A	Y	Y	U	U	U	U	2/11 high	2/13 (15%)
Kannan et al. 2019	RCT	Y	Y	Y	N	N	N	N/A	Y	Y	U	Y	Y	Y	5/11 moderate	8/13 (62%)
Vargedes et al. 2019	RCT	Y	Y	U	N	N	N	U	Y	Y	N	N	Y	Y	4/11 high	6/13 (46%)
Celenay et al. 2020	RCT	Y	U	Y	U	U	N	U	Y	Y	N	N	Y	Y	4/11 high	6/13 (46%)
Doğan et al. 2020	RCT	Y	Y	Y	N	N	Y	N/A	Y	Y	N	N	Y	Y	6/11 moderate	8/13 (62%)
Kirmizigil et al. 2020	RCT	Y	U	Y	N	N	N	N/A	Y	Y	U	N	Y	Y	4/11 high	6/13 (46%)
Fagevik O. et al. 2029	RCT	Y	Y	Y	N	N	Y	N/A	Y	Y	N	N	Y	Y	6/11 moderate	8/13 (62%)
Park et al. 2020	RCT	Y	U	Y	U	N	Y	N/A	Y	Y	N	N	Y	Y	5/11 moderate	7/13 (54%)
Temizkan et al. 2021	RCT	Y	U	N	N	U	N	N/A	Y	Y	N	N	Y	Y	3/11 high	5/13 (39%)
Celenay et al. 2023	RCT	Y	U	Y	N	N	N	N/A	Y	Y	N	N	Y	Y	4/11 high	6/13 (46%)
Deodato et al. 2023	RCT	U	U	U	N	U	N	N/A	Y	U	Y	N	Y	N	2/11 high	3/13 (23%)
Dayican et al. 2024	RCT	Y	U	Y	Y	U	N	N/A	Y	Y	N	N	Y	Y	5/11 moderate	7/13 (54%)
Conesa-A. et al. 2025	RCT	Y	Y	Y	U	U	N	N/A	Y	Y	Y	N	Y	Y	6/11 moderate	8/13 (62%)
Koçoğlu et al. 2025	RCT	Y	U	Y	N	N	N	N/A	Y	Y	Y	N	Y	Y	5/11 moderate	7/13 (54%)
Malik et al. 2025	RCT	Y	U	Y	Y	N	N	N/A	Y	Y	N	N	Y	Y	5/11 moderate	7/13 (54%)

Note. Q1 = randomization; Q2 = concealed allocation; Q3 = similar baseline; Q4 = blinded participants; Q5 = blinded treatment giver; Q6 = identical intervention; Q7 = blinded outcome assessors; Q8 = outcome measured in the same way; Q9 = outcomes measured in a reliable way; Q10 = follow-up adequately described and analysed; Q11 = participants analysed in the randomized group; Q12 = appropriate statistical analysis used; Q13 = appropriate trial design. Y = Yes; N = No; U = Unclear; N/A = Not applicable.

As no standardised method exists for converting JBI checklist responses into overall quality categories, overall risk-of-bias judgments in this review were based on structured reviewer interpretation, with particular emphasis on items related to internal validity (Barker et al. 2023). This approach allowed appraisal decisions to be aligned with the aims and context of the present review.

To operationalise overall quality judgments, a reviewer-defined internal scoring approach was applied, as the revised JBI RCT tool does not provide numerical thresholds. Guided conceptually by the GRADE framework (Schünemann, Brożek, Guyatt and Oxman 2023), studies were rated on the 13-item JBI scale and categorised as low (1–4/13; $\leq 30\%$), moderate (5–9/13; 31–74%), or high quality (10–13/13; $\geq 75\%$). Based on these criteria, five studies were classified as low quality and excluded, while the remaining 18 studies were rated as moderate quality. No study met the criteria for high methodological quality. Risk of bias was evaluated separately using JBI internal validity items (Q1–Q11). Thirteen studies demonstrated high risk of bias ($\leq 4/11$) and ten demonstrated moderate risk of bias (5–8/11); no study was assessed as low risk of bias ($\geq 9/11$).

Although JBI guidance recommends independent appraisal by at least two reviewers (Barker et al. 2023), assessments in this thesis were conducted by a single reviewer. To enhance consistency, predefined appraisal rules were established during the initial assessments and applied systematically across all subsequent studies in accordance with JBI checklist guidance.

4.5 Data Analysis

A preliminary data-charting form was developed and piloted using the first four included studies to identify relevant study characteristics and ensure consistent extraction aligned with the research questions (Fauci et al. 2023; Rodger et al. 2024). Following this pilot phase, the final data-charting form systematically captured study details (study title, lead author, year, study design), population characteristics, intervention details, outcome measures, and key findings (Appendix 3), thereby supporting transparent and comparable data organisation across all 18 included studies.

Building on the charted data, an abductive content analysis was undertaken to synthesise the findings in relation to the two research questions: (1) which MT approaches were used, and (2) how these approaches supported QoL in women with PD. Abduction functioned as the guiding reasoning strategy, enabling iterative movement between empirical findings and relevant conceptual frameworks (Timmermans and Tavory 2012; Barrett and Younas 2024). Qualitative content analysis provided the procedural structure for the analysis, progression from meaning units to codes, sub-categories, and main categories (Erlingsson and Brysiewicz 2017), while category development combined inductive clustering of empirical findings with deductive abstraction informed by relevant theoretical perspectives. Abductive coding supported theory-building through iterative refinement of the coding framework (Vila-Henninger et al. 2024).

The analysis was conducted solely by the author. Coding decisions, category refinements, and clustering rationales were systematically documented using a Miro virtual sticky notes board. Miro is a digital collaborative whiteboard platform that enables visual organisation of information through moveable notes and clustering functions (Miro 2026). In this study, it was used to compare meaning units across studies, visually group emerging codes, and iteratively reorganise sub-categories and main categories. This process created a transparent audit trail of analytic decisions. Reflexive awareness of preunderstandings was maintained throughout the analytic process. As several studies employed more than one PROM or reported multiple intervention components, one study could contribute multiple meaning units across different sub-categories. Coding was therefore performed at the level of individual meaning units rather than at study level.

The analytic procedure followed four sequential steps: identification of meaning units, condensation and coding, development of sub-categories, and abstraction into main categories. Condensation refers to shortening and simplifying original text segments while preserving their essential meaning and analytic relevance (Elo and Kyngäs 2008). Following this procedure, meaning units related to MT approaches were identified and analysed.

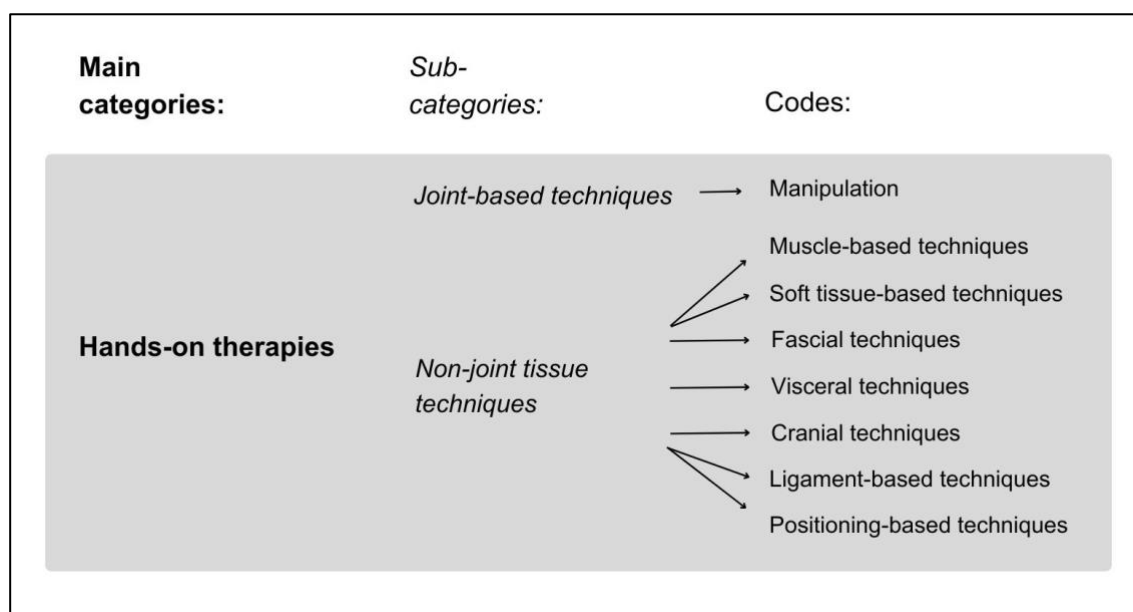
For MT approaches, meaning units were defined as segments describing specific therapeutic techniques or intervention components. These were condensed and coded based on their primary anatomical target and therapeutic purpose. Codes were then compared and grouped into sub-categories reflecting shared characteristics. For example, the meaning unit “Motor imagery-guided pelvic floor activation” (Koçoğlu, Şevgin and Hoşbaş 2025) was coded as ‘Pelvic floor activation’ and grouped together with other exercises targeting the pelvic region within the sub-category ‘Core and pelvic stabilisation exercises’. As these interventions required active bodily engagement, this sub-category was abstracted into the broader main category ‘Movement-based therapies’. The analytical progression from meaning unit to code, sub-category, and main category is illustrated in Table 9.

Table 9. Analytical Pathway from Meaning Unit to Main Category within the MT Framework.

Main categories:	<i>Sub-categories:</i>	Codes:	Meaning units:
Movement based therapies	<i>Core & pelvic stabilisation exercises</i>	Pelvic floor activation	“Motor imagery-guided pelvic floor activation”
		Core & pelvic exercises	“Curl-ups”
			“Abdominal breathing”
			“Pelvic floor & femoral adductor isometric contractions”
			“Kegel exercises”

A similar analytic process informed the formation of the main category ‘Hands-on therapies’. Meaning units describing manual interventions were condensed into codes reflecting specific techniques. These codes were compared based on their anatomical focus and mode of application and were grouped into sub-categories distinguishing ‘Joint-based techniques’ from ‘Non-joint-tissue techniques’. The abstraction into the broader main category ‘Hands-on therapies’ was informed deductively by definitions of MT as comprising skilled hands-on interventions applied to joints and soft tissues (Bise et al. 2017). An example of this abstraction process is presented in Table 10.

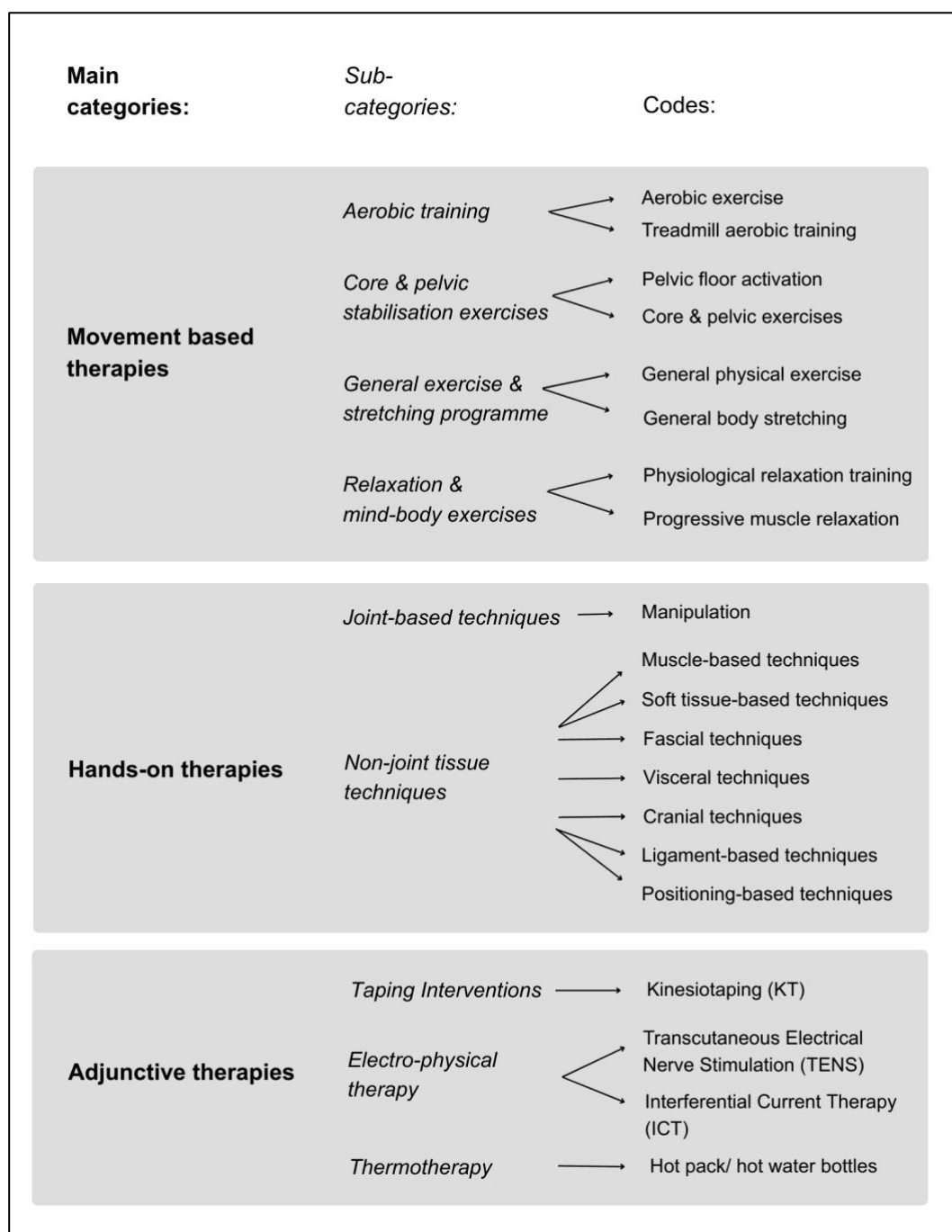
Table 10. Analytical Abstraction of Codes to Sub-categories into Main Category.



In addition, the main category 'Adjunctive therapies' emerged through comparison of interventions described as supplementary to primary therapeutic approaches. The categorisation was informed deductively by healthcare definitions describing such interventions as delivered in addition to a primary treatment to enhance effectiveness (NHS England 2024), while remaining grounded in how the interventions were presented in the included studies.

The final analytic framework synthesising all MT approaches across the included studies is presented in Table 11.

Table 11. Final Category Framework of MT Approaches in Women with PD.



Using the same analytic procedure, QoL outcomes were analysed separately. For QoL outcomes, meaning units were defined as distinct constructs assessed within the included studies. These were identified at the level of individual domains or variables, rather than being treated as whole measurement instruments. For example, the meaning units “Duration of bleeding”, “Intensity of bleeding” (Schwerla, Wirthwein, Rütz and Resch 2014), and “Number of sanitary napkins use” (Arora et al. 2014) were condensed and coded as

'Menstrual bleeding characteristics'. This code was grouped within sub-category 'Physical health and functioning', as duration and intensity of menstrual bleeding represent physiological aspects of menstrual function. Prior research indicates that greater menstrual flow and symptom severity are associated with increased pain and functional impairment (de Moraes et al. 2025; Negriff et al. 2009), supporting their conceptual alignment with the physical domain of HRQOL. To enhance transparency of the analytic process, the progression from meaning units to sub-category 'Health and well-being' within the QoL framework is presented in Table 12.

Table 12. Analytical Progression from Meaning Unit to Sub-category within the QoL Framework.

Main categories:	<i>Sub-categories:</i>	Codes:	Meaning unit:
Health & well-being	<i>Physical health & functioning</i>	Menstrual bleeding characteristics	"Duration of bleeding" "Intensity of bleeding" "Number of sanitary napkins use"

The development of this sub-category was informed inductively through clustering of related physical outcome constructs and deductively through alignment with established QoL domains, including those reflected in the SF-36 framework (Ware et al. 1993: Chapter 3:4–3:5).

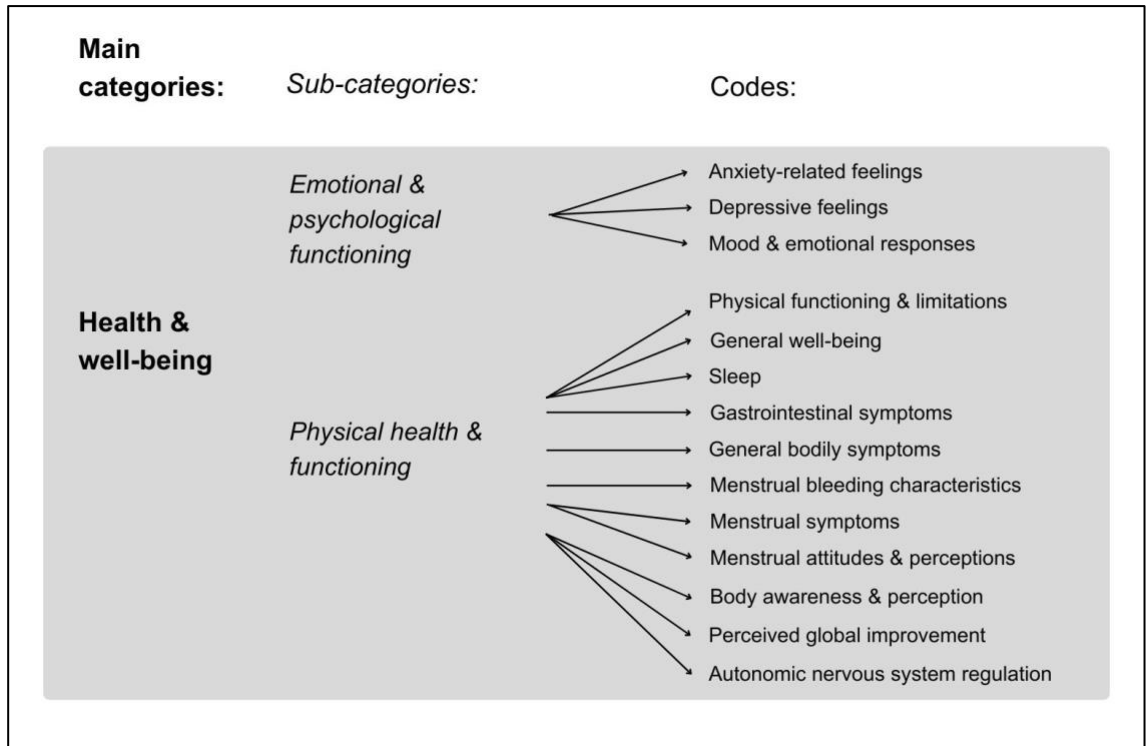
Additional codes relating to physical functioning and limitations, general well-being, sleep, gastrointestinal symptoms, general bodily symptoms, body awareness and perception, and perceived global improvement were derived from constructs measured across multiple PROMs in the included studies (Bai, Hong-Yan and Zhi-Qin 2017; Celenay et al. 2020; Dayican et al. 2024; Doğan et al. 2020; Kirmizigil et al. 2020; Kannan et al. 2019). Codes relating to menstrual burden, including menstrual bleeding characteristics, menstrual symptoms, and menstrual attitudes or perceptions were additionally identified and grouped

within this sub-category according to shared physical health dimensions. Physiological indicators of autonomic nervous system (ANS) regulation, assessed through heart rate variability (HRV) parameters (Park, Song, Jung, Joob, Yang and Lee 2020), were likewise grouped within this sub-category, as they reflect objective dimensions of physical health and regulatory function.

Codes reflecting anxiety, mood disturbance, emotional distress, coping, and psychological well-being were similarly clustered into the sub-category 'Emotional and psychological functioning' based on shared affective and cognitive dimensions across the included PROMs (Azima et al. 2015; Arora et al. 2014; Celenay et al. 2020; Celenay, Barut, Karakus and Alkan 2023; Dayican et al. 2024; Doğan et al. 2020; Kirmizigil and Demiralp 2020; Koçoğlu et al. 2025; Malik, Riaz, Afridi, Sheraz and Ehsan 2025; Schwerla et al. 2014; Temizkan and Budak 2021).

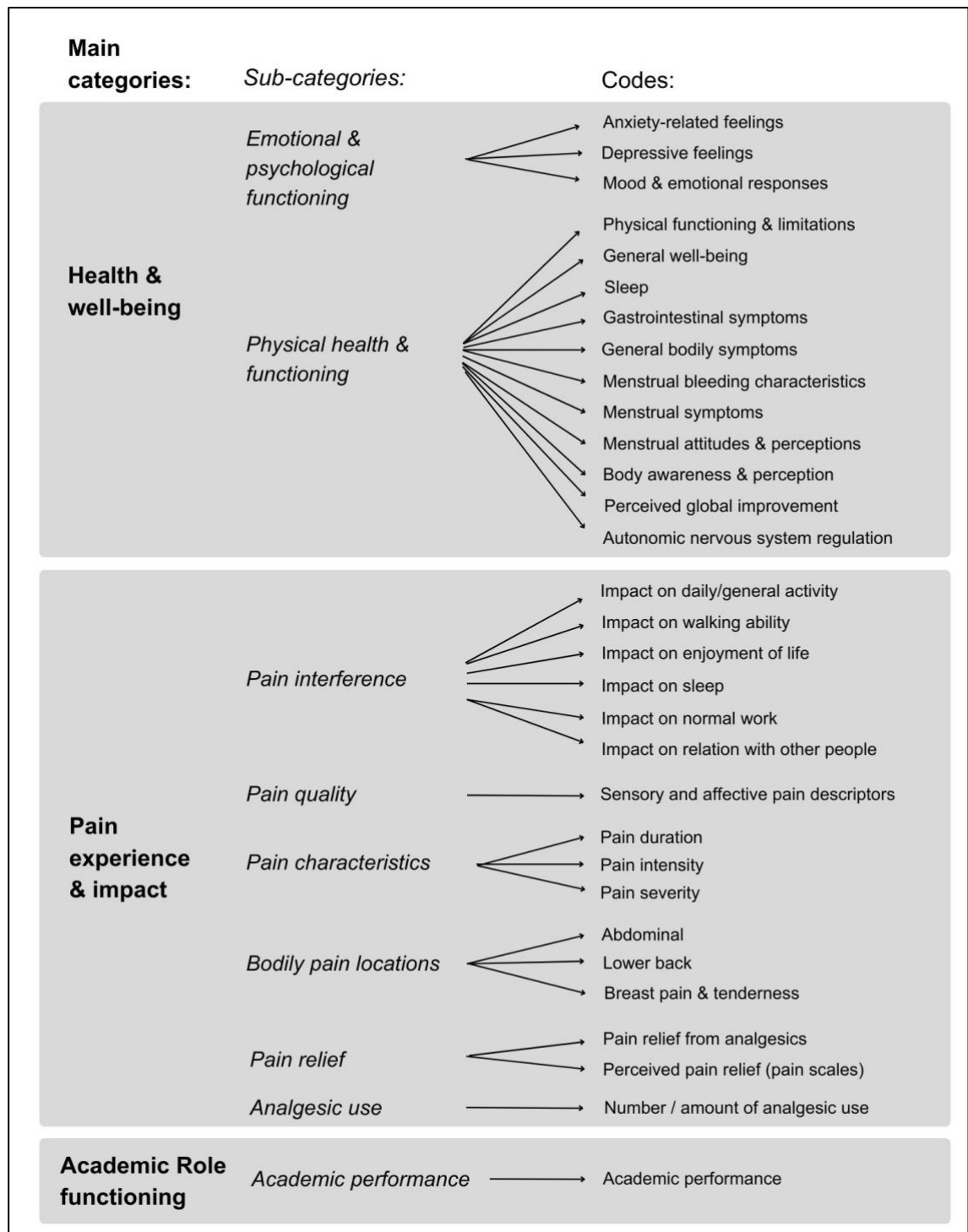
Together, the sub-categories 'Physical health and functioning' and 'Emotional and psychological functioning' were abstracted into the broader main category 'Health and well-being'. This abstraction was informed deductively by established conceptualisations of HRQOL as operationalised in the SF-36 framework, which integrates physical and mental domains of the HRQOL (Ware et al. 1993; 1995), while remaining grounded in the inductively derived data structure. This abstraction is presented in Table 13.

Table 13. Abstraction of QoL Sub-categories into the Main Category Health and Well-being.



The full QoL category framework, including main categories and sub-categories derived from the analysis, is presented in Table 14.

Table 14. Final Category Framework of QoL Aspects supported by MT Approaches.



Methodological rigour was strengthened through systematic documentation of analytic decisions, visual transparency of category development within Miro and Excel, consistent application of the analytic procedure across all studies, and reflexive awareness throughout the process. An abductive approach enabled

interpretation of patterns across studies without hypothesis testing or relying solely on inductive theory building (Barrett and Younas 2024; Vila-Henninger et al. 2024), making it suitable for synthesising previously published data within a ScR context. As this ScR synthesised existing published data rather than generating primary qualitative data, concepts such as data saturation were not applicable. Instead, structured mapping, descriptive analysis, and transparent organisation of evidence were prioritised in accordance with established ScR methodology (Mak and Thomas 2022; Peters et al. 2022).

5 Results

The results are presented across three sections: study characteristics, MT approaches in women with PD, and associated QoL outcomes. Interventions were categorised into 'Movement-based therapies', 'Hands-on therapies', and 'Adjunctive therapies'. Quality-of-life outcomes are reported across three domains identified in the analysis: 'Health and well-being', 'Pain experience and impact', and 'Academic role functioning'.

5.1 Characteristics of Included Studies

The included studies consisted exclusively of RCTs with sample sizes ranging from 22 to 134 female participants aged 12 to 50 years. Across the included studies ($n = 18$), exercise-based interventions were most frequently represented ($n = 9$), including aerobic exercise, isometric training, treadmill exercise, general physical therapy, pelvic floor activation (MOPEXE), and combined stretching and core-strengthening programmes. Kinesiotaping was examined in five studies ($n = 5$), followed by massage therapies (effleurage, rhythmical massage, connective tissue massage, and classical massage) ($n = 4$). Electrotherapy (TENS, ICT) and thermotherapy (hot packs, hot water bottles, warm compress) were each investigated in three studies ($n = 3$). Muscle relaxation interventions (Physiological relaxation training (PRT) and progressive muscle relaxation) and multimodal osteopathic treatment were represented in two studies each ($n = 2$), whereas manipulation and body awareness sessions were each examined in one study ($n = 1$). In some studies, multiple intervention

components were combined within a single treatment protocol; therefore, the number of intervention categories exceeds the total number of included studies. The distribution of intervention types across studies is presented in Figure 5.

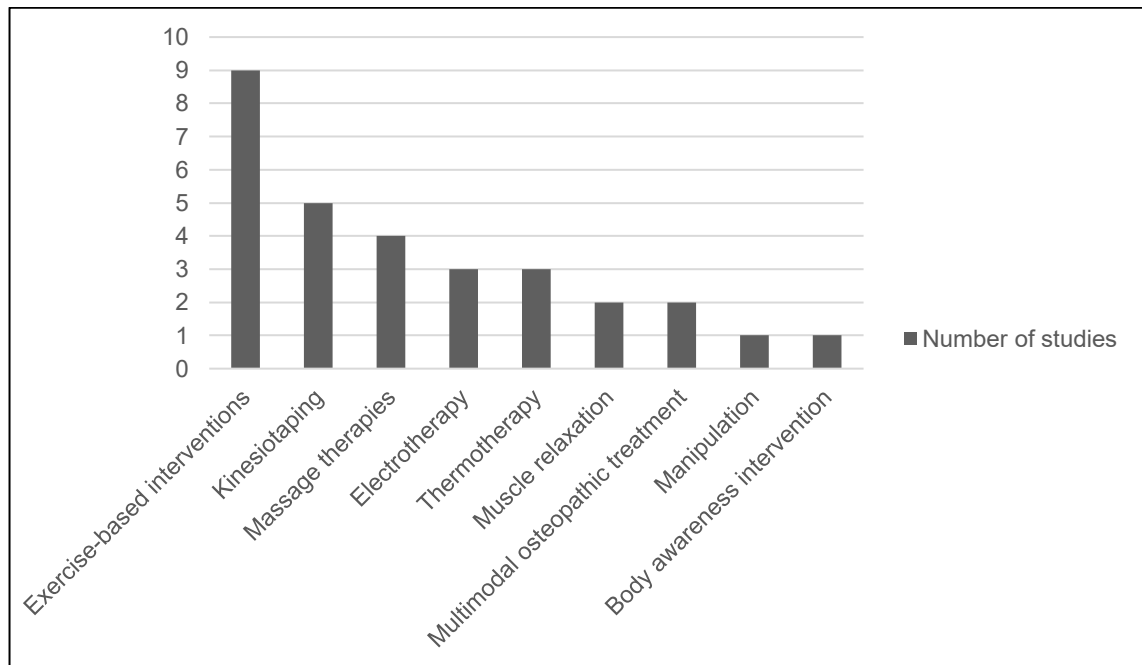


Figure 5. Types of MT interventions represented across the included studies (number of studies per intervention type).

With respect to the analytical categorisation, body awareness sessions (Conesa-Albaladejo, Espí-Lopéz, Martínez-Graullera and Arnal-Gómez 2025) were excluded from the MT categorisation, as the intervention comprised educational information sessions aimed at enhancing menstrual awareness and self-management rather than an MT approach, and were therefore treated as a QoL-related outcome. Similarly, HRV-related procedures were excluded from the MT categorisation, as HRV was used either as a physiological outcome measure (Park et al. 2020) or as a biofeedback intervention (Vargedes et al. 2019) rather than as a MT approach.

Studies were conducted in Turkey (n = 7), India (n = 2), Pakistan (n = 1), Iran (n = 1), China (n = 1), Korea (n = 1), New Zealand (n = 1), Spain (n = 1), Sweden (n = 1), and Germany (n = 1).

Quality-of-life outcomes encompassed psychological, physical, pain-related, and academic domains, as assessed using a range of PROMs. The PROMs used across the included studies and their frequency of use are presented in Table 15.

Table 15. PROMs used Across Included Studies grouped by Outcome Domain and Frequency (n).

Outcome Domain	Instrument	n
Pain characteristics (duration, intensity, severity)	VAS	14
	NRS	3
	Brief Pain Inventory (BPI) - severity subscale	1
	MDS	1
	SF-MPQ - intensity components	4
Pain quality	SF-MPQ sensory & affective descriptors	4
Pain interference	BPI - interference subscale	1
Pain relief HRQOL	BPI - % pain relief	1
	SF-36	5
	SF-12	2
	WHOQOL-BREF	1
Emotional and psychological functioning	STAI	2
	Functional & Emotional Dysmenorrhea Scale (FEDS)	2
	Beck Depression Scale (BDS)	1
Academic functioning	Academic Performance Questionnaire (APQ)	1
Sleep functioning	Pittsburgh Sleep Quality Index (PSQI)	1
	Women's Health Initiative Insomnia Rating Scale (WHIIRS)	1
Menstrual symptoms	MSQ	3
	Menstrual Symptoms Scale (MSS)	1
	MDQ	1
Menstrual attitudes	MAQ	1
	Menstrual Attitude Scale (MAS)	1
Perceived change	Patient Global Impression of Change (PGIC)	1
Body awareness	Body Awareness Questionnaire (BAQ)	1
	Body Satisfaction and Global Self-Perception (QSCPGSe)	1

Note. In some included studies, validated instruments were reported under alternative abbreviations. FEMD as FEDS (Celenay et al. 2023; Koçoğlu et al. 2025), MSQ as MSS (Doğan et al. 2020), MAQ as MAS (Temizkan and Budak 2021), and the Beck Depression Inventory (BDI) as BDS (Temizkan and Budak 2021). The SF-MPQ appears in multiple domains because different components assess distinct pain constructs.

5.2 Manual Therapy Approaches in Primary Dysmenorrhea

Three main categories of MT approaches and their associated sub-categories were identified across the included studies. Specifically, these categories comprised 'Movement-based therapies', 'Hands-on therapies', and 'Adjunctive therapies', although some studies applied multimodal strategies within a single therapeutic framework.

5.2.1 Movement-based therapies

This main category includes MT approaches in which active movement constituted the primary intervention component. Movement-based approaches comprised aerobic activities, targeted muscle activation and stabilisation exercises, mobility and stretching programmes, and structured relaxation methods. Four sub-categories were identified: 'Aerobic training', 'Core and pelvic stabilisation exercises', 'General exercise and stretching programmes', and 'Relaxation and mind-body exercises'. An overview of the sub-categories and their corresponding interventions within the movement-based MT category is presented in Figure 6.

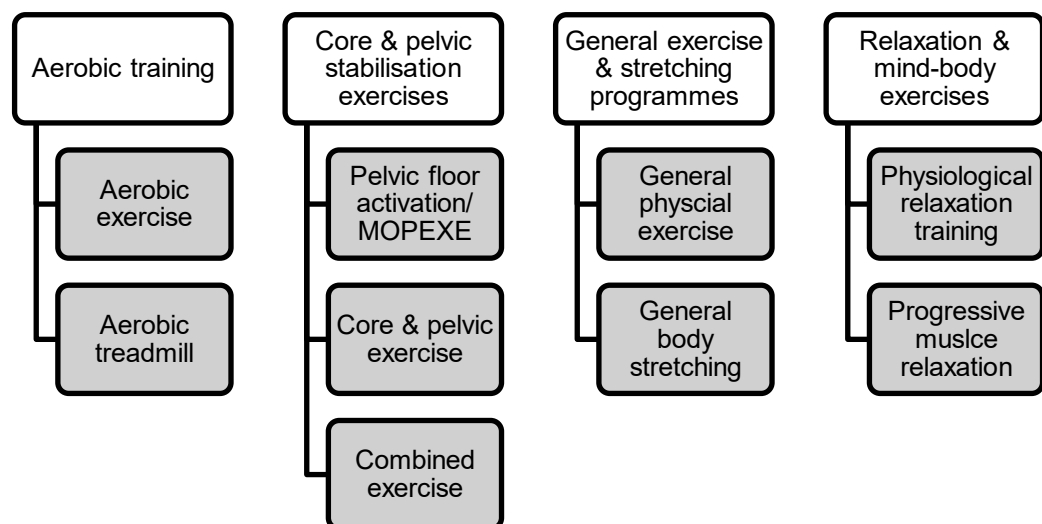


Figure 6. Classification of movement-based MT Approaches, including the identified Sub-categories and Representative Interventions.

First, 'Aerobic training' included of aerobic exercise of moderate-intensity walking and stair climbing (Temizkan and Budak 2021), as well as treadmill-

based aerobic programmes consisting of warm-up, aerobic, and cool-down phases (Arora et al. 2014; Kannan et al. 2019).

Second, 'Core and pelvic stabilisation exercises' targeted trunk and pelvic musculature. For example, one intervention applied pelvic floor activation through the MOPEXE model, which combined Pilates-based pelvic floor exercises with guided motor imagery (Koçoğlu et al. 2025). Core and pelvic exercises were also implemented through staged isometric contractions of the pelvic floor, adductor and abdominal muscles performed in supine positions and combined with deep abdominal breathing and progressive trunk and limb activation (Azima et al. 2015), as well as programmes incorporating pelvic mobilisation, yoga-based movements and region-specific strengthening (Dayican et al. 2024). In addition, a combined exercise programme integrating core strengthening, pelvic and Kegel exercises were implemented in one study (Kirmizigil and Demiralp 2020).

Third, 'General exercise and stretching programmes' included interventions described as general physical exercise programmes incorporating abdominal breathing, curl-ups, heel raises and knee bends (Chaudhuri, Singh and Lakhbir 2014), as well as general body stretching targeting major muscle groups of the upper and lower limbs (Malik et al. 2025).

Finally, 'Relaxation and mind-body exercises' comprised Laura Mitchell's PRT, a guided supine relaxation method using gentle positional movements, body awareness, and breathing techniques (Doğan et al. 2020), and progressive muscle relaxation involving systematic cycles of muscle contraction and release (Koçoğlu et al. 2025).

5.2.2 Hands-on therapies

This main category includes MT approaches delivered through direct therapist contact. Hands-on therapies were grouped into 'Joint-based techniques' and 'Non-joint tissue techniques'. Non-joint tissue techniques included muscle- and soft-tissue-based, fascial, visceral, cranial, ligament-based, and positioning-

based approaches. An overview of the sub-categories and their corresponding interventions within the hands-on MT approaches is provided in Figure 7.

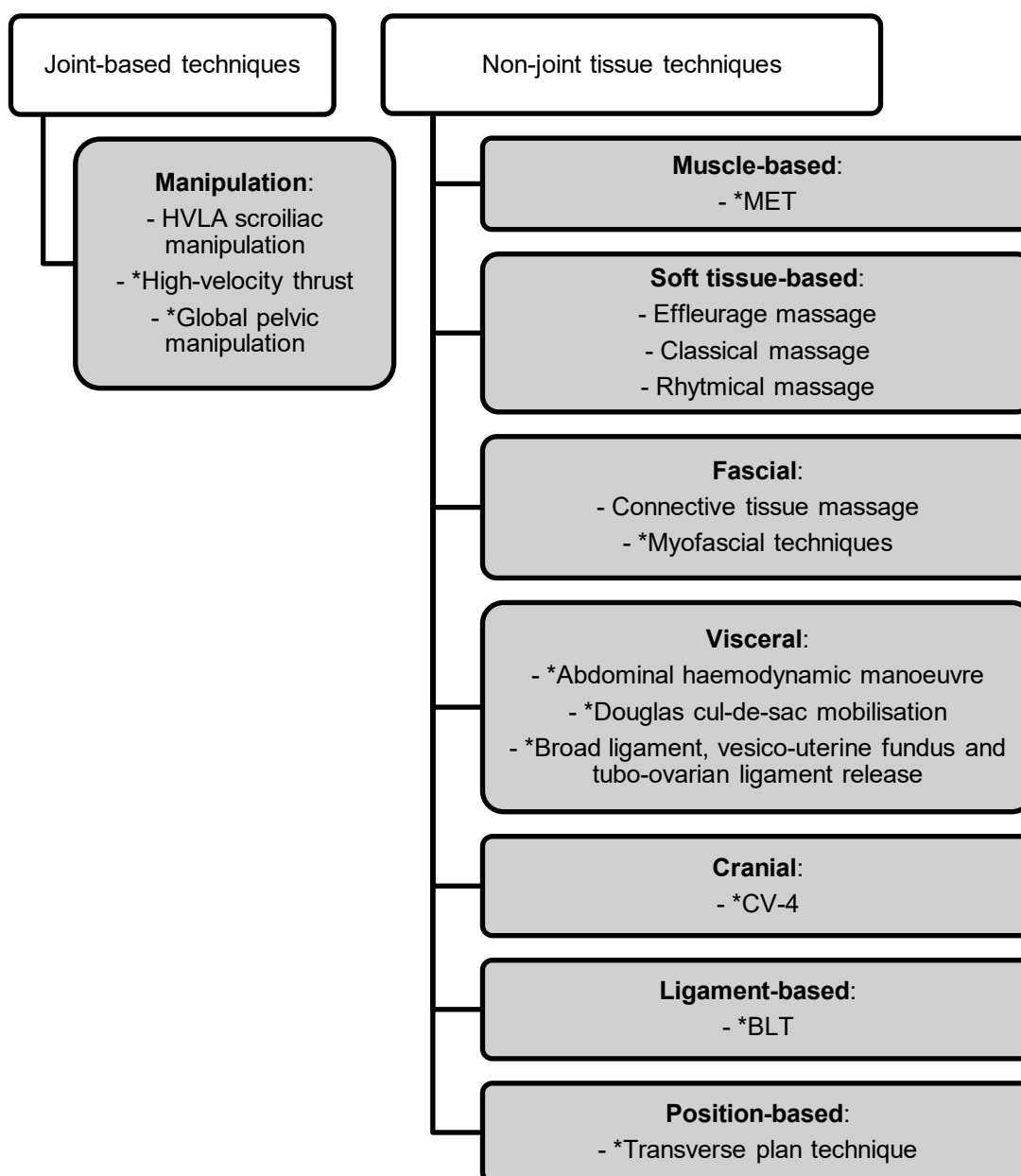


Figure 7. Classification of hands-on MT Approaches, including the identified Sub-categories and Representative Interventions.

Note. *Approaches implemented within multimodal osteopathic treatment.

With regard to 'Joint-based techniques', these included different manipulation techniques. HVLA sacroiliac manipulation applied as a standalone intervention (Park et al. 2020) as well as high-velocity thrust techniques delivered within an osteopathic multimodal treatment context (Schwerla et al. 2014). In addition, a global pelvic manipulation technique within an multimodal osteopathic treatment protocol was also reported (Conesa-Albaladejo et al. 2025), targeting the lumbosacral region to improve sacroiliac and L5–S1 joint mobility (Amin et al. 2023 cited in Conesa-Albaladejo et al. 2025).

Regarding 'Non-joint tissue techniques', several distinct approaches were described. Muscle-based techniques included muscle energy technique applied as part of a multimodal osteopathic treatment approach (Schwerla et al. 2014). Soft tissue approaches included different massage modalities such as effleurage massage using gentle circular strokes applied to the suprapubic-umbilical region with lavender oil (Azima et al. 2015) and classical massage using Swedish massage techniques such as stroking, kneading, and friction applied to the lumbar and abdominal regions (Celenay et al. 2023). Rhythmical massage consisted of gentle lifting and rhythmically undulating gliding movements with loop and lemniscate-shaped patterns applied with varying depth and intensity (Vargedes et al. 2019).

Furthermore, fascial approaches comprised connective tissue massage applied to the lumbosacral, abdominal, and pelvic regions (Celenay et al. 2023), which was selected based on genital organ innervation and referred pain patterns (Holey and Dixon 2014 cited in Celenay et al. 2023) and myofascial techniques directed to the abdominal region (Conesa-Albaladejo et al. 2025; Schwerla et al. 2014) to address fascial restrictions associated with pain and pelvic inflammation (Pilat 2011 cited in Conesa-Albaladejo et al. 2025). The fascial approaches reported by Conesa-Albaladejo et al. (2025) and Schwerla et al. (2014) were also implemented within multimodal osteopathic treatment protocol.

Moreover, visceral techniques were described within multimodal osteopathic treatment protocol (Conesa-Albaladejo et al. 2025; Schwerla et al. 2014), and included abdominal haemodynamic manoeuvres, mobilisation of the Douglas cul-de-sac, release of the broad ligament, vesico-uterine fundus and tubo-

ovarian ligament techniques, which were intended to improve uterine mobility, reduce local congestion and adhesions, and enhance abdominal blood and lymphatic circulation (Schorpp 2013 cited in Conesa-Albaladejo et al. 2025).

Additionally, cranial approaches (Schwerla et al. 2014) were also reported, using compression of fourth ventricular (CV-4) technique (Conesa-Albaladejo et al. 2025), aiming to influence cranial rhythmic function, lymphatic flow and sympathetic nervous system tone (Cardoso-de-Mello-e-Mello-Ribeiro et al. 2015 cited in Conesa-Albaladejo et al. 2025). Ligament-based techniques included balanced ligamentous tension (BLT) (Schwerla et al. 2014). Finally, position-based approaches included the transverse plane technique applied to pelvic structures (Conesa-Albaladejo et al. 2025) to restore uterine mobility and support the fascial organisation of pelvic structures (Hurtado et al. 2005 cited in Conesa-Albaladejo et al. 2025). All visceral and cranial approaches were implemented within the multimodal osteopathic treatment protocol.

5.2.3 Adjunctive therapies

This main category includes supportive interventions applied alongside primary MT approaches. In addition to the previously described categories, adjunctive therapies comprised 'Taping interventions', 'Electro-physical therapies', and 'Thermotherapy'. An overview of the sub-categories and their corresponding interventions within the adjunctive MT approaches is illustrated in Figure 8.

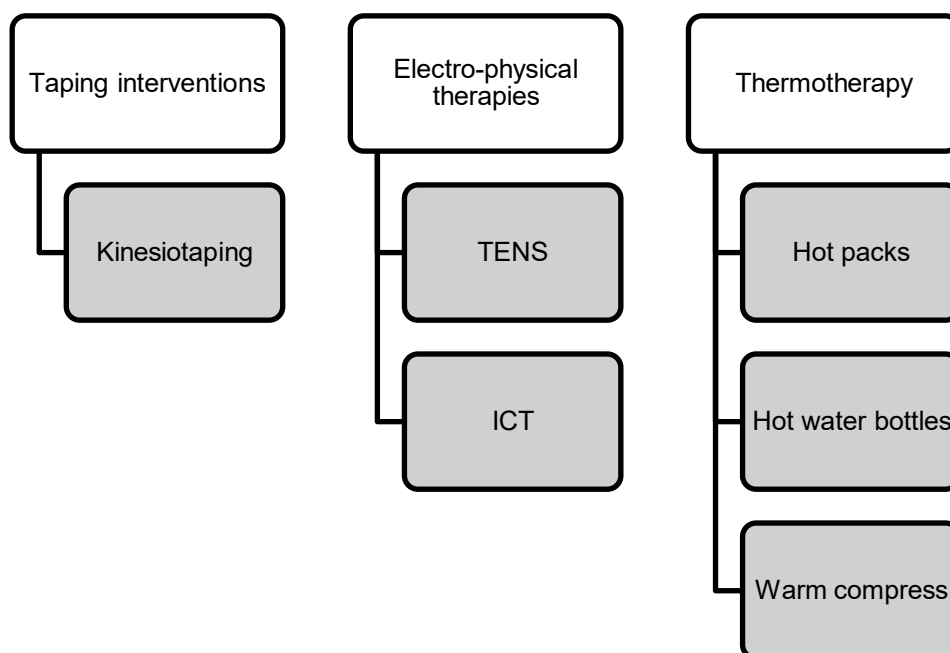


Figure 8. Classification of adjunctive MT Approaches, including the identified Sub-categories and Representative Interventions.

Sub-category ‘Taping interventions’ consisted of KT applied using a ligament technique, in which the tape is applied under tension (Celenay et al. 2020; Dayican et al. 2024; Doğan et al. 2020; Malik et al. 2025; Temizkan and Budak 2021). Applications were most commonly directed to the sacral and suprapubic regions. In some cases, Doğan et al. (2020) additionally applied taping to painful points and fascial tissue, while Temizkan and Budak (2021) applied taping exclusively to the suprapubic region.

‘Electro-physical therapies’ included TENS and ICT. TENS was applied to the painful lower abdominal area (Bai et al. 2017) and on the skin on each side of the uterus (Fagevik Olsén, Björndahl, Ståhl, Börjesson, Sundemo and Gutke 2020), while ICT was applied to the lumbar and gluteal regions to reduce menstrual pain and related symptoms (Dayican et al. 2024).

Lastly, ‘Thermotherapy’ involved the application of hot packs by a therapist (Malik et al. 2025), self-application of warm compresses (Vargedes et al. 2019), or the use of hot water bottles applied on the lower abdomen during painful menstruation days to manage PD (Chaudhuri et al. 2014).

5.3 Quality-of-Life Outcomes of Manual Therapy

Quality-of-life outcomes were organised into three main categories describing how MT approaches supported QoL in women with PD: 'Health and well-being', 'Pain experience and impact' and 'Academic role functioning'. As several studies reported outcomes across more than one QoL domain, individual studies could contribute to multiple categories within the matrix. The matrix includes studies reporting no changes, statistically significant improvements, or other reported outcome changes within each domain. Within each domain, the MT approaches applied and the corresponding reported outcomes are described.

5.3.1 Health and well-being

The first main category was 'Health and well-being', comprising the two sub-categories 'Emotional and Psychological functioning' and 'Physical health and functioning'. The sub-category 'Emotional and psychological functioning' encompassed anxiety-related symptoms, depressive mood states, as well as mental health and emotional role functioning.

Within movement-based therapies, several studies reported improvements in emotional and psychological functioning outcomes. Significant reductions in FEDS scores were observed in both the progressive muscle relaxation group and the combined group including progressive muscle relaxation and MOPEXE, whereas MOPEXE alone did not demonstrate comparable improvements (Koçoğlu et al. 2025). Similarly, aerobic treadmill exercise programmes were associated with improvements in mental health-related outcomes. A 12-week aerobic treadmill programme improved in all eight SF-36 domains, including emotional role and mental health functioning, although results for individual subdomains were not reported separately (Arora et al. 2014). Likewise, a four-week supervised aerobic treadmill programme followed by a six-month home programme resulted in improved MCS scores on the SF-12 at four- and seven-month follow-up compared with usual care (Kannan et al. 2019).

Similarly, within hands-on therapies, massage-based approaches also demonstrated positive outcomes. Both classical massage and connective tissue massage were associated with significant reductions in total FEDS scores and improvements in functional and emotional status. Although connective tissue massage resulted in greater improvements in functional FEDS scores compared with classical massage, reductions in nervousness were reported within the classical massage group. (Celenay et al. 2023). Similarly, effleurage massage was associated with a significant within-group reduction in anxiety after the third cycle, whereas no significant changes were observed in the core and pelvic exercise group; however, no significant between-group differences in mean anxiety levels were identified (Azima et al. 2015). Conversely, no significant differences in mental health status were observed following multimodal osteopathic treatment (Schwerla et al. 2014).

Within adjunctive therapies, several studies examining KT reported improvements. One study reported significant reductions in state and trait anxiety only in the KT group, with no comparable changes in the sham taping (ST) or control groups (Celenay et al. 2020). In addition, the proportion of participants reporting nervousness before or during menstruation and depressed mood decreased significantly in the KT group (Celenay et al. 2020). Similarly, when KT was combined with relaxation and lifestyle modification, significant within-group improvements were observed in the SF-36 domains of emotional role difficulty and mental health in both groups, with post-treatment scores significantly higher in the KT group compared with the lifestyle modification group alone (Doğan et al. 2020). Furthermore, although all groups showed improvement over time in another study, greater between-group improvement in the MCS of the SF-36 was observed in the intervention group receiving KT combined with physical therapy including general body stretching and hot packs, compared with both ST with the same physical therapy and hot packs and a control group receiving general physical therapy and hot packs (Malik et al. 2025). However, when KT was compared with aerobic exercise in another study, reductions in depression scores were observed in both groups but did not reach statistical significance, whereas the control group (no

intervention) showed declining QoL and increasing depression levels over time (Temizkan and Budak 2021).

A summary of emotional and psychological functioning outcomes across movement-based, hands-on, and adjunctive MT approaches is presented in Table 16.

Table 16. Overview of Emotional and Psychological Functioning Outcomes Across MT Approaches.

Study:	MT Approach:	Anxiety:	Depressive Symptoms:	Mental Health/Emotional Role:
<i>Movement-based therapies</i>				
Arora et al. 2014	Aerobic treadmill	-	-	▲*
Kannan et al. 2019	Aerobic treadmill	-	-	▲ (MCS, 4 & 7 months)
Temizkan & Budak 2021	Aerobic exercise	-	○	-
Azima et al. 2015	Core & pelvic exercise	○	-	-
Koçoğlu et al. 2025	Progressive muscle relaxation	-	-	▲ (FEDS)
Koçoğlu et al. 2025	Progressive muscle relaxation + MOPEXE	-	-	▲ (FEDS)
Koçoğlu et al. 2025	MOPEXE	-	-	○
Doğan et al. 2020	PRT + lifestyle	-	-	▲
Malik et al. 2025	General body stretching + hot pack	-	-	▲ (MCS)
<i>Hands-on therapies</i>				
Celenay et al. 2023	Connective tissue massage	-	-	▲ (FEDS)
Celenay et al. 2023	Classical massage	-	-	▲ (nervousness)
Azima et al. 2015	Effleurage massage	▲	-	-
Schwerla et al. 2014	Multimodal osteopathic	-	-	○
<i>Adjunctive therapies</i>				
Celenay et al. 2020	KT	▲▲ (state & trait)	▲	-
Doğan et al. 2020	KT + PRT + lifestyle	-	-	▲ + ▲▲
Malik et al. 2025	KT + general body stretching + hot pack	-	-	▲ + ▲▲ (MCS)
Malik et al. 2025	ST + general body stretching + hot pack	-	-	▲ (MCS)
Temizkan & Budak 2021	KT	-	○	-

Note. ▲ = significant within-group improvement; ▲▲ = significant between-group difference; ○ = non-significant change; – = not reported. *Subdomain-specific emotional results were not separately detailed.

Within the main category 'Physical health and functioning', results were organised across the following sub-domains: 'Physical functioning and limitations', 'General well-being', 'Sleep', 'Gastrointestinal symptoms' and

'General bodily symptoms', 'Menstrual bleeding characteristics', 'Menstrual Symptoms', 'Menstrual attitudes & perceptions', 'Body awareness & perception', 'Perceived global improvement' and 'Autonomic nervous system regulation'.

With regard to 'Physical functioning and limitations' findings varied across interventions. Within movement-based therapies, improvements in the physical functioning domain were identified following aerobic treadmill training (Arora et al. 2014). Within adjunctive therapies, no differences in physical functioning limitations during the first four days of menstruation were found when TENS was compared with a delayed TENS intervention group (Fagevik Olsén et al. 2020). Furthermore, significant improvements in SF-36 physical function were observed within the KT group, whereas no significant change occurred in the aerobic exercise group. Although an overall group difference was detected, post-hoc analysis revealed no significant difference between the two active interventions (Temizkan and Budak 2021).

Turning to 'General well-being', this sub-category encompassed broader HRQOL dimensions reflecting overall physical health, vitality, energy levels, and general health perception. Within movement-based therapies, no significant short-term effects were identified when aerobic treadmill training was compared with usual care, whereas statistically significant improvements in the SF-12 PCS were demonstrated at four- and seven-month follow-up (Kannan et al. 2019).

Within hands-on therapies, comparable improvements in physical health were demonstrated following multimodal osteopathic intervention, reflected by significant between-group increases in the SF-36 PCS score compared with no intervention (Schwerla et al. 2014). In contrast, rhythmical massage was associated with significant pre–post improvements in overall QoL; however, no significant between-group differences were observed compared with usual care (Vargedes et al. 2019).

Finally, within adjunctive therapies, both groups demonstrated significant improvements across several SF-36 domains; however, post-treatment scores in physical functioning and general health were significantly higher in the group

combining KT with PRT and lifestyle modification compared with the lifestyle and PRT group alone (Doğan et al. 2020). When broader HRQOL comparisons were examined, no significant differences were observed between KT and ST (Bai et al. 2017). By contrast, significant between-group improvements in overall QoL were demonstrated when body awareness sessions were combined with a multimodal osteopathic treatment protocol compared with body awareness sessions alone (Conesa-Albaladejo et al. 2025). Greater improvements in SF-36 PCS scores were observed in the combined KT group compared with the combined ST group, and in the combined ST group compared with the control group receiving general body stretching and hot packs, while all groups improved over time (Malik et al. 2025).

Regarding 'Sleep', this sub-category encompassed sleep quality, including overall sleep disturbance, daytime dysfunction, and insomnia-related symptoms. Within movement-based therapies, significant improvements in daytime dysfunction and total PSQI scores were identified in the combined exercise group, while no comparable changes were identified in the control group that received neither exercise nor lifestyle changes (Kirmizigil and Demiralp 2020). In contrast, aerobic treadmill training showed no significant effects on sleep at any assessment time point (Kannan et al. 2019). Within adjunctive therapies, KT reduced insomnia symptoms compared with ST (Celenay et al. 2020).

The sub-categories 'Gastrointestinal symptoms' and 'General bodily symptoms' encompassed menstrual-related somatic complaints recorded as present or absent. Gastrointestinal symptoms included abdominal swelling, diarrhoea, nausea, and constipation, whereas general bodily symptoms comprised fatigue, dizziness or drowsiness, and loss of appetite, reflecting the broader physical symptom burden associated with menstruation.

Under movement-based therapies, the combined exercise programme resulted in significant reductions in all MSQ parameters within the combined exercise group, and at follow-up significant between-group differences were demonstrated for the MSQ total score and the negative outcomes subscale in favour of the combined exercise group (Kirmizigil and Demiralp 2020). Within

adjunctive therapies, reductions in abdominal swelling, fatigue and nausea were identified following KT compared with ST (Celenay et al. 2020).

An overview of findings related to physical functioning, general well-being, sleep, gastrointestinal and general bodily symptoms across movement-based, hands-on, and adjunctive therapies is presented in Table 17.

Table 17. Overview of Physical Health and Functioning Outcomes Across MT Approaches.

Study:	MT Approach:	Physical Functioning/ Limitations:	General Well-being (HRQOL):	Sleep:	Gastrointestinal / General Bodily Symptoms:
<i>Movement-based therapies</i>					
Arora et al. 2014	Aerobic treadmill	▲	-	-	-
Kannan et al. 2019	Aerobic treadmill	-	▲▲ (PCS, 4 & 7 months)	○	-
Temizkan & Budak 2021	Aerobic exercise	○ (vs KT)	○ (vs KT)	-	-
Doğan et al. 2020	PRT + lifestyle	▲	▲	-	-
Kirmizigil & Demiralp 2020	Combined exercise	-	-	▲	▲ + ▲▲
Malik et al. 2025	General body stretching + hot pack	-	▲	-	-
<i>Hands-on therapies</i>					
Vargedes et al. 2019	Rhythmical massage	-	▲	-	-
Schwerla et al. 2014	Multimodal osteopathic	-	▲▲	-	-
Conesa-Albaladejo et al. 2025	Body awareness + multimodal osteopathic	-	▲▲	-	-
<i>Adjunctive therapies</i>					
Fagevik Olsén et al. 2020	TENS	○	-	-	-
Temizkan & Budak 2021	KT	▲	▲	-	-
Malik et al. 2025	KT + general body stretching + hot pack	-	▲ + ▲▲ (vs ST)	-	-
Malik et al. 2025	ST + general body stretching + hot pack	-	▲ + ▲▲ (vs control)	-	-
Doğan et al. 2020	KT + PRT + lifestyle	▲ + ▲▲	▲ + ▲▲	-	-
Bai et al. 2017	KT	-	○	-	-
Celenay et al. 2020	KT	-	-	▲▲	▲▲

Note. ▲ = significant within-group improvement; ▲▲ = significant between-group difference; ○ = non-significant change; – = not reported.

The sub-category 'Menstrual bleeding characteristics' encompassed measurable aspects of menstrual bleeding, including bleeding intensity, duration, number of bleeding days, and sanitary napkin use. These outcomes were assessed using study-specific self-reported measures rather than validated PROM instruments, for example recording the number of sanitary napkins used during the day of maximum bleeding (Arora et al. 2014) and Likert-scale ratings of bleeding intensity together with the number of bleeding days (Schwerla et al. 2014). Within movement-based therapies, aerobic treadmill training was associated with reduced sanitary napkin use (Arora et al. 2014). Within hands-on therapies, no significant changes in bleeding duration or intensity, nor in the number of bleeding days, were identified following multimodal osteopathic treatment compared with no intervention (Schwerla et al. 2014).

Menstrual symptoms encompassed the broader symptom burden associated with menstruation. In the included studies, PROMs assessing the frequency and severity of menstrual symptoms (Doğan et al. 2020), as well as instruments capturing menstrual-related symptoms across multiple physical, emotional, and behavioural domains (Chaudhuri et al. 2014), defined this sub-category. Within movement-based therapies, reductions in menstrual symptom scores were observed following both the general physical exercise programme and thermotherapy, reflected by decreased MDQ scores and a shift from moderate and severe to mild grades; however, no statistically significant between-group differences were identified (Chaudhuri et al. 2014). Menstrual symptom scores decreased in both intervention groups; however, the reduction was significantly greater in the combined KT group than in the combined PRT group (Doğan et al. 2020).

Turning to 'Menstrual attitudes and perceptions', this sub-category captured women's positive and negative attitudes toward menstruation, expectations related to physiological and emotional symptoms, and coping responses during the menstrual period, reflecting the multidimensional nature of menstrual appraisal (Koçoğlu et al. 2025; Temizkan and Budak 2021). Results were described across movement-based and adjunctive interventions. Reductions across all MAQ sub-parameters were reported in both progressive muscle

relaxation and the combined progressive muscle relaxation plus MOPEXE group, with partial improvements also observed in the MOPEXE group (Koçoğlu et al. 2025).

When KT was compared with aerobic exercise, menstrual attitude scores improved significantly in the KT group, whereas no significant change was observed following aerobic exercise; however, the difference between the interventions was not statistically significant (Temizkan and Budak 2021). Improvements in coping method scores were demonstrated in both KT and ICT groups (Dayican et al. 2024). Furthermore, improvements in menstrual symptoms were identified across all intervention groups in another study, with greater reductions in the combined KT group compared with the combined ST and the group receiving general body stretching and hot packs (Malik et al. 2025).

An overview of findings related to menstrual bleeding characteristics, menstrual symptoms, and menstrual attitudes and perceptions across movement-based, hands-on, and adjunctive therapies is presented in Table 18.

Table 18. Overview of Menstrual Bleeding Characteristics, Symptoms and Attitude Outcomes Across MT Approaches.

Study:	MT Approach:	Bleeding Characteristics:	Menstrual Symptoms:	Menstrual Attitude & Perception:
<i>Movement-based therapies</i>				
Arora et al. 2014	Aerobic treadmill	▲ (sanitary napkin use)	-	-
Temizkan & Budak 2021	Aerobic exercise	-	-	○
Doğan et al. 2020	PRT + lifestyle	-	▲	-
Koçoğlu et al. 2025	Progressive muscle relaxation	-	-	▲
Koçoğlu et al. 2025	Progressive muscle relaxation + MOPEXE	-	-	▲
Koçoğlu et al. 2025	MOPEXE	-	-	△
Chaudhuri et al. 2014	General physical exercise	-	▲	-
Malik et al. 2025	General body stretching + hot pack	-	▲	-
<i>Hands-on therapies</i>				
Schwerla et al. 2014	Multimodal osteopathic	○	-	-
<i>Adjunctive therapies</i>				
Doğan et al. 2020	KT + PRT + lifestyle	-	▲ + ▲▲	-
Temizkan & Budak 2021	KT	-	-	▲
Malik et al. 2025	KT + general body stretching + hot pack	-	▲ + ▲▲	-
Malik et al. 2025	ST + general body stretching + hot pack	-	▲	-
Dayican et al. 2024	KT + core & pelvic exercise	-	-	▲ (coping)
Dayican et al. 2024	ICT + core & pelvic exercise	-	-	▲ (coping)
Chaudhuri et al. 2014	Thermotherapy	-	▲	-

Note. ▲ = significant within-group improvement; ▲▲ = significant between-group difference; △ = partial or descriptive improvement without statistical significance; ○ = non-significant change; – = not reported.

The sub-category ‘Body awareness and perception’ captured constructs related to awareness of internal bodily states and perceptions of the body. These included sensitivity to bodily rhythms and cycles and the ability to detect and anticipate bodily changes (Doğan et al. 2020), as well as overall body satisfaction and global self-perception (Conesa-Albaladejo et al. 2025). Perceived global improvement referred to participants’ overall self-rated change in their condition compared with baseline (Kannan et al. 2019).

Within movement-based therapies, no significant between-group differences in overall body awareness were observed between the group receiving PRT and lifestyle modification and the combined KT group receiving additional lifestyle modification and PRT. Perceived global improvement was assessed in one movement-based intervention and a greater proportion of participants in the exercise group rated themselves as “much improved” or “very much improved” at four- and seven-month follow-up compared with usual care, although no significant difference was observed at one month (Kannan et al. 2019).

Within hands-on therapies, combined body awareness sessions and a multimodal osteopathic treatment protocol was compared with body awareness sessions alone. The body awareness sessions consisted of two clinician-led 45-minute group sessions providing education on anatomy, menstrual physiology, dysmenorrhea mechanisms, and menstrual self-care. Significant improvements in body satisfaction were observed in both groups, with statistically greater improvements in the combined intervention group. Additionally, a larger proportion of participants in the combined group reported overall perceived improvement. (Conesa-Albaladejo et al. 2025.)

Within adjunctive therapies, no significant between-group differences in overall body awareness were observed between the combined KT group and the group receiving lifestyle modification and PRT alone; however, greater improvement in awareness of the sleep–wake cycle was observed in the combined KT group (Doğan et al. 2020).

Finally, within the sub-category ‘Autonomic nervous system regulation’, HVLA sacroiliac joint manipulation resulted in a significant between-group difference in short-term autonomic balance compared with sham treatment (Park et al. 2020), with autonomic function assessed using HRV analysis as a non-invasive measure (Pumprla et al. 2002 cited in Park et al. 2020).

An overview of findings related to body awareness and perception, perceived global improvement and ANS regulation across movement-based, hands-on, and adjunctive therapies is presented in Table 19.

Table 19. Overview of Body Awareness, Perceived Global Improvement, and ANS Regulation Outcomes across MT approaches.

Study:	MT Approach:	Body Awareness & Perception:	Perceived Global Change:	ANS Regulation:
<i>Movement-based therapies</i>				
Kannan et al. 2019	Aerobic treadmill	-	▲ ▲ (4 & 7 months)	-
Doğan et al. 2020	PRT + Lifestyle	○ (body awareness)	-	-
<i>Hands-on therapies</i>				
Conesa-Albaladejo et al. 2025	Body awareness + multimodal osteopathic	▲ + ▲ ▲ (body satisfaction)	▲ ▲	-
Conesa-Albaladejo et al. 2025	Body awareness	▲ (body satisfaction)	-	-
Park et al. 2020	Manipulation	-	-	▲ ▲ (short-term)
<i>Adjunctive therapies</i>				
Doğan et al. 2020	KT + PRT + lifestyle	▲ ▲ (sleep-wake cycle awareness)	-	-

Note. ▲ = significant within-group improvement; ▲ ▲ = significant between-group difference; ○ = no significant between-group change; – = not reported.

5.3.2 Pain Experience and Impact

The second main category ‘Pain experience and impact’ encompassed multiple dimensions of menstrual pain, including its disruptive effects, qualitative features, measurable characteristics, specific bodily locations, perceived relief, and associated medication use. Across the included studies, pain outcomes were reported for movement-based, hands-on, and adjunctive MT approaches.

The sub-category ‘Pain interference’ referred to the extent to which menstrual pain disrupted daily activities. Only movement-based interventions reported outcomes for this sub-category. Within movement-based therapies, aerobic treadmill exercise was associated with significant reductions in pain interference over time in the aerobic treadmill exercise group, with improvements maintained at one, four, and seven months (Kannan et al. 2019). In contrast, no eligible hands-on or adjunctive therapies specifically reported outcomes related to pain interference.

The ‘Pain quality’ sub-category encompassed sensory and affective descriptors measured primarily with the SF-MPQ. Findings were reported across

movement-based and hands-on therapies, whereas adjunctive-only approaches did not specifically assess this construct.

Within movement-based therapies, aerobic treadmill training was associated with improvements in pain quality at four and seven months (Kannan et al. 2019). Similarly, reductions in sensory and affective pain descriptors were observed following progressive muscle relaxation, MOPEXE, and their combination, although with no significant differences were identified between intervention groups (Koçoğlu et al. 2025). Furthermore, when KT was compared with aerobic exercise, a significant improvement in pain quality was observed within the aerobic exercise group, and the time \times group interaction for MPQ was significant; however, post-hoc comparisons showed no significant differences between KT and aerobic exercise groups (Temizkan and Budak 2021).

Regarding hands-on therapies, combined body awareness sessions and a multimodal osteopathic treatment protocol were compared with body awareness sessions alone, with both groups showing reductions in pain perception and intensity, with significantly greater improvements observed in the combined intervention group (Conesa-Albaladejo et al. 2025). In contrast, no adjunctive-only approaches specifically assessed pain quality beyond the comparisons described above.

The sub-category 'Pain characteristics' included intensity, severity, and duration of menstrual pain. Pain intensity and duration were the most frequently assessed characteristics across the included studies.

Within movement-based therapies, supervised aerobic exercise followed by home training reduced pain intensity at one month within the aerobic treadmill training group, and these improvements were sustained at four and seven months (Kannan et al. 2019). Similarly, aerobic treadmill training over twelve weeks also decreased pain intensity and improved the SF-36 bodily pain domain, with significant between-group differences favouring the exercise group compared with the control group (Arora et al. 2014), although the control condition was not further specified in the study report. Likewise, a combined exercise programme reduced pain intensity within the intervention group

(Kirmizigil and Demiralp 2020). In another study, both the general physical exercise and thermotherapy groups showed reductions in VAS pain scores over time, with greater reductions observed following hot water bottle application compared with exercise (Chaudhuri et al. 2014).

Within hands-on therapies, massage-based interventions demonstrated consistent effects. Both the effleurage massage and isometric exercise groups showed significant reductions in pain intensity and pain duration, although the reductions were greater in the massage group compared with the core and pelvic exercise and control groups (Azima et al. 2015). Similarly, both connective tissue massage and classical massage significantly reduced pain intensity and duration within groups; however, the reduction in pain duration was greater following connective tissue massage, while no between-group difference was observed for pain intensity (Celenay et al. 2023). In addition, rhythmical massage showed greater reductions in pain intensity compared with usual care after three months, whereas no significant differences were identified between rhythmical massage and HRV biofeedback or between HRV biofeedback and control (Vagedes et al. 2019). Likewise, HVLA sacroiliac manipulation reduced pain intensity within both intervention and sham groups, without significant between-group differences (Park et al. 2020). Furthermore, multimodal osteopathic treatment significantly reduced both pain intensity and duration compared with a no-intervention control group (Schwerla et al. 2014). Similarly, both groups showed reductions in pain intensity following a multimodal osteopathic treatment protocol and body awareness sessions, with greater improvements observed in the combined group (Conesa-Albaladejo et al. 2025).

Among adjunctive therapies, TENS reduced dysmenorrhoeal pain intensity compared with sham treatment (Bai et al. 2017), whereas another TENS study reported no significant effects on pain intensity when TENS was compared with delayed TENS stimulation (Fagevik Olsén et al. 2020). Kinesiotaping reduced pain intensity, with greater reductions compared with both ST and control groups (Celenay et al. 2020). When KT was combined with PRT and lifestyle modification and compared with PRT and lifestyle modification alone, both groups improved; however, greater reductions were observed in the KT group

(Doğan et al. 2020). Similarly, when KT combined with general body stretching and hot packs was compared with ST and a control group, significant reductions in VAS pain scores were observed in the KT group, with significant between-group differences. In contrast, the ST group showed improvements from baseline to week eight, whereas the control group improved from week eight to twelve. (Malik et al. 2025.) Both the kinesiotaping-plus-exercise and electrotherapy-plus-exercise groups showed significant within-group reductions in pain intensity, although no significant between-group differences were identified (Dayican et al. 2024). Finally, when KT was compared with aerobic exercise, both interventions showed greater reductions in pain intensity than the control group (no intervention), while no significant difference was identified between KT and aerobic exercise (Temizkan and Budak 2021).

The sub-category 'Bodily pain locations' captured specific menstrual pain sites, including abdominal pain, low back pain, and breast tenderness. Within movement-based therapies, the combined exercise programme showed a significant between-group difference in abdominal pain at follow-up compared with the control group (Kirmizigil and Demiralp 2020). Within hands-on therapies, connective tissue massage reduced low back pain, whereas classical massage did not; nonetheless, the between-group difference was not statistically significant. Although baseline differences in breast tenderness existed between massage groups, no significant post-treatment differences were identified. (Celenay et al. 2023.) Additionally, HVLA sacroiliac joint manipulation was evaluated in women with dysmenorrhea-related low back pain, with both the intervention and sham groups demonstrating reductions in low back pain intensity after treatment, without significant between-group differences (Park et al. 2020). Within adjunctive approaches, the proportion of women reporting breast tenderness increased in the control group, while no significant changes occurred in the KT or ST groups (Celenay et al. 2020).

Overall, pain outcomes were most frequently assessed through measures of pain intensity, while fewer studies evaluated pain interference, qualitative pain descriptors, or medication use. An overview of findings related to pain experience and its impact across movement-based, hands-on, and adjunctive therapies is presented in Table 20.

Table 20. Overview of Pain Experience and Impact Outcomes Across MT Approaches.

Study:	MT Approach:	Pain Interference:	Pain Quality:	Pain Characteristics:	Bodily Pain Locations:
Movement-based therapies					
Kannan et al. 2019	Aerobic treadmill	▲	▲	▲	-
Arora et al. 2014	Aerobic treadmill	-	-	▲ + ▲▲	-
Chaudhuri et al. 2014	General physical exercise	-	-	▲	-
Temizkan & Budak 2021	Aerobic exercise	-	○	▲	-
Azima et al. 2015	Core & pelvic exercise	-	-	▲	-
Kirmizigil & Demiralp 2020	Combined exercise	-	-	▲	▲▲ (abdominal)
Doğan et al. 2020	PRT + lifestyle	-	-	▲	-
Koçoğlu et al. 2025	Progressive muscle relaxation	-	▲	▲ + ▲▲	-
Koçoğlu et al. 2025	Progressive muscle relaxation + MOPEXE	-	▲	▲	-
Koçoğlu et al. 2025	MOPEXE	-	▲	▲	-
Malik et al. 2025	General body stretching + hot pack	-	-	▲ (week 8 - 12)	-
Hands-on therapies					
Azima et al. 2015	Effleurage massage	-	-	▲ + ▲▲	-
Celenay et al. 2023	Connective tissue massage	-	-	▲ + ▲▲	▲ (low back)
Celenay et al. 2023	Classical massage	-	-	▲	○ (breast tenderness)
Vagedes et al. 2019	Rhythmical massage	-	-	▲ + ▲▲	-
Park et al. 2020	Manipulation	-	-	▲	▲ (low back)
Schwerla et al. 2014	Multimodal osteopathic	-	-	▲ + ▲▲	-
Conesa-Albaladejo et al. 2025	Body awareness + multimodal osteopathic	-	▲ + ▲▲	▲	-
Conesa-Albaladejo et al. 2025	Body awareness	-	▲	▲ + ▲▲	-
Adjunctive therapies					
Bai et al. 2017	TENS	-	-	▲ + ▲▲	-
Fagevik Olsén et al. 2020	TENS	-	-	○	-
Celenay et al. 2020	KT	-	-	▲ + ▲▲	○ (breast tenderness)
Doğan et al. 2020	KT + PRT + lifestyle	-	-	▲ + ▲▲	-
Malik et al. 2025	KT + general body stretching + hot pack	-	-	▲ + ▲▲	-
Malik et al. 2025	ST + general body stretching + hot pack	-	-	▲ (week 1-8)	-
Temizkan & Budak 2021	KT	-	○	▲	-
Dayican et al. 2024	KT + core & pelvic exercise	-	-	▲	-
Dayican et al. 2024	ICT+ core & pelvic exercise	-	-	▲	-
Chaudhuri et al. 2014	Thermotherapy	-	-	▲ + ▲▲	-

Note. ▲ = significant within-group improvement; ▲▲ = significant between-group difference; ○ = non-significant change; – = not reported.

Moreover, the sub-category 'Pain relief' referred to perceived symptom relief and relief achieved through analgesics. Statistically significant increases in the percentage of pain relief obtained from analgesics were observed at four and seven months following treadmill-based aerobic exercise (Kannan et al. 2019). Similarly, a longer duration of dysmenorrhoeal pain relief was reported following TENS compared with the sham group (Bai et al. 2017).

The final sub-category, 'Analgesic use', reflected medication burden through the amount of analgesic consumption. Within movement-based therapies, the number of analgesics used decreased in both the combined KT and control groups (Doğan et al. 2020). Within hands-on therapies, NSAID consumption decreased in the multimodal osteopathic treatment group over consecutive cycles, while medication use increased in the control group (Schwerla et al. 2014). Similarly, analgesic consumption decreased in the rhythmical massage group, whereas increases were observed in the biofeedback and control groups (Vagedes et al. 2019). In addition, both connective tissue massage and classical massage were associated with reduced drug use after the intervention period (Celenay et al. 2023). Regarding adjunctive therapies, lower ibuprofen consumption was reported following TENS compared with sham treatment (Bai et al. 2017). In contrast, another TENS study reported no differences between groups in analgesic use and no relevant changes across baseline, treatment, and wash-out periods (Fagevik Olsén et al. 2020).

An overview of findings related to perceived pain relief and analgesic use across movement-based, hands-on, and adjunctive therapies is presented in Table 21.

Table 21. Overview of Pain Relief and Analgesic Use Outcomes Across MT Approaches.

Study:	MT Approach:	Pain Relief:	Analgesic Use:
<i>Movement-based therapies</i>			
Kannan et al. 2019	Aerobic treadmill	▲ (analgesics)	-
Doğan et al. 2020	PRT+ lifestyle	-	▲
<i>Hands-on therapies</i>			
Schwerla et al. 2014	Multimodal osteopathic	-	▲▲
Vargedes et al. 2019	Rhythmical massage	-	▲
Celenay et al. 2023	Connective tissue massage	-	▲
Celenay et al. 2023	Classical massage	-	▲
<i>Adjunctive therapies</i>			
Bai et al. 2017	TENS	▲▲ (TENS)	▲▲
Fagevik Olsén et al. 2020	TENS	-	○
Doğan et al. 2020	KT + PRT + lifestyle	-	▲

Note. ▲ = significant within-group improvement; ▲▲ = significant between-group difference; ○ = non-significant change; – = not reported.

5.3.3 Academic Role Functioning

The third main category was ‘Academic role functioning’ and was represented by the sub-category ‘Academic performance’. This sub-category was operationalised as a single code reflecting academic performance and encompassed classroom performance, assignment completion, examination performance, extracurricular engagement, and personality-related academic behaviours, reflecting educational role participation rather than broader social functioning (Malik et al. 2025).

Only one study contributed to this category. Significant within-group improvements in academic performance were observed in the combined KT group. Moreover, significant between-group differences were identified at weeks 8 and 12, favouring the combined KT group compared with both the combined ST group and the group receiving general body stretching and hot packs (Malik et al. 2025).

6 Discussion

Across the included studies, MT approaches for PD encompassed movement-based therapies, multimodal and single-intervention hands-on techniques, and adjunctive therapies examined across the RCTs and comparator conditions. Movement-based therapies included aerobic training, core and pelvic stabilisation exercises, general exercise and stretching programmes, and relaxation or mind–body approaches. Hands-on approaches included multimodal osteopathic treatment protocols, massage-based techniques applied to the abdominal, pelvic, or lumbar regions, and joint manipulations. Adjunctive therapies, such as taping interventions, electro-physical therapy, and thermotherapy, were frequently implemented alongside other interventions or evaluated against control conditions. Across studies, considerable variation was observed in both the composition and delivery of interventions, with several RCTs applying multimodal strategies that combined movement-based and manual components within a single therapeutic framework, which limited the ability to isolate the specific contribution of individual therapeutic elements.

Improvements in emotional and psychological outcomes were reported following massage-based interventions (Azima et al. 2015; Celenay et al. 2023) and relaxation-based interventions (Doğan et al. 2020; Koçoğlu et al. 2025). One possible explanation relates to the affective processing of therapeutic touch. Gentle, slow stroking touch, commonly applied in massage-based interventions, activates C-tactile afferent fibres that project to interoceptive brain regions such as the insular cortex (Björnsdotter, Morrison and Olausson 2010). These pathways have been associated with affective and autonomic regulation (Casals-Gutiérrez and Abbey 2020). Such mechanisms may influence both autonomic regulation (Cathcart et al. 2019 cited in Casals-Gutiérrez and Abbey 2020) and pain modulation (Habig et al. 2017 cited in Casals-Gutiérrez and Abbey 2020), reflecting the close interaction between affective and sensory dimensions of pain processing.

Improvements in anxiety, depressive symptoms, and mental health-related outcomes were also reported following KT interventions applied either as

standalone treatments or combined with relaxation, lifestyle modification, or general body stretching (Celenay et al. 2020; Doğan et al. 2020; Malik et al. 2025). In contrast, aerobic exercise showed more variable findings (Arora et al. 2014; Kannan et al. 2019; Temizkan and Budak 2021), although longer-term aerobic training programmes appeared to be associated with improvements in mental HRQOL (Arora et al. 2014; Kannan et al. 2019). Emotional and psychological outcomes were assessed using different PROMs across studies, including FEDS, SF-36 mental health domains, and anxiety or depression scales, which may partly explain variability in reported findings. These findings align with existing evidence suggesting that pain and psychological distress are closely interconnected, with higher levels of depression and anxiety associated with greater menstrual symptom severity and poorer psychosocial QoL (Beal et al. 2014; Sahin, Kasap, Kirli, Yeniceri and Topal 2018).

Across the included studies, improvement was most consistently reported for pain intensity and duration, which were assessed in the majority of trials across movement-based, hands-on, and adjunctive therapies. In contrast, broader dimensions of the pain experience, such as pain interference, qualitative pain descriptors, bodily pain locations, and medication-related outcomes, were examined in fewer studies and often within specific intervention categories. The range of effective movement-based, hands-on, and adjunctive approaches identified in this review is consistent with the understanding that PD involves multiple contributing mechanisms rather than a single underlying cause (Latthe et al. 2006). Notably, improvements in pain intensity and pain quality following aerobic exercise are noteworthy given that sedentary lifestyle has been identified as a potential risk factor for PD (Karout et al. 2021). Importantly, reductions in pain may themselves contribute to improvements in broader aspects of QoL. This is particularly relevant given that dysmenorrhea has been associated with heightened pain sensitivity and alterations in pain processing mechanisms (Bajaj et al. 2002 cited in Stieger et al. 2015), and menstrual symptoms are widely reported to interfere with daily life (Holst et al. 2022) as well as participation in work and study (Mardon et al. 2024).

Sleep outcomes were reported in only a small number of studies, limiting the ability to identify consistent patterns regarding the influence of MT approaches

on sleep-related aspects of QoL. Similarly, outcomes related to body awareness, perceived global improvement, and ANS regulation were reported in relatively few studies, preventing the identification of consistent patterns across MT approaches.

Outcomes related to menstrual burden, including bleeding characteristics, menstrual symptoms, and menstrual attitudes, showed considerable heterogeneity across studies. Improvements in menstrual symptom scores were reported following several movement-based and adjunctive therapies (Chaudhuri et al. 2014; Doğan et al. 2020; Malik et al. 2025); however, many of these interventions were multimodal protocols, which limits attribution of effects to specific MT components. In contrast, menstrual bleeding characteristics were assessed in only a small number of studies and showed inconsistent findings (Arora et al. 2014; Schwerla et al. 2014). Similarly, menstrual attitudes and perceptions were examined in few trials (Dayican et al. 2024; Koçoğlu et al. 2025; Temizkan and Budak 2021), providing limited evidence regarding potential effects of MT approaches on emotional or psychological aspects of menstruation. Taken together, these findings indicate that menstrual-related outcomes were assessed inconsistently and often as secondary outcomes rather than central indicators of QoL.

In addition, only one study (Malik et al. 2025) in the present review examined academic role functioning, indicating that this outcome has received very limited attention within research on MT approaches for PD. This is notable given that menstrual pain and associated symptoms are widely reported to disrupt work and educational participation (Mardon et al. 2024) and daily activities (Holst et al. 2022) among young women.

Overall, the synthesis suggests that MT approaches may support QoL in women with PD by influencing emotional and psychological well-being and physical health, aspects of pain experience, and participation-related outcomes such as daily functioning, role limitations, and academic role functioning. Nevertheless, the included studies most commonly focused on pain-related outcomes, whereas broader health and well-being domains were assessed less consistently. This emphasis reflects a common tendency within PD research to

prioritise symptom characteristics such as pain intensity, duration or quality, while the wider functional and psychosocial consequences of the condition receive comparatively less attention.

Evidence from observational research indicates that PD affects multiple domains of daily life, including physical functioning, education, work participation, and social engagement (Armour et al. 2020; Cameron et al. 2024; Iacovides et al. 2014; Mardon et al. 2024). Psychological well-being is also frequently affected, with increased levels of stress, anxiety, and depressive symptoms reported among women experiencing dysmenorrhea (Cameron et al. 2025; Ju et al. 2014; Rogers et al. 2021). These findings highlight the multidimensional nature of quality of life, encompassing physical, psychological, and social aspects of well-being (Eurostat 2023). Consequently, outcome measures focusing solely on pain characteristics or bodily symptom locations may capture only a limited part of the overall burden associated with PD.

Against this background, several included studies applied multimodal interventions combining movement, taping, thermotherapy, or relaxation components (Doğan et al. 2020; Koçoğlu et al. 2025; Malik et al. 2025). Such approaches may reflect the multifactorial nature of PD and the integrative character of MT practice, which commonly combines manual techniques with exercise and other supportive strategies (Coronado and Bialosky 2017; Keter et al. 2023; Rabey et al. 2017).

Moreover, because RCTs are typically designed to test discrete interventions under controlled conditions (Capili 2023), the broader contextual and patient-centred dimensions of MT care were rarely examined. Consequently, several quality-of-life domains known to be affected by PD were only sparsely assessed in the included studies.

Future research may therefore benefit from incorporating broader patient-centred outcomes that capture daily functioning, role participation, and academic functioning alongside symptom-related measures to better reflect the multidimensional impact of PD on women's daily lives.

6.1 Validity and reliability

To strengthen the validity and reliability of the present ScR, several measures were implemented throughout the research process. The author engaged in extensive self-directed learning on ScR methodology (Levac et al. 2010; Peters et al. 2021b), ensuring that the selected approach was methodologically appropriate for addressing the research questions. Background literature on PD, QoL, and MT was systematically reviewed to inform the conceptual framework of this ScR.

The search strategy was developed and refined in collaboration with an experienced librarian, thereby strengthening database selection and search precision. Search methods and results are reported in accordance with PRISMA-ScR guidelines, supporting transparency and alignment with best practice standards (Fauci et al. 2023; Rodger et al. 2024). Methodological rigour was further supported through participation in workshops on thesis writing, literature review methodology, qualitative research, and academic writing provided by Metropolia University of Applied Sciences during the 2025 academic year.

Inclusion and exclusion criteria were iteratively refined throughout the review process (Levac et al. 2010; Peters et al. 2021a). This reflexive approach supports consistent decision-making, reduces the risk of selection bias, and enhances the transparency and verifiability of screening decisions. In addition, a pilot test of the data charting form was conducted prior to full data extraction, allowing potential ambiguities and inconsistencies to be identified and addressed early. This step supported clarity, consistency, and completeness in data collection, thereby strengthening the accuracy and integrity of the subsequent data synthesis.

In line with JBI guidance, an a priori protocol in the form of a thesis plan was developed to enhance transparency and methodological rigour. Although protocol development is considered best practice, it remains underreported in published ScRs (Tricco et al. 2016). By predefining the research question,

eligibility criteria, and search strategy, the present review strengthened both validity and reliability.

During data analysis, methodological rigour was further supported through predefined inclusion criteria, transparent quality appraisal, abductive content analysis, and cautious interpretation of findings. Reflexivity was applied to maintain awareness of pre-understandings and to minimise the influence of prior assumptions on interpretation (Erlingsson and Brysiewicz 2017). Through continuous reflection and iterative engagement with the data, the credibility and trustworthiness of the analysis were further supported. Abductive content analysis facilitated a systematic and reflexive analytic process by iteratively engaging empirical findings with existing theory, supporting transparent interpretation and theory-informed sense-making (Timmermans and Tavory 2012; Vila-Henninger et al. 2024).

At the level of the included studies, several validity and reliability concerns were identified, particularly among studies at the lower end of the moderate-quality range.

At the study level (Q1-3), several validity and reliability concerns were identified, particularly among studies at the lower end of the moderate-quality range. Baseline imbalances and unclear allocation procedures limited interpretability (Chaudhuri et al. 2014; Azima et al. 2015). Lack of blinding increased the risk of performance bias, while incomplete or unbalanced follow-up and exclusion of dropouts without intention-to-treat analysis reduced confidence in the findings. Additional concerns included inadequate handling of cluster randomisation in Chaudhuri et al. (2014) and insufficient sample size relative to planned power in Azima et al. (2015).

Across the remaining studies rated as moderate quality, similar but less pronounced methodological limitations were identified. At the study level, randomisation was frequently reported, but allocation concealment was often unclear despite generally comparable baseline characteristics. At the intervention level, lack of blinding of participants and treatment providers and

non-identical interventions between groups were common, increasing the risk of performance bias.

Interpretation of quality-of-life outcomes is further complicated by trial design characteristics in several included studies. Three studies (Dayican et al. 2024; Doğan et al. 2020; Malik et al. 2025) implemented multiple interventions concurrently rather than isolating a single therapeutic approach, introducing potential co-intervention bias (Keirse and Hanssens 2000) and limiting the ability to attribute observed QoL changes to specific MT components.

At the outcome and results levels, validated self-report measures were typically used and collected consistently; however, reliance on subjective outcomes, incomplete follow-up, frequent exclusion of dropouts without intention-to-treat analysis, limited reporting of effect sizes, and inconsistent handling of statistical assumptions reduced confidence in the robustness and interpretability of the findings. Overall, variation in methodological rigour across studies indicates that the evidence base should be interpreted with caution when considering validity and reliability. In addition, substantial heterogeneity in intervention protocols, treatment duration, and outcome measures across studies limited comparability between trials and may reduce the consistency of the evidence base.

6.2 Limitations

Across the included studies, reliance on self-reported measures for pain and quality-of-life outcomes was common. Variability in symptom constructs, shared variance across questionnaire domains, and challenges in accurately capturing the full menstrual symptom experience may limit the interpretability of self-reported outcomes (Negriff et al. 2009). In addition, self-reported data are inherently susceptible to information and reporting biases, which may further influence the accuracy of outcome assessment (Delgado-Rodríguez and Llorca 2004).

Another consideration relates to the reporting of analgesic use within several studies (Bai et al. 2017; Celenay et al. 2023; Doğan et al. 2020; Vagedes et al. 2019; Schwerla et al. 2014). Reduction in analgesic consumption should be

interpreted cautiously, as NSAIDs remain a standard treatment for PD (Bofill Rodriguez et al. 2019). Concomitant medication may therefore represent a potential confounding factor (Delgado-Rodríguez and Llorca 2004), as it may independently influence pain outcomes and obscure the specific effects of the MT intervention.

Furthermore, within the defined search parameters, all included studies were RCTs, indicating that the current evidence base on MT and QoL in PD consists exclusively of quantitative experimental designs. While this represents a strength in terms of higher-level evidence for evaluating intervention effects, it also limits the inclusion of broader perspectives, such as qualitative experiences and real-world implementation contexts, which qualitative research has been shown to capture within MT practice (Figg-Latham and Rajendran 2017). Consequently, the available evidence primarily reflects controlled experimental conditions rather than routine clinical practice. Despite the use of a structured PCC framework and comprehensive search strategy, no non-RCT or qualitative studies were identified. This may reflect both on the dominance of experimental designs within this research field but also variability in reporting practices, including inconsistent use of keywords and indexing terms, which may hinder retrieval of relevant studies. The absence of qualitative or mixed-methods studies restricts understanding of women's lived experiences of MT, perceived facilitators or barriers to QoL improvements, and how these interventions are integrated into routine clinical practice, thereby highlighting an important gap in the literature.

In contrast, several limitations were also identified at the review level. The study selection and data extraction processes were conducted by a single reviewer, which may have increased the risk of selection bias and subjective decision-making during screening and inclusion of studies. Best practice guidelines for evidence synthesis recommend independent double-screening and reconciliation to enhance reliability and minimise bias (Polanin et al. 2019), which was not feasible within the scope of this thesis.

Moreover, the data assessment was iterative and required repeated reassessment of several studies to ensure consistency in judgement,

particularly when distinguishing between 'yes' and 'unclear' responses across appraisal items. As a novice reviewer, the author found the detailed response structure of the revised appraisal tool challenging, which may have introduced subjectivity despite efforts to minimise bias. This highlights limited reviewer experience as a potential methodological limitation of the thesis.

7 Ethical considerations

This ScR s based exclusively on secondary data derived from previously published studies. As no research involving human participants was conducted and no identifiable personal data were processed, ethical approval or a research permit was not required (Arene 2019). All included studies are cited accurately to ensure academic integrity and respect for intellectual property (Arene 2019).

The thesis has been prepared in accordance with Metropolia's academic guidelines, and originality has been verified using Turnitin. In line with principles of transparency and open access (Theseus 2025), the final thesis will be published in Theseus.

Artificial intelligence (OpenAI 2025–2026) was used as a language-support tool to refine phrasing and structure. All data interpretation, critical analysis, and conclusions represent the independent work of the author.

8 Conclusion

Movement-based, hands-on, and adjunctive therapies were examined across the included studies, reflecting considerable variation in intervention type and delivery. Several trials applied multimodal strategies that combined movement-based and manual components within a single therapeutic framework, which limited the ability to isolate the effects of individual MT approaches. Across the reviewed literature, pain-related outcomes, particularly pain intensity and duration, were the most frequently assessed indicators of QoL in women with PD, whereas broader quality-of-life domains were evaluated less consistently.

Overall, the included studies suggest that MT approaches may contribute to improvements in pain-related outcomes and selected QoL domains. However, the evidence base remains heterogeneous. Methodological limitations across studies, including risks of bias and inconsistent statistical approaches, limit the robustness of reported findings and require cautious interpretation.

Future research should therefore employ more rigorous study designs, clearer intervention descriptions, and consistent outcome reporting to strengthen the evidence base. In particular, studies should evaluate MT approaches using well-defined intervention protocols and comparable outcome measures to improve interpretability across studies. In addition, qualitative and mixed-methods research may help to deepen understanding of how MT approaches influence broader quality-of-life outcomes in women with PD, including aspects of daily functioning, academic and social participation, and women's experiences of treatment and care, which remain underexplored in the current literature.

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Appendices

Search terms and synonyms used for each PCC concept

PCC Element:	Controlled Vocabulary [MeSH] & [CINAHL Headings]:	Free-text Terms & synonyms:
<i>Women with PD (Population)</i>	"dysmenorrhea"	"primary dysmenorrhea" "painful menstruation" "menstrual pain" "menstrual cramps"
<i>Aspects related to QoL (Concept)</i>	"quality of life"	"quality of life" "health-related quality of life" "HRQOL" "life quality"
<i>Manual therapy approaches (Context)</i>	"manual therapy" "musculoskeletal manipulations" "manipulation, osteopathic" "osteopathic medicine" "physical therapy modalities" "physical therapy"	"manual therapy" "manipulation therapy" "spinal manipulation" "soft tissue therapy" "hands-on treatment" "osteopathy" "osteopathic manipulation" "osteopathic treatment" "osteopathic medicine" "hands-on therapies" "physical therapy" "physiotherapy" "physical therapy techniques" "massage" "lymphatic drainage massage"

Variations of search strings pilot tested for data selection

Search String ID:	Search String:	Rationale:
A	("dysmenorrhea" OR "primary dysmenorrhea" OR "painful menstruation" OR "menstrual pain" OR "menstrual cramps") AND ("quality of life" OR "health-related quality of life" OR "HRQOL" OR "life quality") AND ("musculoskeletal manipulations" OR "manual therapy" OR "manipulation therapy" OR "spinal manipulation" OR "soft tissue therapy" OR "hands-on treatment" OR "osteopathic manipulation" OR "osteopathic treatment" OR "osteopathic medicine" OR "osteopathy" OR "physical therapy modalities" OR "physical therapy" OR "physiotherapy" OR "physical therapy techniques" OR "massage" OR "lymphatic drainage")	Full search string without the terms [MeSH] and [tiab]
B	("dysmenorrhea" OR "primary dysmenorrhea" OR "painful menstruation") AND ("quality of life") AND ("manual therapy" OR "soft tissue therapy" OR "osteopathic manipulation" OR "physical therapy")	Variation of A with only 8 Boolean connectors
C	("menstrual pain" OR "dysmenorrhea") AND ("health-related quality of life" OR "life quality") AND ("musculoskeletal manipulations" OR "spinal manipulation" OR "massage" OR "physical therapy techniques")	Different variation of A with only 8 Boolean connectors
D	(dysmenorrhea OR menstrual*) AND ("quality of life" OR "HRQOL") AND ("manual therapy" OR osteopath* OR physio* OR massage)	8 Boolean connectors with truncation
E	(dysmenorrhea) AND ("quality of life") AND (osteopathic OR physiotherapy OR "spinal manipulation" OR massage NOT yoga NOT acupuncture)	8 Boolean connectors and NOT
F	(Primäre Dysmenorrhö) und (Lebensqualität) und (Manuelle Therapie oder Physiotherapie oder Osteopathie oder Massage oder Lymphdrainage)	German language; only grey literature
G	(primär dysmenorré eller menstruation) och (livskvalitet) och (manuell terapi eller fysioterapi eller osteopati eller massage eller lymfmassage)	Swedish language; only grey literature
H	Abstract & Title: Dysmenorrhea, Therapy: stretching, mobilisation, manipulation, massage	Only used for PEDro database
I	Abstract & Title: Dysmenorrhea, Therapy: electrotherapies, heat, cold	Only used for PEDro database

Data charting form containing characteristics of included studies

Study characteristics	Population characteristics	Intervention characteristics	Measurement tools	Aim	Key findings
'Effect of 12-Weeks of Aerobic Exercise on Primary Dysmenorrhea' Arora et al. 2014 India RCT	60 females Age 19-24 yrs Diagnosed with PD	Physiotherapy Study period: 12 weeks <i>Intervention:</i> Treadmill aerobic exercise <i>Control:</i> Not specified	VAS (Pain intensity) SF-36 (QoL) MDS (Dysmenorrhea severity, impact on daily activity) SN-Max (Maximum number of Sanitary napkins used per day on the day of maximum bleeding)	To study the effect of 12-weeks of aerobic exercises on PD.	VAS: Significant decrease in pain intensity in Intervention group. SF-36: Significant improvements in all eight domains, and total SF-36 scores in Intervention group vs Control. MDS: Significant reduction in multidimensional dysmenorrhea scores in Intervention group vs Control. SN-Max: Significant reduction in number of sanitary napkins used on the day of max. bleeding in Intervention group vs Control.
'A randomised controlled trial of exercise and hot water bottle in the management of dysmenorrhoea in school girls of Chandigarh, India' Chaudhuri et al. 2014 India RCT	128 females Age 12-16 yrs Diagnosed with PD	Physiotherapy Study period: 3 months <i>Intervention:</i> Exercise programme <i>Control:</i> Hot water bottle over lower abdomen	VAS (Pain) MDQ (Menstrual distress)	To compare the effects of exercise and hot water bottle on the occurrence and severity of PD.	VAS: Both groups improved from moderate/severe to mild grade of dysmenorrhea, with greater improvement by month 3; both groups showed a decrease in pain (mean VAS); hot water bottle was more effective in reducing pain. MDQ: Menstrual distress improved similarly in both groups; both interventions were equally effective in reducing menstrual symptoms.
'Osteopathic treatment in patients with primary dysmenorrhoea'	60 females Mean age (yr): 31.8 (Intervention), 34.9 (Control)	Osteopathy Study period: 3 months <i>Intervention:</i> Six osteopathic	NRS (Pain) API (Average pain intensity during menstruation)	To investigate the effectiveness of a series of osteopathic	NRS/API/DDP: Pain intensity, duration, and days with severe pain

<p>: A randomised controlled trial' Schwerla et al. 2014 Germany RCT</p>	<p>Diagnosed with PD</p>	<p>treatment sessions <i>Control:</i> No intervention</p>	<p>DDP (Days of dysmenorrhoea I pain exceeding 50% of NRS max.) SF-36 (QoL) Likert scale (Duration and average intensity of bleeding) Diary for NSAID use</p>	<p>treatments in patients with pain due to PD.</p>	<p>decreased only in the Intervention group; significantly greater effect than Control. SF-36: Physical component improved only in the Intervention group and was significantly better than Control; mental component showed no significant between-group difference. <i>Associated pain & Bleeding:</i> Associated pain duration improved in both groups, with greater improvement in the Intervention group; bleeding duration and intensity showed no change in either group. <i>NSAID use:</i> Marked reduction in the Intervention group; increased use in Control.</p>
<p>'Comparison of the Effect of Massage Therapy and Isometric Exercises on Primary Dysmenorrhea: A Randomized Controlled Clinical Trial' Azima et al. 2015 Iran RCT</p>	<p>120 females Mean age (yr): 21.41 (Intervention I), 20.73 (Intervention II) 21.08 (Control) Diagnosed with PD</p>	<p>Physiotherapy Study period: 2 months <i>Intervention 1:</i> Clockwise effleurage massage with lavender oil <i>Intervention 2:</i> Isometric aerobic exercise <i>Control:</i> No intervention</p>	<p>VAS (Pain intensity and duration) STAI (Anxiety)</p>	<p>To compare the effects of aromatic massage and isometric exercises on pain intensity, pain duration, and anxiety level in students with PD.</p>	<p>VAS: Pain intensity and duration decreased in both Intervention groups with greater reduction in the Intervention 1 group. Anxiety: Anxiety decreased within the Intervention 1 group only; no significant change in the Intervention 2 group or between groups.</p>
<p>'Effect of transcutaneous electrical nerve stimulation therapy for the treatment of primary dysmenorrhea' Bai et al. 2017</p>	<p>134 females Age 18-30 yrs Diagnosed with PD</p>	<p>Complementary & Integrative medicine Study period: 3 months Intervention: TENS at lower abdomen (2-100Hz) Control: Sham TENS (power switched off)</p>	<p>NRS (Lower abdominal pain) Duration of relief from dysmenorrhoea I pain Use of Ibuprofen Adverse events</p>	<p>To explore the effect and safety of TENS for relieving pain in Chinese young women with PD.</p>	<p>NRS: Intervention group showed reduced dysmenorrhoeal pain intensity & lowered ibuprofen use vs. Control. Duration of relief</p>

China RCT			WHOQOL-BREF (QoL)		from dysmenorrhoeal pain: Greater dysmenorrhoeal pain relief in Intervention group vs. Control. AEs: No AEs (ex. intermenstrual bleeding, breast tenderness) in both groups. WHOQOL-BREF: No between-group difference in QoL.
'Effectiveness of a treadmill-based aerobic exercise intervention on pain, daily functioning, and quality of life in women with primary dysmenorrhea: A randomized controlled trial' Kannan et al. 2019 New Zealand RCT	70 females Age 18-43 yrs Diagnosed with PD	Physiotherapy Study period: 7 months Intervention: 4 weeks supervised treadmill aerobic exercise and 6 months unsupervised home programme Control: Usual care	SF-MPQ (Pain quality, intensity, present pain) SF-12 (QoL) SF-BRI (Pain severity, interference, % pain relief) WHIIRS (Sleep quality) PGIC (Perception of global improvement)	To evaluate the effectiveness of a treadmill-based aerobic exercise intervention on pain, QoL, daily functioning and sleep in women with PD.	SF-MPQ: Intervention group improved pain quality, intensity, and interference but not present pain vs. Control. SF-12. BRI, WHIIRS & PGIC: No significant difference between groups, except pain relief with analgesics at 4 and 7 months. Effects improved during follow-up (7-months) and were maintained for pain intensity, present pain, QoL and daily function.
'Efficacy of rhythmical massage in comparison to heart rate variability biofeedback in patients with dysmenorrhea —A randomized, controlled trial' Vargedes et al. 2019 Germany RCT	60 females Age 16-46 yrs Diagnosed with PD	Complementary & Integrative medicine Study period: 3 months <i>Intervention 1:</i> Rhythmical massage <i>Intervention 2:</i> Heart rate variability (HRV) biofeedback <i>Control:</i> Usual care	NRS (Pain intensity) SF-12 (QoL) ECG (24-h-HRV-measurement) Menstrual pain diary (pain intensity during menstruation & use of analgesics during menstruation)	To examine the efficacy of rhythmical massage and heart rate variability biofeedback compared to usual care on pain intensity in women with PD.	NRS: Intervention 1 showed greater improvement than Control, but no difference vs. Intervention 2 or between Intervention 2 and Control. SF-12: No between-group differences; within-group improvements in both Intervention groups (1 & 2). Use of analgesics: Lower usage in Intervention group 1; higher usage in Intervention

Appendix 3

					group 2 & Control.
'Effects of kinesiotape application on pain, anxiety, and menstrual complaints in women with primary dysmenorrhea: A randomized sham-controlled trial' Celenay et al. 2020 Turkey RCT	51 females Age 18-35 yrs Diagnosed with PD	Physiotherapy Study period: 3 weeks <i>Intervention 1</i> : KT with ligament technique (stretch); <i>Intervention 2</i> : ST no technique/tension; <i>Control</i> : No taping	VAS (Pain intensity) Menstrual complaints STAI (Anxiety)	To investigate the effects of kinesiotaping application on pain, anxiety, and menstrual complaints in women with PD and compare this application with controls and ST.	VAS: Greater reduction in pain intensity in Intervention group 1 vs other two groups. Menstrual complaints present: Low back pain, abdominal swelling, fatigue, nausea, and insomnia decreased in Intervention group 1; no changes in Intervention group 2 and Control; Increased breast tenderness in Control. STAI: Decreased nervousness before and during menstrual period and rate of feeling depressed in Intervention group 1 vs the other two groups.
'The effect of kinesiotaping and lifestyle changes on pain, body awareness and quality of life in primary dysmenorrhea' Doğan et al. 2020 Turkey RCT	60 females Mean age (yr): 21.63 (Intervention), 22 (Control) Diagnosed with PD	Physiotherapy Study period: 3 weeks <i>Intervention 1</i> : KT with ligament technique (stretch), lifestyle changes and physiological relaxation training (PRT) training <i>Control</i> : Lifestyle changes and PRT	VAS (Pain intensity) through diary SF-36 (QoL) Body Awareness questionnaire (Body awareness) MSS (Menstrual pain and associated symptom) Use of analgesics	To investigate the effects of kinesiotaping and lifestyle changes on pain, body awareness, and QoL in individuals with PD.	VAS: Pain intensity decreased in both groups with greater decrease in Intervention group. Body Awareness & SF-36: Body awareness and QoL increased in both groups with greater increase in Intervention group. MSS: Scores decreased in both groups. Use of analgesics: Amount of drug usage decreased in both groups equally
'Effectiveness of functional exercises on pain and sleep quality'	28 females Mean age (yr): 22.9 (Intervention) 23.1 (Control)	Physiotherapy Study period: 8 weeks Intervention: Exercise programme	VAS (Pain intensity) PSQI (Sleep) MSQ (Menstrual pain)	To investigate the effects of a combined exercise training on	VAS: Significant within-group pain reduction in the intervention group; only

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<p><i>in patients with primary dysmenorrhea: a randomized clinical trial'</i> Kirmizigil & Demiralp 2020 Turkey RCT</p>	<p>Diagnosed with PD</p>	<p><i>Control:</i> No exercise, no lifestyle changes</p>	<p>and associates symptoms)</p>	<p>pain, sleep and menstrual symptoms in patients with PD.</p>	<p>abdominal pain showed a significant between-group difference at follow-up. PSQI: The intervention group showed significant improvement in daytime dysfunction and total score over time. IPAQ: No statistical difference between groups. MSQ: Significant improvement in all MSQ parameters in the intervention group; MSQ total and negative outcomes differed between groups at follow-up. No significant changes in Control for VAS and PSQI.</p>
<p><i>'Effects of high-intensity high-frequency transcutaneous electric nerve stimulation in primary dysmenorrhea—a randomised cross-over pilot study'</i> Fagevik Olsén et al. 2020 Sweden RCT</p>	<p>22 females Median age (yr): 27 (Intervention) 25 (Delayed treatment group) Diagnosed with PD</p>	<p>Physiotherapy Study period: One to four menstrual cycles, depending on group allocation <i>Intervention:</i> Immediate TENS at lower abdomen (80Hz) and home-based, self-administered TENS used as needed <i>Delayed Intervention:</i> TENS after control and wash-out period and home-based, self-administered TENS used as needed</p>	<p>VAS (Pain, limitations in physical function, other symptoms) Use of analgesics</p>	<p>To evaluate the effect of high-intensity, high-frequency TENS in women with moderate to severe PD.</p>	<p>VAS: No between-group differences in pain intensity, physical function limitations and other symptoms; physical function improved during wash-out period within the total sample. Analgesic use: No differences.</p>
<p><i>'The effect of sacroiliac joint manual therapy on heart rate variability in women with primary dysmenorrhea'</i> Park et al. 2020 Korea RCT</p>	<p>33 females Age 18-50 yrs Diagnosed with PD</p>	<p>Physiotherapy Study period: day of menstruation \pm2 days <i>Intervention:</i> HVLA sacroiliac manipulation both sides <i>Control:</i> Sham treatment (without tension/manipulation)</p>	<p>VAS (Pain intensity) HRV (Balance of ANS)</p>	<p>To evaluate the effects of sacroiliac manipulation on autonomic function, assessed by heart rate variability, in individuals with PD.</p>	<p>VAS: Pain intensity decreased in both groups, with a larger reduction in the Intervention group; no significant between-group difference. HRV: Reduced autonomic balance of HRV in both groups with greater decrease in Intervention</p>

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					group; In Control low frequency decreased and autonomic balance increased; between groups, only autonomic balance differed significantly.
'The Effects of Kinesiological Taping and Aerobic Exercise in Women with Primary Dysmenorrhea: A Randomized Single-Blind Controlled Trial' Temizkan & Budak, 2021 Turkey RCT	45 females Age 19-28 yrs Diagnosed with PD	Physiotherapy Study period: 3 weeks <i>Intervention 1:</i> KT with ligament technique (stretch) <i>Intervention 2:</i> Aerobic exercise (AE) programme <i>Control:</i> No application	MPQ (Pain quality) VAS (Pain intensity) Beck Depression Scale (Symptoms of depression) MAS (Menstrual attitude) SF-36 (QoL)	To investigate the effects of kinesiotaping and AE on pain, attitude, depression, and QoL in women with PD.	MAS & SF-36: Significant differences within Intervention group 1. MPQ & MAS: Significant overall effect (group/time), no difference between both Intervention groups (post-hoc). Control: No significant within-group changes. Beck Depression Scale: decrease in KT group (non-significant); increase in control group.
'Comparison of Connective Tissue Massage and Classic Massage in Women With Primary Dysmenorrhea: A Randomized Clinical Trial' Celenay et al. 2023 Turkey RCT	42 females Mean age: 21 yrs Diagnosed with PD	Physiotherapy Study period: est. 14 days (ovulation to start of next menstruation) <i>Intervention 1:</i> Connective tissue massage incl. stretching <i>Intervention 2:</i> Classical massage incl. rhythmic applications	VAS (Pain Intensity) FEDS (Functional and emotional status) Pain duration Drug use	To compare the short-term effects of connective tissue massage and classic massage on pain, functional and emotional status, and menstrual complaints in women with PD.	VAS, FEDS, pain duration & drug use: Both groups showed reduced pain intensity & duration, drug use and FEDS scores with greater reductions in pain duration and functional status in Intervention group 1 (less low back pain, constipation, and sleeplessness, while nervousness decreased in Intervention group 2; between-group difference was observed only for sleeplessness.
'Comparative Effects of Exercises Combined With Kinesio Taping and	36 females Age 18-30 yrs Diagnosed with PD	Physiotherapy Study period: 8 weeks <i>Intervention:</i> KT with ligament technique (stretch) for est. 14	VAS (Pain intensity) MSQ (Menstrual pain and associated symptoms)	To evaluate and compare the effects of exercises combined with either kinesio-	VAS & MSQ: Significant decrease in pain intensity and MSQ-coping scores in both

<p>Electrotherapy in Women with Primary Dysmenorrhea: A Randomized Controlled Clinical Trial' Dayican et al. 2024 Turkey RCT</p>		<p>days (ovulation to start of next menstruation), exercise program incl. relaxation <i>Control:</i> Electrotherapy & exercise program as Intervention group for 8 weeks</p>		<p>taping or electrotherapy on reducing menstrual pain and associated symptoms in women suffering from PD.</p>	<p>groups. MSQ negative effects & total MSQ: significant improvement in Control: additional improvement in MSQ negative effects and total MSQ scores; no significant between-group difference regarding substantial changes.</p>
<p>'Potential effects of combining osteopathic manual therapy and menstrual awareness on pain and associated symptoms in women with primary dysmenorrhea: A randomized clinical trial' Conesa-Albaladejo et al. 2025 Spain RCT</p>	<p>39 females Mean age: 30.4 yrs Diagnosed with PD</p>	<p>Osteopathy Study period: 9 weeks <i>Intervention:</i> Two body awareness sessions, three OMT sessions <i>Control:</i> Only two body awareness sessions</p>	<p>VAS (Pain intensity) McGill (Pain perception) SF-36 (QoL) QSCPGSe (Body Satisfaction and Global Self-Perception) PGIC(Global perception of change)</p>	<p>To evaluate the effect of an OMT protocol and body awareness, compared with only body awareness, on intensity and perception of pain, QoL, perception of change, and body satisfaction in women with PD.</p>	<p>VAS, McGill, Sf-36 & QSCPGSe: Significant group x time improvement in pain intensity, pain perception, QoL, and body satisfaction over time; greater changes in the Intervention group vs Control. PGIC: Greater change in the Intervention group.</p>
<p>'Comparison of motor imagery focused pelvic floor exercises and relaxation exercises for treating dysmenorrhea: A randomized controlled study' Koçoğlu et al. 2025 Turkey RCT</p>	<p>60 females Age 18-30 yrs Diagnosed with PD</p>	<p>Physiotherapy Study period: 8 weeks <i>Intervention 1:</i> MOPEXE (motor imagery-focused pelvic floor exercises) <i>Intervention 2:</i> Progressive muscle relaxation <i>Intervention 3:</i> Combination MOPEXE & RE</p>	<p>VAS (Pain) SF-MPQ (Pain perception) MAS (Menstrual attitude) FEDS (Functional and emotional status)</p>	<p>To evaluate the effect of co-treatment with MOPEXE and RE on pain and menstrual symptoms in dysmenorrhea .</p>	<p>VAS: Largest decrease in pain in Intervention group 2 followed by Intervention group 3, then Intervention group 1. SF-MPQ: Significant reduction within all groups. MAS: Significant reduction within Intervention group 2 & 3; Intervention group 1 showed some reductions, but "denial" subscale was not significant. FEDS: Significant reduction within Intervention group 2 & 3; Intervention group 1 showed no significant change.</p>

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<p>'Effects of Therapeutic Taping on Clinical Symptoms of Students with Primary Dysmenorrhea' Malik et al. 2025 Pakistan RCT</p>	<p>67 females Age 18-25 yrs Diagnosed with PD</p>	<p>Physiotherapy Study period: 12 weeks <i>Intervention 1:</i> KT with ligament technique (stretch), physical therapy & hot pack <i>Intervention 2:</i> ST (no technique/tension), similar physical therapy as in Intervention 1 & hot pack <i>Control:</i> General physical therapy & hot pack</p>	<p>VAS (Pain) MSQ (Menstrual symptoms) APQ (Academic Performance) SF-36 (QoL)</p>	<p>To examine the effects of therapeutic taping versus sham and control on pain, menstrual symptoms, QoL, and academic performance in students with PD.</p>	<p>VAS & MSQ: Significant within-group improvement over time; greatest in Intervention group 1. VAS: Significant between-group differences; Intervention group 1 improvement at all time points, Intervention group 2 only improved baseline-week 8, Control only week 8 to 12. MSQ: Greater symptom improvement in Intervention group 1. APQ: Significant within-group improvement in Intervention group 1; between-group differences at weeks 8 and 12 favouring Intervention group 1. SF-36: Improvement in all groups; greatest improvement in Intervention group 1, followed by Intervention group 2, then Control.</p>
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