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Evaluation of the Effectiveness of Modern Devices and Rehabilitation Methods in the Therapy of Pelvic Floor Muscle Dysfunction

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Abstract

Objective: The aim of this study was to evaluate the effectiveness of modern devices and rehabilitation methods used in the therapy of pelvic floor muscle dysfunction. Particular attention was given to techniques such as biofeedback, electrical stimulation, and intelligent training devices supporting therapy.

Methodology: The study included a review of the scientific literature concerning the mechanisms of pelvic floor disorders, their diagnosis, and therapeutic options. The effectiveness of various rehabilitation methods was also analysed, with particular emphasis on their application in physiotherapy practice.

Results: The literature review showed that modern rehabilitation methods, including biofeedback and electrical stimulation, are effective tools in the treatment of patients with pelvic floor muscle dysfunctions. They improve muscle strength, control over physiological functions, and patients' quality of life. The integration of therapy with mobile technologies further increases treatment effectiveness.

Implications and recommendations: Modern rehabilitation methods should be more widely used in the treatment of pelvic floor dysfunctions. The individualisation of therapy and patient education regarding prevention and proper use of therapeutic techniques are of key importance. Further research is needed on the optimisation of therapeutic procedures and the long-term effects of treatment.

Originality/value: The study provides a comprehensive review of current pelvic floor muscle rehabilitation methods, highlighting their clinical significance and potential directions for further development. It constitutes an important source of knowledge for specialists on the use of training devices and equipment in the therapy of pelvic floor muscle dysfunctions.

Keywords: pelvic floor muscles, dysfunction, rehabilitation, biofeedback, electrical stimulation

1. Introduction

Pelvic floor muscle dysfunctions (PFMD) constitute a significant medical and social problem, affecting a substantial proportion of the national female population (Muszyńska et al., 2022). The prevalence of urinary incontinence in the population of adult Poles aged ≥40 years is approximately 21.3-36.6% among women and 5.9-10.8% among men (Przydacz et al., 2021).

These disorders, manifesting as urinary incontinence, fecal incontinence, pelvic organ prolapse, and sexual dysfunctions, significantly affect patients' quality of life, limiting their social, professional, and physical activity (Halski et al., 2021).

According to the International Statistical Classification of Diseases and Related Health Problems (ICD-10), pelvic floor muscle dysfunctions are not limited to a single disease entity, but also encompass a broad spectrum of disorders classified in various ICD-10 categories, including N39 (disorders of micturition), N81 (genital prolapse), R15 (fecal incontinence), K59 (functional bowel disorders), and F52 (sexual dysfunctions) (World Health Organization, 2009). Despite the growing number of studies in the last decade on pelvic floor muscle dysfunctions, there remains a clear gap in comprehensive analyses of modern rehabilitation methods that integrate traditional physiotherapeutic approaches with advanced technologies such as biofeedback, electrical stimulation, and intelligent training devices (Hallier, 2023).

From an epidemiological perspective, disorders classified under ICD-10 categories N39, N81, R15, K59, and F52 are characterised by a high prevalence in the general population, with rates increasing with age, hormonal changes, and lifestyle-related factors such as sedentary behavior, obesity, and chronic stress (Peinado-Molina et al., 2023).

Disorders of micturition (N39), including urinary incontinence, represent one of the most common urogynecological dysfunctions, affecting approximately 15-25% of adults, while symptoms of lower urinary tract syndrome are observed in up to 70% of individuals over 40 years of age (Batmani et al., 2021). Pelvic organ prolapse (POP) is a widespread health problem, particularly among older women. The lifetime risk of developing this condition is estimated at 30-50%, while the prevalence of symptomatic pelvic organ prolapse in the female population ranges from 3% to 12% (Zumrutbas, 2025). Fecal incontinence (R15) affects approximately 8% of the adult population, with its prevalence increasing to 15% in older age groups (Mack et al., 2024). Functional bowel disorders (K59), including chronic constipation and irritable bowel syndrome, are diagnosed in approximately 40% of the adult population (Arif et al., 2025).

The high prevalence of these disorders and their complex, multifactorial nature indicate the need for a comprehensive diagnostic and therapeutic approach, including prevention, early diagnosis, and interdisciplinary rehabilitation.

The existing studies (Hite & Curran, 2021; Hutchison et al., 2022; Li et al., 2025) often focuse on individual therapeutic methods, overlooking a holistic approach to the problem and the potential for combining different techniques to optimise treatment outcomes. This article addressed this gap by providing a review of contemporary rehabilitation methods, with particular emphasis on their mechanisms of action, clinical indications, and therapeutic effectiveness. The main objective of this article is to analyse and evaluate the effectiveness of modern pelvic floor muscle rehabilitation methods in the context of their clinical application based on a literature review.

2. Anatomical and Physiological Determinants of Pelvic Floor Disorders

2.1. Pathophysiology of Pelvic Floor Disorders

The pelvic floor is a musculofascial complex involved in the regulation of intra-abdominal pressure, maintenance of the anatomical position of the internal genital organs, sexual function, as well as closure of the vaginal introitus and control of micturition and defecation (Halski et al., 2021).

When the structure of the muscular compartment is disrupted and weakened, pelvic floor muscle insufficiency syndrome (PFMIS) develops a hypo and hypertonic dysfunction which constitutes a predisposing factor for the development of pelvic organ prolapse (POP) (Halski et al., 2021). Damage to any pelvic floor muscle structure may contribute to urinary incontinence, fecal incontinence, sensory disturbances in the lower urinary tract, chronic pelvic and/or perineal pain, sexual dysfunctions, and, with disease progression, overt descent of the pelvic organs (Remneva et al., 2022).

3. Etiopathogenesis and Risk Factors of Pelvic Floor Muscle Insufficiency

Pelvic floor muscle dysfunctions represent a complex problem resulting from multiple interacting factors. Their identification is of key importance for prevention, diagnosis, and effective therapeutic management. The literature distinguishes four main groups of factors influencing the development of these disorders: predisposing, triggering, facilitating, and concomitant factors. Predisposing factors (e.g. genetic background, temperament) are usually non-modifiable, whereas triggering, facilitating, and concomitant factors (e.g. stress, lifestyle, environmental factors, social support) are to a large extent modifiable through appropriate therapeutic interventions and behavioural changes (Peinado-Molina et al., 2023).

Table 1 presents the classification of risk factors for pelvic floor muscle dysfunction into four main categories, based on their influence on the development of dysfunction and their role in the etiopathogenesis of the disease.

Table 1. Risk factors for pelvic floor muscle dysfunction

Category	Factors	Source
Predisposing factors	Female sex; genetic determinants; nervous system functioning; individual anatomy; collagen content in tissues; cultural and environmental factors	Good & Solomon (2019)
Triggering factors	Vaginal delivery; direct damage to neuromuscular structures; pelvic radiotherapy; surgical interventions	Peinado-Molina et al. (2023)
Facilitating factors	Chronic constipation; obesity; pelvic surgical procedures; respiratory diseases; nicotine use; hormonal fluctuations related to the menstrual cycle; recurrent lower urinary tract infections; pharmacotherapy; menopause; occupational load; inappropriate physical activity	Peinado-Molina et al. (2023)
Concomitant factors	Ageing processes; cognitive dysfunctions; comorbidities; ongoing pharmacotherapy	Peinado-Molina et al. (2023)

Source: own study based on the cited literature.

4. Diagnostics and Assessment of Pelvic Floor Muscle Function

At the early stages of disease development, patients rarely seek help from specialists, which results both from a lack of awareness of the seriousness of the problem and from embarrassment related to symptoms such as urinary incontinence, fecal incontinence, or sexual dysfunctions. Consequently, data on the prevalence of pelvic floor muscle insufficiency (PFMIS) are highly variable (Majkusiak & Barcz, 2017).

In physiotherapy, a muscle strength assessment system modified for the evaluation of pelvic floor muscles is used. The Modified Oxford Grading Scale is a fundamental tool for assessing pelvic floor muscle function and is widely applied in physiotherapy and gynecological practice. The scale allows for a more precise evaluation of a patient's baseline muscle strength and for monitoring progress during rehabilitation exercise programmes such as Kegel exercises or training using biofeedback. In the urogynecological context, the interpretation of individual grades of the Modified Oxford Grading Scale refers directly to the patient's ability to voluntarily contract the pelvic floor muscles (Adamiak-Godlewska & Rechberger, 2012).

Table 2 presents estimated distributions of results obtained using the Oxford Grading Scale for muscle strength assessment.

Table 2. Oxford Grading Scale for Muscle Strength Assessment

Grade	Description
0	No contraction and no movement
1	Flicker of contraction, not sustained
2	Palpable contraction, but without elevation of the pelvic floor structures
3	Contraction with elevation of the pelvic floor
4	Contraction with elevation against resistance
5	Full muscle strength

Source: own study based on (Adamiak-Godlewska & Rechberger, 2012).

In parallel, the PERFECT scheme (Power, Endurance, Repetitions, Fast contractions, Every Contraction Timed), developed by Laycock and Jerwood (2001), is used in clinical practice as a standardised and comprehensive system for the assessment of pelvic floor muscle function. This method enables a multidimensional analysis of muscle functional parameters, including maximal contraction strength (Power), endurance (Endurance), the number of repetitions that can be performed (Repetitions), the ability to generate rapid contractions (Fast contractions), and control of contraction duration (Every Contraction Timed).

The PERFECT scheme is widely applied in urogynecological physiotherapy as a diagnostic tool and for monitoring the effectiveness of therapeutic interventions in women with pelvic floor muscle dysfunctions, such as urinary incontinence, pelvic organ prolapse, and sexual dysfunctions. The standardization of assessment using this model allows for an objective comparison of the study results, a precise evaluation of rehabilitation progress, and the individualisation of the therapeutic plan, which significantly enhances the effectiveness of physiotherapeutic interventions (Da Silva et al., 2021).

5. Modern Rehabilitation Methods for Pelvic Floor Muscles

Devices designed for pelvic floor muscle training use advanced technologies such as biofeedback, electrical stimulation, and intelligent trainers integrated with mobile applications to support patients in the rehabilitation and strengthening of these key anatomical structures (Hallier, 2023). These devices can best be described as an artificial form of pelvic floor muscle training.

The general principle for the use of these devices is that if a patient is able to perform a pelvic floor muscle contraction without the assistance of rehabilitation devices, independent exercise is a more functional and effective solution (Mateus-Vasconcelos et al., 2018).

However, in cases of significant muscle weakness or difficulty in performing the exercises correctly, electrical stimulation may provide effective support, enabling muscle strengthening until the patient gains confidence in proper training technique (Romanova, 2025).

6. Biofeedback in Pelvic Floor Muscle Rehabilitation

Biofeedback, also referred to as biological feedback, is a therapeutic method that enables patients to gain conscious control over physiological functions by providing feedback on muscle activity (Mencel, 2024).

In the context of pelvic floor muscle training, this technology involves the visualisation of muscle activity on a monitor screen, allowing patients to consciously monitor and modify their activity. This

makes it possible to stimulate both conscious and subconscious control centres in the cerebral cortex, leading to improved muscle function and better control of physiological processes (Nunes et al. 2019).

Biofeedback is a non-invasive and effective therapeutic method used to identify and strengthen pelvic floor muscles. Many individuals activate these muscles incorrectly, which may result in functional disorders such as urinary incontinence, urgency, or increased frequency of urination and defecation. Biofeedback enables patients to consciously control muscle activity and is recommended by Herderschee et al. (2011) as a first-line therapy in the treatment of urological and gynecological conditions associated with pelvic floor dysfunction.

The use of biofeedback in rehabilitation leads to increased strength and endurance of the pelvic floor muscles, improved bladder control, and reduced urgency. Biofeedback is also used in the treatment of pelvic pain syndrome and functional defecation disorders (Newman, 2014).

Biofeedback employs a computerised system for monitoring muscle activity, recording parameters such as contraction, relaxation, and muscle strength. These signals are processed into clear graphs displayed on a monitor, allowing patients to continuously observe the correctness of the performed exercises (Chiang et al., 2021).

In addition, the system may use auditory signals to facilitate the identification of the correct muscle groups and to eliminate activation of undesired muscles, such as the abdominal muscles (Wang, Xu et al, 2020). The use of this therapeutic method allows patients to perform exercises both independently in a home environment – as an adjunct to pelvic floor muscle training – and within therapy conducted under the supervision of a specialist.

In pelvic floor muscle rehabilitation, training-support technologies, e.g. biofeedback devices and interactive trainers, are increasingly used. Their purpose is to increase exercise effectiveness through visual or sensory feedback that enables patients to consciously perform pelvic floor muscle contractions and monitor therapy progress. Examples include portable devices such as EMY and Pelvifly, as well as advanced clinical systems such as PHENIX Liberty. EMY is a device combining biofeedback functions with a mobile app, allowing users to track their progress in real time (Jochum et al., 2022). Pelvifly uses biofeedback in visual and vibratory form (Wang, Qiu et al., 2024). PHENIX Liberty is an advanced system offering electrotherapy, biofeedback, and pressure measurement, enabling the comprehensive assessment of pelvic floor muscle function and the individualisation of therapy (Díaz-Mohedo et al., 2023).

The urogynecological physiotherapist plays a key role in the treatment process, not only selecting an individualised therapeutic programme but also supervising the correctness of exercise techniques and monitoring therapeutic progress. At the same time, the physiotherapist prepares the patient for the safe and effective continuation of therapy in the home environment.

7. Methods of Application and Therapeutic Protocol

There are two primary methods of delivering feedback (Szymanowski et al., 2014):

1. **Surface electrodes** – small self-adhesive electrodes placed in the perianal area, enabling recording of muscle activity.
2. **Internal sensors** – a small probe inserted vaginally (in women) or rectally (in both women and men), allowing for a more precise analysis of pelvic floor muscle function.

Both methods enable the recording and visualisation of changes in muscle activity, allowing patients to continuously correct their exercise performance and monitor progress during therapy (Szymanowski et al., 2014).

A standard biofeedback session typically lasts 20-30 minutes and is conducted once or twice per month. The optimal duration of therapy is at least six months, after which periodic follow-up visits are recommended, adjusted to the patient's individual progress (Fernandes et al., 2025).

Based on the initial assessment of pelvic floor muscle function, the physician may recommend more frequent visits during the early stage of therapy (up to twice per week). In addition, the patient receives an individualised home exercise programme and keeps a voiding diary to monitor therapeutic progress. Regular consultations allow for the evaluation of treatment effectiveness and adjustment of the rehabilitation programme to the patient's needs (Fernandes et al., 2025).

8. Types of Biofeedback Devices

Biofeedback devices such as Educator, NeuroTrac Simplex, Elvie, and Perifit are important tools for the assessment and training of pelvic floor muscles. They provide users with feedback on muscle activity, enabling the precise monitoring of contraction strength, relaxation, and the correctness of the performed exercises. They function analogously to a physiotherapist who, during a therapeutic session, evaluates exercise technique, pressure force, and the number of repetitions (De Souza Duarte et al., 2024).

Individual devices differ in the range of functions they offer:

- **Educator** is a simple tool resembling a tampon with an attached indicator. After insertion into the vagina, the indicator remains visible between the user's legs. A correct pelvic floor muscle contraction causes the indicator to move downward and away from the body, while relaxation results in its return toward the body. This is a basic form of biofeedback, often used in patients at the early stages of therapy (Jokar et al., 2025).
- **Elvie** represents a more technologically advanced solution that connects to a mobile app. The device is equipped with a vaginal probe containing pressure sensors that record changes during muscle contraction. These data are transmitted in real time to the application, where they are visualised as a rising or falling object corresponding to muscle contraction and relaxation. The app also offers training programmes that guide the user through successive stages of exercise, providing performance reports after each session (Hua et al., 2024).

It is worth noting that biofeedback differs from electrical stimulation. While biofeedback requires the user's active engagement in performing exercises, electrical stimulation involves the external activation of muscles using electrical impulses, which may be perceived as a less active approach to training.

Biofeedback is particularly effective in individuals with good exercise technique (Chiang et al., 2021). However, in cases of difficulty with effective contraction or relaxation, these devices may only signal abnormalities without providing guidance on how to correct the problem.

9. Electrical Stimulation of the Pelvic Floor Muscles

Electrical stimulation is a therapeutic procedure involving the application of controlled electrical impulses to induce muscle contraction (Sarmento et al., 2022).

In clinical practice, electrical stimulation is applied using a vaginal or rectal electrode. It improves urethral sphincter function and inhibits excessive bladder contractility, among other mechanisms through its influence on the pudendal nerve. In the case of pelvic floor muscles, electrical stimulation may be used to stimulate nerves and muscles, promoting the regeneration of damaged innervation and improving muscle strength and endurance. Regular electrical stimulation sessions may lead to increased muscle tone, improved control of bladder and bowel function, and a reduction of symptoms associated with pelvic floor dysfunctions (Chen et al., 2023).

The neurophysiological mechanism of electrical stimulation is primarily based on a direct effect inducing hypertrophy of the striated pelvic floor muscles. Recruitment of faster motor units and the modification of myosin isoform expression lead to a transformation of the tissue toward type I muscle (composed of slow-twitch, fatigue-resistant fibres). This effect cannot be achieved through voluntary muscle contractions alone (Voorham et al., 2022).

10. Application Technique

The mechanism of action of electrical stimulation in gynecological rehabilitation includes the following components (Bø et al., 2015):

- **Generation of electrical impulses** – the electrical stimulation device generates electrical impulses of controlled frequency and intensity, which are adjusted to the patient's needs.
- **Transmission of impulses to the pelvic floor muscles** – the impulses are delivered via surface electrodes (placed in the perineal area) or vaginal/rectal electrodes, allowing the precise stimulation of deep muscle layers.
- **Nerve stimulation and muscle contraction** – the electrical current stimulates motor nerves (mainly the pudendal nerve), leading to the contraction of the pelvic floor muscles. This mechanism mimics the natural activation of these muscles, enabling their strengthening in patients with impaired muscular control.
- **Muscle adaptation and functional improvement** – regular stimulation leads to (Bø et al., 2015):
    1. increased muscle contraction strength,
    2. improved coordination and control of the muscles responsible for supporting the pelvic organs,
    3. improved blood flow, which supports tissue regeneration,
    4. reduction of pelvic pain.

11. Types of Electrical Stimulation

Electrical stimulation of the pelvic floor muscles uses a gentle low-intensity electrical current (usually 0.5-100 mA) and a frequency of 10-50 Hz (comparable to TENS devices—**Transcutaneous Electrical Nerve Stimulation**—used in physiotherapy as a non-invasive method of pain relief) to induce muscle contractions similar to those performed during Kegel exercises. This process strengthens the pelvic floor structures, which can significantly improve bladder control, reduce the frequency and urgency of urination and urinary incontinence, and increase overall vaginal and pelvic floor muscle strength. The procedure involves inserting a small probe (comparable in size to a tampon) into the vagina. The probe emits mild, safe electrical impulses that stimulate the appropriate nerves and muscles during a session lasting 20-30 minutes. The most important parameters of these impulses are frequency (usually 10-50 Hz for muscle strengthening and 50-100 Hz for pain relief), pulse width (200-300 μs), and intensity individually adjusted to the patient's sensory threshold (Huang et al., 2024).

TENS and EMS electrical stimulators differ primarily in their purpose and mode of action. TENS is mainly used for pain relief through nerve stimulation, whereas EMS (**Electrical Muscle Stimulation**) stimulates muscles, leading to their contraction and strengthening. The choice of the appropriate electrical stimulation method should depend on the individual needs of the patient. TENS is more suitable for pain-related conditions, whereas EMS is more appropriate for rehabilitation of weakened pelvic floor muscles (Patel et al., 2025).

As shown in Table 3, several different electrical stimulation methods are used in pelvic floor muscle rehabilitation, differing in parameters, indications, and clinical effectiveness.

Table 3. Comparison of electrical stimulation methods used in pelvic floor muscle rehabilitation

Method	Characteristics	Clinical application	Source
NMES (Neuromuscular Electrical Stimulation)	Induction of muscle contraction	Strengthening of the pelvic floor muscles	Cavalcante et al. (2024)
TENS (Transcutaneous Electrical Nerve Stimulation)	Stimulation of sensory nerves via skin electrodes	Pain therapy; reduction of urinary and bowel urgency	Wolfe et al. (2024)
SNS/SNM (Sacral Nerve Stimulation / Sacral Neuromodulation)	Implanted stimulators acting on sacral nerve roots	Treatment of urge urinary and fecal incontinence	Duelund-Jakobsen et al. (2024); Park et al. (2024)
PENS (Percutaneous Electrical Nerve Stimulation)	Nerve stimulation using needles	Pain management; stimulation of spinal nerves	Trinh et al. (2024)
PTNS (Percutaneous Tibial Nerve Stimulation)	Percutaneous placement of an electrode in the distal lower limb enables effective peripheral nerve stimulation with minimal invasiveness	Modulation of nerves controlling bladder function and pelvic floor muscles	Hamedfar et al. (2024)

Source: own study based on the cited literature.

12. Examples of Devices

Modern neuromuscular electrical stimulators used in pelvic floor rehabilitation apply different stimulation parameters depending on the type of dysfunction. Clinical studies (Chêne et al., 2013) have demonstrated the effectiveness of the following parameters:

- **Stress urinary incontinence:** impulses with a duration of approximately 300 ms and an intensity of 10-50 mA at a frequency of 50 Hz are used. Stimulation is interspersed with rest periods, and the intensity may be gradually increased during the therapeutic session.
- **Urge urinary incontinence:** impulses with an intensity of 15-35 mA at a lower frequency of approximately 12.5 Hz are recommended. Stimulation is semi-continuous, and intensity is increased more gradually.
- **Mixed urinary incontinence:** protocols with variable frequency are used, adjusted during the session to the patient's individual needs.

The mechanism of action of these devices is based on generating electrical impulses that are delivered to the pelvic floor muscles via a vaginal or rectal probe. Depending on the settings, the device may activate different muscle functions. For example, one programme focuses on the activation and improvement of muscle sensation, another on increasing endurance and prolonging contraction time, and another on contraction response speed (Hamedfar et al., 2024; Park et al., 2024; Trinh et al., 2024). Most devices are equipped with predefined therapeutic programmes.

13. Intelligent Pelvic Floor Muscle Trainers

Intelligent pelvic floor muscle trainers are modern devices that combine traditional exercise methods with advanced digital technologies. Equipped with sensors and communication modules, these trainers monitor muscle activity in real time and transmit data to dedicated mobile apps (Shelly, 2016).

The apps analyse the collected information, providing users with personalised training programmes, instructions, and feedback on progress. Integration with mobile technologies also enables the tracking of training history, setting reminders, and adjusting exercises to individual needs, which increases

rehabilitation effectiveness and patient motivation for regular exercise (Shelly, 2016). In recent years, several clinical studies have confirmed the effectiveness of such solutions, see Mao et al. (2024); De Araújo et al. (2024); and Dufour et al. (2019).

14. Clinical and Rehabilitation Aspects in the Treatment of Pelvic Floor Disorders

Transcutaneous electrical nerve stimulation (TENS) has been investigated as an adjunctive method in the treatment of chronic pelvic pain (CPP) and other related conditions. Clinical studies conducted by Mira et al. (2020) demonstrated that the regular use of TENS significantly reduced the intensity of pelvic pain and deep dyspareunia, which in turn led to a statistically significant improvement in quality of life and restoration of normal sexual function in the women participating in the study. The mechanism of action of electrotherapy may involve blocking the transmission of pain signals to the central nervous system, as well as improving local circulation and neuromuscular function within the pelvic region.

Electromyographic biofeedback (EMG-BF, electromyography biofeedback) is used as a supportive therapy for pelvic floor muscle training (PFMT) in the treatment of stress urinary incontinence (SUI) and other pelvic floor disorders. In a large-scale meta-analysis including 21 studies and more than 3,800 participants, the combination of EMG-BF with PFMT resulted in higher cure rates and greater symptom improvement compared with pelvic floor muscle training alone. Moreover, this therapy contributed to increased muscle strength and improved patients' quality of life (Wu et al., 2021).

To illustrate the clinical effectiveness of selected therapeutic methods used in the rehabilitation of pelvic floor muscle dysfunctions, the results of published studies involving diverse patient populations were compiled. The table presents key elements of the study designs, such as the applied intervention, population characteristics (sex, age), clinical diagnosis, and the obtained therapeutic outcomes.

Table 4. Overview of the effectiveness of selected rehabilitation methods for pelvic floor muscle dysfunctions

Method	Sex	Mean age	Disease / dysfunction	Effect	Literature (source)
TENS (various frequencies: <25, 25-75, >75 Hz)	Women	18-60	Chronic pelvic pain	Pain reduction (from ~6.8 to ~1.7), statistically significant effect ($p < 0.0001$)	Mira et al. (2020)
PFMT + NMES	Women	30-50	Sexual dysfunction in women with multiple sclerosis	Improvement in PERFECT and FSFI (arousal, lubrication, satisfaction)	Herderschee et al. (2011)
ES + PFME (meta-analysis)	Women	30-70	Pelvic floor dysfunction (general)	Combination more effective than PFME alone ($p < 0.05$)	Huang Y., Huang, Z. et al. (2024)
TENS (meta-analysis of RCTs for dysmenorrhea)	Women	18-45	Primary dysmenorrhea	Moderate pain reduction (−1.29 on VAS), higher effectiveness at high frequency	Babazadeh-Zavieh et al. (2023)

Source: own study based on the cited literature.

15. Indications and Contraindications for Therapy

Appropriate patient qualification for therapy of pelvic floor disorders is a key element of effective clinical management. The selection of suitable therapeutic methods depends on a thorough assessment of the patient's condition, presenting symptoms, medical history, and diagnostic test results. Both the potential benefits and the risks associated with specific rehabilitation procedures must be considered. Table 5 presents a summary of the main indications as well as absolute and relative contraindications for individual therapeutic methods used in the treatment of pelvic floor muscle dysfunctions.

Table 5. Indications and contraindications for therapy

Method	Indications	Contraindications	Source
Electrotherapy	– Increase in pelvic floor muscle strength and endurance, beneficial in urinary incontinence and pelvic organ prolapse – TENS is used in the treatment of chronic pelvic pain by modulating pain signals, which may provide relief in patients with chronic pelvic pain	– Electrotherapy, including TENS, should not be used during pregnancy, especially over the abdominal and pelvic regions, due to potential risk to the foetus – Patients with implanted pacemakers or cardiac arrhythmias should not undergo electrotherapy, as electrical currents may interfere with cardiac function – Electrotherapy should not be applied in areas with malignant lesions due to the risk of stimulating cancer cells – Electrotherapy should be avoided on skin with open wounds, skin infections, or lesions, to prevent worsening of skin conditions – Caution is required when applying electrotherapy near metallic implants, as interactions may affect treatment efficacy	Webb (1910); Watson (2008)
Biofeedback	– Biofeedback helps patients recognise and strengthen pelvic floor muscles, which is particularly useful in urinary incontinence and pelvic organ prolapse – Biofeedback can support the treatment of chronic pelvic pain by promoting relaxation and conscious control of muscle tension	– Dermatological conditions (e.g. eczema, dermatitis) – Allergy to electrode or contact materials (tape / gel) – Patients with pacemakers (although EMG biofeedback does not directly affect them, they may be sensitive to electromagnetic fields in the therapeutic environment)	Wagner et al. (2022); Voorham et al. (2017)

Source: own study based on the cited literature.

16. Summary

The use of the technologies discussed above in pelvic floor muscle training constitutes an important element of modern rehabilitation, offering patients effective tools to improve muscle function and quality of life. In response to pelvic floor dysfunction, modern therapeutic methods, including electrical stimulation and biofeedback, provide effective support in pelvic floor muscle rehabilitation.

Based on a review of the literature, the application of advanced technologies in rehabilitation has been shown to improve muscle strength and control, reduce symptoms of urinary and fecal incontinence, and enhance patients' quality of life (Nunes et al., 2019). The article also highlights the important role of individualised therapeutic management based on thorough diagnostics, as well as the need for patient education in prevention and self-application of selected techniques.

Despite its high prevalence and significant impact on daily functioning, pelvic floor muscle dysfunction has long been insufficiently addressed in the context of modern rehabilitation methods. Contemporary physiotherapy increasingly integrates supportive technologies that enable a more precise, measurable, and individualized therapeutic approach. This study indicates that biofeedback and electrical stimulation can serve not only as supportive tools but also as initiating modalities in the process of muscle re-education in patients with low body awareness or impaired neuromuscular control. Intelligent trainers supported by mobile appls, in turn, provide a motivating tool that enables effective home-based therapy consistent with current trends in e-health and patient self-monitoring (Brækken et al., 2024; Lunardi et al., 2025; Sahin et al., 2022).

To sum up, modern pelvic floor muscle rehabilitation methods should be incorporated as an integral part of an interdisciplinary therapeutic approach that includes physiotherapeutic, educational, and

preventive interventions. Their effectiveness has been confirmed in numerous scientific studies, indicating the need for further development and standardisation of therapeutic protocols based on robust clinical evidence. The future of pelvic floor disorder therapy depends on the advancing clinical knowledge and technological capabilities that can ensure lasting improvements in functional status and patients' quality of life.

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Ocena skuteczności nowoczesnych urządzeń i metod rehabilitacji w terapii dysfunkcji mięśni dna miednicy

Streszczenie

Cel: Celem pracy jest ocena skuteczności nowoczesnych urządzeń i metod rehabilitacji stosowanych w terapii dysfunkcji mięśni dna miednicy. Szczególną uwagę poświęcono takim technikom, jak biofeedback, elektrostymulacja oraz inteligentne trenażery wspomagające terapię.

Metodyka: W pracy dokonano przeglądu literatury naukowej dotyczącej mechanizmów zaburzeń dna miednicy, ich diagnostyki oraz możliwości terapeutycznych. Analizie poddano również skuteczność różnych metod rehabilitacyjnych, ze szczególnym uwzględnieniem ich zastosowania w praktyce fizjoterapeutycznej.

Wyniki: Przegląd badań wskazuje, że nowoczesne metody rehabilitacji, w tym biofeedback i elektrostymulacja, są skutecznymi narzędziami w terapii pacjentów z dysfunkcjami mięśni dna miednicy. Poprawiają one siłę mięśniową, kontrolę nad czynnościami fizjologicznymi oraz jakość życia pacjentów. Integracja terapii z technologiami mobilnymi dodatkowo zwiększa efektywność leczenia.

Implikacje i rekomendacje: Nowoczesne metody rehabilitacji powinny być szerzej stosowane w leczeniu dysfunkcji dna miednicy. Kluczowe znaczenie ma indywidualizacja terapii oraz edukacja pacjentów w zakresie profilaktyki i odpowiedniego stosowania technik terapeutycznych. Konieczne są dalsze badania nad optymalizacją protokołów terapeutycznych oraz długoterminowymi efektami leczenia.

Oryginalność/wartość: Praca dostarcza kompleksowego przeglądu aktualnych metod rehabilitacji mięśni dna miednicy, podkreślając ich znaczenie kliniczne i potencjalne kierunki dalszego rozwoju. Stanowi istotne źródło wiedzy dla specjalistów z zakresu wykorzystania możliwości, jakie dają trenażery i urządzenia stosowane w terapii dysfunkcji mięśni dna miednicy.

Słowa kluczowe: mięśnie dna miednicy, dysfunkcja, rehabilitacja, biofeedback, stymulacja elektryczna