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NARRATIVE REVIEW

The Role of Physical Activity in Managing Endometriosis: A Comprehensive Review

a comprehensive review

HIGHLIGHTS

- Endometriosis affects approximately 6–10% of reproductive-age women worldwide, causing chronic pelvic pain, infertility, and reduced quality of life, with an average diagnostic delay of 7–10 years.
- The disease is driven by estrogen-dependent inflammation, immune dysfunction, and ectopic endometrial tissue growth; conventional hormonal and surgical treatments offer only partial or temporary relief.

- Regular physical activity reduces systemic inflammation by lowering pro-inflammatory cytokines (IL-6, TNF-α), modulates estrogen metabolism by decreasing adipose tissue, and stimulates endorphin release to improve pain tolerance.
- Low-impact exercises — yoga, Pilates, swimming, and walking — are particularly beneficial for pelvic mobility, muscle relaxation, and mental well-being; high-impact or heavy-resistance exercise may worsen symptoms in some women.
- Individualized, gradually progressing exercise programs combined with anti-inflammatory dietary strategies and stress management represent a promising non-pharmacological approach to endometriosis management.

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ABSTRACT

Endometriosis is a chronic gynecological disorder affecting millions of women worldwide, leading to chronic pain, infertility, and reduced quality of life. Conventional treatment methods, including hormonal therapy and surgical interventions, often do not provide sufficient relief or have long-term side effects, increasing the need for complementary therapies [1]. Physical activity is emerging as a non-pharmacological strategy that may help alleviate endometriosis symptoms through its impact on inflammatory processes, hormone regulation, and pain modulation [2]. Various studies have investigated the relationship between exercise and endometriosis, suggesting potential benefits such as reduced pain intensity, improved circulation, and better overall well-being. However, discrepancies in study designs, exercise protocols, and patient adherence make it difficult to establish standardized guidelines for physical activity as a therapeutic approach [3,4]. This review synthesizes the current research findings on the relationship between physical activity and endometriosis, explaining the biological mechanisms involved and highlighting the need for further well-controlled studies to develop practical recommendations.

KEYWORDS endometriosis; physical activity; exercise; inflammation; pain management; quality of life

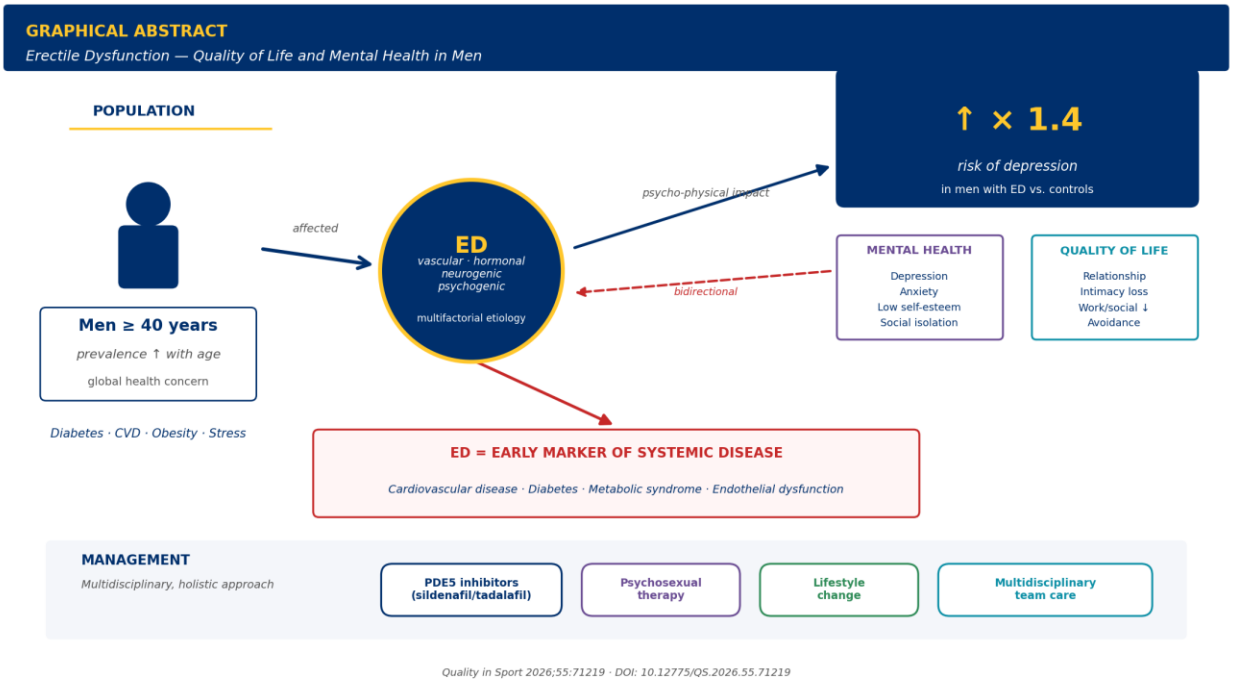

Figure 1. *Graphical overview of erectile dysfunction — from multifactorial etiology (vascular, hormonal, neurological, psychogenic) through clinical consequences (depression, anxiety, reduced self-esteem, impaired quality of life, CVD and metabolic comorbidity) to integrated multidisciplinary management combining PDE5 inhibitors, psychosexual therapy and lifestyle modification.*

PLAIN LANGUAGE SUMMARY

Erectile dysfunction (ED) is the persistent inability to achieve or maintain an erection good enough for satisfying sex. It is very common — around 20–40% of men have it to some degree, and more than half of men aged 40–70. ED has many causes: problems with blood vessels (the same processes that lead to heart attacks), low testosterone, nerve disorders such as diabetes-related neuropathy, and psychological factors such as stress, anxiety and depression. Because of this, the appearance of ED is often an early warning sign of cardiovascular disease, type 2 diabetes or metabolic syndrome — sometimes years before any chest pain or heart attack. ED also takes a serious toll on mental health and quality of life. Men with ED are more likely to experience depression, anxiety, shame, low self-esteem and a sense of ‘failed’ masculinity; they may avoid intimacy and withdraw from their partner and from social life. The good news is that ED is highly treatable. Tablets such as sildenafil and tadalafil work for most men and often improve mood and confidence at the same time. Psychosexual therapy and couples counselling help with performance anxiety, communication and intimacy. Lifestyle changes — regular exercise, weight loss, stopping smoking, better control of diabetes and blood pressure — improve both erections and general health. The most effective approach combines all three: a family doctor or urologist who screens for heart and metabolic risk, a mental health professional who supports the patient and his partner, and the man himself making sustainable lifestyle changes.

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Endometriosis is a complex gynecological disorder characterized by the presence of endometrial-like tissue outside the uterus, which triggers a chronic inflammatory response. This condition predominantly affects the pelvic region, including the ovaries, fallopian tubes, and peritoneal surfaces, leading to a wide range of debilitating symptoms such as chronic pelvic pain, painful menstruation, pain during intercourse, bowel irregularities, and, in many cases, infertility [5,6]. It is estimated that approximately 6-10% of reproductive-age women worldwide suffer from endometriosis, contributing to a substantial burden on healthcare systems and affecting women's productivity, quality of life, and emotional well-being. The disease is often underdiagnosed or misdiagnosed due to symptom overlap with other conditions such as irritable bowel syndrome and pelvic inflammatory disease, leading to an average diagnostic delay of 7 to 10 years [7]. This delay exacerbates the condition, increasing lesion progression and the severity of symptoms.

Despite numerous studies, the exact cause of endometriosis remains unclear. Multiple factors are thought to contribute to its development, including hormonal imbalances, immune system dysfunction, genetic predisposition, and environmental influences. One prevailing theory is that retrograde menstruation, in which menstrual blood flows backward into the pelvic cavity, allows endometrial cells to implant and grow outside the uterus. However, this theory alone does not fully explain why some women develop endometriosis while others do not, nor does it account for cases found in women who have had a hysterectomy or even in men undergoing estrogen therapy. Alternative hypotheses involve metaplasia, in which peritoneal cells transform into endometrial-like tissue, and lymphatic or vascular dissemination, where endometrial cells travel to distant sites through the bloodstream or lymphatic system [8,9].

Endometriosis is a disease that significantly affects a woman's overall well-being beyond the reproductive system. It has been associated with higher levels of anxiety and depression, likely due to chronic pain and the impact on daily functioning. Additionally, the economic burden of endometriosis is substantial, as women with the condition frequently require medical consultations, imaging studies, surgical interventions, and long-term treatments. Moreover, limitations in daily activities due to chronic pain often reduce work productivity and overall participation in social life, creating further psychological distress [10,11].

2. THE ENDOMETRIOSIS

Endometriosis is a chronic inflammatory disorder affecting millions of women worldwide, with symptoms ranging from mild discomfort to severe pain, infertility, and systemic health complications. The condition is characterized by the presence of endometrial-like tissue growing outside the uterus, which responds to hormonal fluctuations in the same way as the uterine lining. However, unlike normal endometrial tissue, these ectopic growths have no means of exiting the body, leading to inflammation, fibrosis, and adhesions that can severely impact reproductive and overall health [1,10,12].

Endometriosis is classified into four stages: minimal (stage I), mild (stage II), moderate (stage III), and severe (stage IV) based on lesion severity, location, and the extent of adhesions [13]. However, classification does not always correlate with symptom severity. Some women with extensive lesions experience minimal pain, while

others with few lesions suffer from debilitating symptoms. The variability in symptom presentation makes diagnosis challenging, and many women experience delays of several years before receiving a definitive diagnosis. The disease can remain asymptomatic for years, only being discovered when a woman seeks treatment for infertility or undergoes surgery for an unrelated condition [14].

Endometriotic lesions can develop on various pelvic organs, including the ovaries, fallopian tubes, peritoneum, bladder, and intestines. The location of these lesions influences symptom presentation. One of the most severe forms of the disease is deep infiltrating endometriosis (DIE), where lesions penetrate deeply into surrounding tissues, causing chronic pelvic pain, painful urination, bowel dysfunction, and in some cases, nerve pain radiating to the lower back and legs. Another common form is ovarian endometriomas, or chocolate cysts, which are filled with old blood that accumulates due to cyclical bleeding within the cysts. These cysts can grow significantly, affecting ovarian function and increasing the risk of complications such as ovarian torsion or rupture [8].

Beyond reproductive health, endometriosis is increasingly recognized as a systemic disease that affects multiple organ systems. Women with endometriosis have a higher prevalence of autoimmune disorders such as lupus, rheumatoid arthritis, and inflammatory bowel disease, suggesting an underlying immune dysfunction that contributes to disease progression. Furthermore, endometriosis has been linked to an increased risk of cardiovascular disease, likely due to the chronic inflammatory state and oxidative stress that can damage blood vessels over time. The hormonal imbalances associated with endometriosis, particularly elevated estrogen levels, exacerbate these risks by promoting inflammation and metabolic disturbances that contribute to insulin resistance and increased cardiovascular risks [15,16].

The psychological burden of endometriosis is also substantial. Women with the condition often experience higher levels of anxiety and depression due to chronic pain, infertility concerns, and the impact on daily functioning. Many women with endometriosis report difficulties maintaining relationships, engaging in physical activities, and performing well in professional settings due to recurrent flare-ups of pain and fatigue. This has profound economic implications, as endometriosis-related productivity loss accounts for substantial healthcare costs and work absenteeism worldwide. The unpredictability of symptoms can make it challenging for women to plan daily activities, further exacerbating stress and emotional distress [10,11].

Environmental influences are also believed to play a role in the development and progression of endometriosis. Exposure to endocrine-disrupting chemicals (EDCs), such as dioxins and bisphenol A (BPA), has been associated with a higher risk of endometriosis. These chemicals, found in plastics, pesticides, and industrial pollutants, mimic estrogen in the body and may promote the growth of endometriotic lesions [17]. Additionally, lifestyle factors, including diet, stress levels, and physical activity, can influence disease severity, with high-inflammatory diets and sedentary behavior worsening symptoms. Emerging research suggests that anti-inflammatory diets rich in omega-3 fatty acids, antioxidants, and whole foods may help alleviate symptoms by reducing systemic inflammation and supporting immune function [18].

Despite being a widespread and impactful disease, endometriosis remains poorly understood and underfunded in medical research. The lack of non-invasive diagnostic tools presents a major challenge, as laparoscopic surgery is still the gold standard for confirming a diagnosis. Researchers are actively exploring potential biomarkers in blood, urine, and endometrial tissue that could allow for earlier, non-invasive diagnosis. Imaging techniques such as transvaginal ultrasound and MRI have shown promise in detecting deep infiltrating endometriosis, but their accuracy varies depending on lesion location and the experience of the examiner [19,20].

Raising awareness and improving education about endometriosis are essential to reducing diagnostic delays and ensuring that women receive timely and appropriate care. Many women endure years of misdiagnoses and inadequate treatment before finally receiving a proper diagnosis. Increased training for healthcare professionals,

greater public awareness campaigns, and policy changes to support research funding are critical steps in addressing the unmet needs of women with endometriosis. Encouraging multidisciplinary approaches that integrate gynecologists, pain specialists, nutritionists, and mental health professionals can improve patient outcomes and provide comprehensive care tailored to individual needs [19].

3. TREATMENT OF ENDOMETRIOSIS

The treatment of endometriosis aims to manage symptoms, improve fertility outcomes, and enhance the overall quality of life for affected individuals. Since there is no definitive cure for the disease, therapeutic strategies focus on reducing pain, slowing lesion progression, and minimizing recurrence risk. Treatment options are broadly categorized into pharmacological, surgical, and non-pharmacological approaches, with the choice of therapy depending on disease severity, symptom burden, reproductive goals, and patient preferences.

Pharmacological Treatments

Hormonal therapy remains a cornerstone in managing endometriosis-related symptoms. Since endometriosis is an estrogen-dependent disease, suppressing ovarian estrogen production can significantly reduce lesion growth and inflammation. Combined oral contraceptives (COCs), progestins, gonadotropin-releasing hormone (GnRH) agonists, and aromatase inhibitors are among the most commonly prescribed medications. COCs and progestins are first-line treatments that help regulate menstrual cycles and reduce pain by thinning the endometrial lining, thereby limiting retrograde menstruation. However, long-term use may cause side effects such as mood disturbances, weight gain, and breakthrough bleeding.

GnRH agonists induce a hypoestrogenic state by downregulating pituitary gonadotropin release, effectively putting the patient into a temporary menopause-like state. While highly effective in reducing pain, GnRH therapy can cause adverse effects such as hot flashes, decreased bone density, and cardiovascular risks, limiting its prolonged use without add-back hormonal therapy. Aromatase inhibitors, which block estrogen synthesis, have also shown promise in treating endometriosis, particularly in cases resistant to standard hormonal therapy. However, due to their potent estrogen-lowering effects, they are usually prescribed in combination with progestins or COCs to mitigate side effects.

Nonsteroidal anti-inflammatory drugs (NSAIDs) are frequently used as first-line pain management options. They help reduce inflammation and alleviate dysmenorrhea, although they do not influence lesion growth or prevent recurrence. In some cases, opioid analgesics may be prescribed for severe pain, though their long-term use poses risks of dependence and gastrointestinal complications [2,3,22].

Surgical Treatments

Surgical intervention is considered when pharmacological treatments fail, or when structural abnormalities, such as large endometriomas or bowel obstructions, require correction. Laparoscopic surgery is the gold standard for both the diagnosis and treatment of endometriosis. The procedure involves excising or ablating endometriotic lesions, releasing adhesions, and restoring normal pelvic anatomy. Studies suggest that surgical excision is superior to ablation in reducing recurrence and improving fertility outcomes, as it completely removes endometriotic tissue rather than merely cauterizing it.

Despite the benefits of surgery, recurrence remains a major concern. Research indicates that up to 50% of women experience symptom relapse within five years of surgical intervention, particularly in cases where lesions are not entirely excised or when hormonal suppression is not maintained postoperatively. In severe cases, such as deep infiltrating endometriosis involving the bladder or intestines, multidisciplinary surgical teams, including gynecologists, urologists, and colorectal surgeons, may be required for optimal management.

For women who no longer wish to preserve fertility or experience refractory symptoms despite multiple treatment attempts, hysterectomy with bilateral oophorectomy may be considered as a last resort. However, this

approach remains controversial due to the risk of persistent pain even after the removal of reproductive organs, likely due to residual microscopic endometriotic lesions or central sensitization of pain pathways [22,23].

Non-Pharmacological and Complementary Approaches

Given the limitations of hormonal and surgical treatments, increasing attention has been given to non-pharmacological strategies, including lifestyle modifications, dietary changes, and alternative medicine. Studies suggest that adopting an anti-inflammatory diet rich in omega-3 fatty acids, fiber, and antioxidants may help reduce systemic inflammation and improve symptoms. Conversely, diets high in trans fats, processed foods, and dairy products have been linked to increased pain and lesion growth [24,25].

Regular physical activity has also been identified as a potential complementary therapy for endometriosis management. Exercise can help modulate immune function, improve blood circulation, and reduce estrogen levels by lowering adipose tissue, a key site for estrogen synthesis. Low-impact exercises such as yoga and Pilates have been particularly beneficial in improving pelvic mobility and reducing stress-related symptom exacerbation.

Additionally, mindfulness-based stress reduction (MBSR) techniques, acupuncture, and pelvic floor physical therapy have gained popularity as adjunct therapies. Acupuncture has been found to alleviate pain by modulating neuroinflammatory pathways and promoting endogenous opioid release. Pelvic floor physiotherapy helps address musculoskeletal dysfunctions often associated with endometriosis-related pain, providing relief from myofascial trigger points and improving pelvic muscle relaxation [26].

Future Directions in Treatment

Recent advancements in precision medicine and regenerative therapies hold promise for improving endometriosis management. Ongoing research is investigating targeted therapies that modulate specific inflammatory and hormonal pathways involved in lesion development. Stem cell-based therapies and immunomodulatory treatments are also being explored as potential future interventions for slowing disease progression and promoting tissue repair [27].

Genomic and proteomic studies are paving the way for personalized medicine approaches, allowing clinicians to tailor treatments based on a patient's unique molecular profile. Additionally, non-hormonal pharmacological agents, such as selective progesterone receptor modulators (SPRMs) and anti-fibrotic agents, are being developed to provide alternative treatment options for women who cannot tolerate conventional hormonal therapies [27,28].

In conclusion, while current treatments for endometriosis aim to alleviate symptoms, they do not provide a definitive cure. A multidisciplinary approach combining pharmacological, surgical, and non-pharmacological interventions offers the best strategy for individualized patient care. Future research into novel therapies and personalized medicine may lead to more effective, long-term solutions for women suffering from this debilitating condition.

4. IMPACT OF PHYSICAL ACTIVITY ON SYMPTOMS OF ENDOMETRIOSIS

Physical activity has been increasingly recognized as a valuable complementary approach in the management of endometriosis. Regular exercise can play a significant role in alleviating symptoms by modulating inflammation, regulating hormonal activity, improving pain tolerance, and enhancing overall physical and mental well-being. Given that endometriosis is an estrogen-dependent and inflammatory disease, exercise-induced changes in hormone metabolism and immune function may help mitigate disease progression and improve quality of life for affected women [1,4].

One of the most significant mechanisms through which exercise benefits women with endometriosis is the reduction of systemic inflammation. Studies have shown that women with endometriosis exhibit elevated levels

of pro-inflammatory cytokines such as interleukin-6 (IL-6), tumor necrosis factor-alpha (TNF-α), and prostaglandins, which contribute to chronic pain and lesion progression. Regular moderate-intensity exercise, such as walking, swimming, and cycling, has been demonstrated to lower inflammatory markers, reducing systemic inflammation and thereby alleviating endometriosis-related pain [29,30].

Another key benefit of physical activity is its effect on estrogen metabolism. Since endometriosis is an estrogen-driven disease, excess estrogen promotes the growth and persistence of endometriotic lesions. Exercise helps regulate estrogen levels by increasing the breakdown and excretion of estrogen through hepatic metabolism and reducing circulating levels of estradiol. Additionally, aerobic exercise and resistance training contribute to fat loss, which is particularly important because adipose tissue is a major source of estrogen synthesis. By decreasing adipose tissue, regular physical activity indirectly lowers estrogen production, potentially slowing the progression of endometriotic lesions [31].

Pain modulation is another crucial aspect of the relationship between exercise and endometriosis symptom relief. Physical activity stimulates the release of endorphins, dopamine, and serotonin, which act as natural painkillers and mood enhancers [32]. This is particularly beneficial for women experiencing chronic pelvic pain, dysmenorrhea, and dyspareunia, as it helps improve pain tolerance and reduces the overall perception of discomfort. Low-impact exercises such as yoga and Pilates have been particularly effective in enhancing flexibility, strengthening pelvic muscles, and promoting relaxation, which may help reduce pain intensity [33].

Beyond its physiological benefits, exercise has been shown to improve mental health and overall well-being in women with endometriosis. Many women with the condition suffer from depression, anxiety, and stress due to the chronic nature of the disease and its impact on daily life. Regular physical activity has been linked to reduced levels of cortisol and stress hormones, improving mood and emotional resilience [10]. Group exercise programs and structured physical therapy sessions also provide a social support system, helping women with endometriosis feel less isolated in managing their condition.

However, while the benefits of physical activity are well-documented, certain types of high-intensity exercise may exacerbate symptoms in some women. Activities that increase intra-abdominal pressure, such as heavy weightlifting or high-impact sports, may worsen pelvic pain and discomfort [34]. Therefore, personalized exercise programs tailored to individual pain thresholds, fitness levels, and disease severity are recommended for optimal symptom management [3].

Despite its potential benefits, adherence to regular physical activity remains a challenge for many women with endometriosis. Chronic fatigue, pain, and fear of exacerbating symptoms often discourage participation in exercise routines [35]. Healthcare professionals should work closely with patients to develop customized exercise plans that accommodate their physical limitations and encourage gradual progression. Implementing lifestyle interventions that combine physical activity with other holistic approaches, such as dietary modifications and stress management, may further enhance the effectiveness of non-pharmacological treatments for endometriosis.

In conclusion, physical activity presents a promising, non-invasive approach to managing endometriosis symptoms by reducing inflammation, modulating hormone levels, enhancing pain tolerance, and improving mental well-being. While more research is needed to establish specific exercise guidelines, individualized and carefully structured physical activity regimens can play a valuable role in comprehensive endometriosis treatment plans.

5. FURTHER RESEARCH POSSIBILITIES

Although significant progress has been made in understanding the impact of physical activity on endometriosis, further research is necessary to refine exercise recommendations, explore new therapeutic mechanisms, and determine the long-term benefits of different exercise regimens. One key area of future research involves

conducting large-scale, randomized controlled trials (RCTs) to establish clear exercise protocols for women with endometriosis [36]. These studies should focus on defining the optimal intensity, frequency, and type of physical activity that provides the greatest symptom relief while minimizing potential discomfort.

Another promising avenue for future research is investigating the interaction between physical activity and other lifestyle factors such as diet, sleep quality, and stress management. Combining exercise with an anti-inflammatory diet rich in omega-3 fatty acids, antioxidants, and fiber may have synergistic effects in reducing systemic inflammation and improving overall well-being [37]. Exploring the effects of physical activity on gut microbiota composition and metabolic pathways could also provide insights into how lifestyle interventions influence disease progression.

Further research should also examine the role of resistance training and alternative movement therapies, such as Tai Chi and aquatic therapy, in endometriosis management. While most existing studies focus on aerobic exercise, resistance training may offer additional benefits in strengthening pelvic muscles, improving core stability, and reducing musculoskeletal imbalances associated with chronic pelvic pain. Investigating the efficacy of mindfulness-based movement practices such as Tai Chi and Qigong could provide new strategies for enhancing relaxation and stress reduction [1,33].

Advancements in personalized medicine and wearable technology present exciting opportunities for tailoring physical activity recommendations to individual patients. The development of digital health tools, such as mobile applications and wearable fitness trackers, could help monitor patient adherence, track symptom fluctuations, and provide real-time feedback on exercise intensity [38]. Future studies should explore how integrating digital health interventions with exercise prescriptions can improve patient outcomes and promote sustained engagement in physical activity.

Additionally, research on the molecular and genetic mechanisms underlying endometriosis may lead to novel therapeutic targets that enhance the benefits of physical activity. Investigating the effects of exercise on gene expression, inflammatory pathways, and hormonal regulation could uncover new insights into how movement-based interventions influence disease progression at the cellular level [39]. Identifying biomarkers that predict individual responses to exercise could enable clinicians to develop personalized exercise programs tailored to each patient's unique physiological profile.

6. CONCLUSIONS

Endometriosis is a complex and multifaceted disorder that affects millions of women worldwide, significantly impairing their quality of life. Traditional treatments, including hormonal therapy and surgical interventions, often provide only temporary relief, leaving many women searching for alternative management strategies. Among these, physical activity has emerged as a promising non-pharmacological approach to alleviating endometriosis symptoms and improving overall well-being [2,3].

Regular exercise has been shown to reduce systemic inflammation, regulate hormonal balance, enhance pain tolerance, and support mental health. By decreasing levels of pro-inflammatory cytokines and modulating estrogen metabolism, physical activity can help mitigate disease progression while providing patients with a natural and sustainable method of symptom management. Additionally, the psychological benefits of exercise, including reduced stress, improved mood, and increased social support, further contribute to its effectiveness as a complementary therapy [1,4,10,11].

Despite these benefits, challenges remain in implementing exercise as a routine part of endometriosis management. Many women struggle with chronic pain and fatigue, which may hinder adherence to structured physical activity programs [35]. Moreover, not all types of exercise are equally beneficial, and individualized programs tailored to symptom severity and physical ability are crucial for optimizing results. Future research

should focus on establishing clear exercise guidelines, exploring the long-term effects of physical activity on endometriosis progression, and integrating lifestyle interventions for a more holistic approach to care.

Ultimately, a multidisciplinary approach that combines conventional treatments with lifestyle modifications, including physical activity, holds great potential in enhancing the quality of life for women with endometriosis. By promoting awareness, increasing research efforts, and encouraging personalized treatment plans, healthcare professionals can help women take an active role in managing their condition, leading to improved outcomes and greater overall well-being.

11. DISCLOSURE

11.1. Author Contributions

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Supervision: Anna Libera, Julia Maria Kostro and Maciej Jakub Kozicki.

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11.4. Informed Consent Statement

Not applicable.

11.5. Conflict of Interest

The authors declare no conflicts of interest.

11.6. Data Availability Statement

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11.7. Acknowledgements

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