

The role of physiotherapy in the treatment of men's sexual dysfunction (erectile dysfunction and premature ejaculation): a review

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Mohammad Mohsen Roostayi , Nooshin Rahdar 

School of Rehabilitation, Shahid Beheshti University of Medical Sciences, Tehran, Iran

Abstract

Sexual dysfunction in men is one of the issues that has an effect on the mental status, couples' relationships, and their quality of life. In addition to the psychological and emotional disturbances that sexual dysfunction can cause, some physical attributes that induce problems are reduced joint mobility, changes in the tone and lack of control and rhythm of pelvic floor muscles, presence of trigger points in the pelvic area, reduced blood flow and pain in the genital area. Previous research has shown that, apart from the importance of psychological intervention, physical therapy, such as manual therapies, pelvic floor muscle tone regulation, performing specific aerobic exercises, raising the awareness of the patient, posture correction, improving mobility, and reducing pain, can have a significant impact on improving sexual function and quality of life in men. The purpose of this article is to introduce the role of physiotherapy in alleviating men's sexual dysfunction.

Key words: physiotherapy, sexual dysfunction, men, erectile dysfunction, premature ejaculation

Introduction

Men's sexual phases include desire and stimulation of androgenic hormones, erection and ejaculation, orgasm, and, ultimately, detumescence of the penis [1]. A disorder in any of these phases can cause sexual dysfunction. Erectile dysfunction and premature ejaculation are the most common sexual disorders in men. Several studies have been conducted on the treatment of sexual dysfunction on the medical, surgical, and, in particular, psychological basis, but less emphasis has been placed on the importance of physiotherapy in sexual rehabilitation. Normal sexual function is a biopsychosocial process, and so the occurrence of any biological, psychological, or social disorder can lead to sexual dysfunction [2]. This implies the need for teamwork and the application of multidisciplinary approaches. In modern therapies, sexual disorders are treated collectively and the presence of a physiotherapist is required along with other professionals. Studies have shown that physical therapy can be effective in improving sexual function and quality of life. This review article attempts to address the causes of sexual dysfunction in men and explain the role of physiotherapy in controlling them. Before explaining the causes, it is necessary to briefly define erectile dysfunction and premature ejaculation.

According to the definition of the National Institutes of Health (NIH), erectile dysfunction is the inability to reach or maintain an appropriate erection for sex. This disorder can significantly affect the mental health and quality of life in men, and may also have a wider impact on the sexual health and psychological issues of the partner [1, 3]. The prevalence of erectile dysfunction is related to age; it is observed in 20% of people aged under 40 years, in 50% of people aged over 40 years, and in 66% of people older than 70 years. Erection can occur in 3 ways: (1) psychogenic: caused by seeing, hearing, or touching stimulating subjects; (2) reflexogenic: obtained by touching the genitalia and stimulating the nerves

of S2–S4 and T10–L2; (3) nocturnal: occurs during rapid movement of the eyes during sleep, and men often experience 3–5 erections during normal night's sleep. Erectile dysfunction is a neurovascular event; smooth muscles of corpora cavernosa and striated muscles of pelvic floor play a role in facilitating and maintaining erection. The rhythmic contraction of the ischiocavernosus and bulbocavernosus muscles is involved in ejaculation and reaching orgasm [4]. *Gray's Anatomy* (1909 edition) describes the ischiocavernosus muscle as the penis erector, and therefore pelvic muscle weakness can also play a role in erectile dysfunction. Premature ejaculation is a common sexual dysfunction in males, with a reported prevalence rate of 20–30% [5]. There is no consensus as for its definition [6]. In 2008, in accordance with the definition by the International Society for Sexual Medicine, McMahon et al. [7] referred to premature ejaculation as semen ejaculation in almost always less than 1 minute after sexual penetration. Premature ejaculation will usually be accompanied by negative consequences such as anxiety, frustration, and lack of sexual pleasure. Ejaculation is controlled by the sympathetic nervous system and is accomplished with the help of pelvic floor muscles (PFM).

There are many causes of sexual dysfunction, but they can be generally divided into physical and psychological ones. Physiotherapy can be used as a physical approach to treat and improve some complications, including: musculoskeletal system disorders, neurological disorders related to pudendal nerves (S2–S4), lower urinary tract disorders such as chronic prostatitis (CP), and all local conditions associated with the urinary and excretory systems (anorectal section). These complications can lead to chronic pelvic pain syndrome (CPPS). CPPS is diagnosed when persistent pain occurs for at least 6 months continuously or alternately in pelvic structures. It refers to a condition where there is no proven infection or other specific pathology that could cause pelvic pain. Various studies indicate that the spasm and trigger points in

Correspondence address: Mohammad Mohsen Roostayi, Department of Physiotherapy, School of Rehabilitation, Shahid Beheshti University of Medical Sciences, Damavand Street, across from Buali Hospital, Tehran, Iran, e-mail: roosta@sbmu.ac.ir, <https://orcid.org/0000-0002-5866-6505>

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PFM are the main causes of CPPS [8]. Chronic pain causes changes in the central nervous system and modifies or increases the individual's perception of pain, causing allodynia or hyperalgesia [9]. On the basis of what has been said, the importance of PFM and the role of physiotherapy in reducing pain and improving pelvic organ function are more evident in improving male sexual dysfunction.

The role and assessment of pelvic floor muscles with the physiotherapy approach

Men have similar PFM as women, with the potential for parallel benefits to urinary and sexual health [10]. PFM with a tonic activity play an important role in maintaining pelvic organs and preventing their excessive stretching, as well as in respiration, spinal stability, bladder and intestinal function, and sexual activity [11]. The pelvic floor is covered by 4 layers, one of which is the fascia, and the other 3 are the superficial, middle, and deep muscles. PFM contraction not only helps to stabilize the pelvis and lower joints during movements, but also closes the urethra, anus, and vagina, and thus prevents urine and faecal leakage. For urinary and faecal excretion, as well as sexual intercourse, relaxation of PFM is required; therefore, hyper-activation of these muscles can lead to disruption of urinary and faecal excretion, as well as desirable sex [12]. Studies have shown that trauma or excessive pressure on PFM and surrounding muscles (including gluteal muscles, external pelvic rotators, psoas and adductor muscles) and psychological stress can cause the development of trigger points and abnormal tone (decreased or increased) in PFM, as well as the formation of scar tissue. These changes can result in pelvic pain, back pain, sexual dysfunction (such as erectile dysfunction and premature ejaculation), and a disorder in the orgasm phase [13]. Because PFM integrates with the pelvic girdle muscles and helps to stabilize the body, muscle weakness and trunk instability can also lead to compensatory activity of PFM. Before starting treatment, an accurate assessment of PFM and the diagnosis of the disorder are essential. The evaluation should be performed by a physiotherapist who has attended specific training courses on the assessment and rehabilitation of PFM and sexual disorders. In the digital rectal evaluation, an examination of the prostate and PFM strength and tone, and the identification of trigger points should be done in the pelvic muscles. In addition, it is necessary to pay attention to the bilateral symmetry and balance of PFM. Trigger points, scar tissue, or any unilateral tone disorder in PFM may cause a lack of symmetry in muscle function, resulting in the inability to close the sphincters. Trigger points reduce muscle length, and their stimulation can lead to a referred pain in the abdomen or pelvis. A review of the hold-relax cycle in PFM is also a must. For this purpose, during a rectal examination, the person is asked to contract these muscles (push the therapist's finger) and then relax them. The therapist should initially feel pressure on the finger and then relaxation. Bio-feedback, electromyography, and other tools can also be used to evaluate the hold-relax cycle and the PFM power.

Interventions in the management of sexual dysfunction

In cases where the cause of erectile dysfunction and premature ejaculation is the involvement of lower urinary and excretory tracts with a specific pathology (acute or chronic bacterial involvement), the first line of therapy is pharmaceutical medication such as antibiotics, non-steroidal anti-inflam-

matory drugs, and opioids [14, 15]. As for premature ejaculation, although the cause and effect relationship is not well understood, the statistics indicate that it closely correlates with psychological problems, especially depression. Depression is associated with decreased libido, function of ejaculation and sexual activity. In this case, treatment should be started with selective serotonin reuptake inhibitors (SSRIs). It should be noted that most antidepressants also lead to sexual adverse events [16], and the use of other therapies, especially physical therapy and exercise, in the treatment of depression can help reduce the side effects of drug therapy. In erectile dysfunction, routine first-line treatment usually involves oral phosphodiesterase-5 inhibitors (such as sildenafil and vardenafil). Second-line therapy includes intracavernosal injections of papaverine or alprostadil and vacuum devices. Surgically implanted penile prostheses are an option when other treatments have been ineffective [3, 17, 18].

If sexual dysfunction has no known causes of infectious disease or a certain pathology, or is related to tonicity changes (muscle weakness or spasm) or structural changes in the pelvic muscles (scar tissue, trigger points, or fibromyalgia), decreased blood circulation in the genital area, disturbance of hold-relax rhythm, lack of proper control of PFM function, and, ultimately, pain, physical therapy interventions can help to normalize muscle tone, eliminate structural disorders, optimize contraction (strength and endurance), improve neuromuscular coordination and proprioception, improve blood circulation, and, eventually, reduce pain. Several studies have shown that internal manual therapy techniques (like sweeping strokes across PFM) are effective in alleviating pelvic floor myalgia, reducing pain levels, and improving sexual function in individuals with chronic pelvic pain [19]. Therapeutic interventions including physiotherapy modalities, as well as various manual therapies, such as massage and various techniques of release and relaxation, can help to improve the quality of sexual relationships [12]. Mutually improving sexual health can also indirectly contribute to reducing anxiety, mental stress, and sexual problems, and thus to a better quality of life.

The effect of exercise on pelvic floor muscles

The first published systematic review on the effects of PFM training on erectile dysfunction and premature ejaculation revealed that PFM training was effective in the management of these sexual dysfunctions. A combination of maximal (for fast-twitch fibres) and submaximal (for slow-twitch fibres) contractions allows for a targeted recruitment of different skeletal muscle fibres of the pelvic floor. Maximal contraction provides the sustained tone required for erection, and submaximal contraction and reflexive response are necessary for ejaculation [20]. Most recommendations for PFM strengthening involve 2–3 sessions per week.

Before introducing specific PFM exercises, it is important to remember the effect of resistance exercise and anabolic hormones on PFM. The acute endocrine response to a bout of resistance exercise includes increased secretion of various catabolic (breakdown-related) and anabolic (growth-related) hormones. One of the primary anabolic hormones released in response to resistance exercise is testosterone. In muscles, testosterone stimulates protein synthesis (anabolic effect) and inhibits protein degradation (anti-catabolic effect). These effects account for the promotion of muscle hypertrophy by testosterone. In fact, testosterone is believed to be the major booster of muscle growth and the subsequent increase in muscle strength in response to resistance

training in men [21]. Given the role of exercise in raising testosterone levels and according to a study by Tapper et al. [22], it has been suggested that the use of anabolic agents in conjunction with pelvic floor exercises might be beneficial in the treatment of pelvic floor disorders. Indeed, physical exercises directed toward strengthening PFM improve erectile function and intercourse satisfaction. Gupta et al. [23] examined the relationship between the bulbocavernosus muscle and androgenized tissue. The study results demonstrated a correlation between morning serum testosterone levels and the bulbocavernosus muscle surface area as measured on ultrasound. Linear regression analysis showed that a total testosterone level in the normal range implied a higher bulbocavernosus muscle surface area and a total testosterone level below the normal range was associated with a lower muscle surface area. Thus, decreased bulbocavernosus muscle size can signal a lower end-organ activity of androgen, whether by androgen deficiency or androgen resistance. For this reason, the condition of PFM is recognized as a marker of hypogonadism [23]. The action of both the bulbocavernosus and ischiocavernosus muscles is structurally linked with the corpora cavernosa. During the vascular phase, there is an increase in cavernous arterial blood flow together with a venous compression under the tunica albuginea that decreases the venous outflow; the 2 processes result in an increase in intracavernous pressure and a stretching of the tunica albuginea. What is more, contractions of those muscles may contribute to the pressure rise in the corpora cavernosa, thus increasing the systolic system pressure 3-fold. At full erection, the intracavernous pressure plateaus at nearly 110 mm Hg [24]. Thus, during the treatment of erectile dysfunction in the course of hypogonadism, apart from testosterone supplementation, one should refer to the condition of those muscles and consider their rehabilitation.

Among the most common exercises for enhancing and improving the function of PFM, there are Kegel exercises. They begin with the supine position, and are gradually improved as the training progresses in sitting and standing positions. Starting and maintaining the contraction should be slow, usually lasting for 5–10 seconds (depending on the individual's physical condition), and the same amount of rest is given between the contractions. In the first exercise, the person tries to contract the muscles, as if they wanted to stop urination. In the next exercise, the contraction of the anal muscles takes place, in which the individual must feel that all the muscles around their anus are elevated. In the final stage, the combination of these 2 exercises is applied. For better performance, the person can use their hand as a feedback measure to verify if they feel the contraction under the hand. In performing PFM exercises and providing the necessary feedback to improve the isolated contractions of these muscles and eliminate muscle synergies (thigh, gluteal, and rectus abdominis adductor muscles), the individual's partner can help enhance the sensory perception of isolated PFM contractions by touching the perineal area. Gradually, with more exercise and stronger contractions, the individual should be able to see penis movement during the exercise. During these exercises, the contraction of the buttocks, thigh, and abdomen muscles should be prevented, as these are PFM synergies. Exercises should be performed 5–10 times a day, several times a week. The results are often tangible after 6–12 weeks [10].

In addition to exercise, biofeedback and electrical stimulation can also be used to retrain and improve PFM function [25]. Electrical stimulation can be applied directly on the PFM ventricle (by rectal electrode), as well as through the pudendal nerve (an electrode on the S2–S4 nerves and another one

in the anus or on the perineum area). Electrical stimulation is based on various studies in bipolar square with frequencies of 10–50 Hz, duration of 0.2–0.5 ms, and a current of 50–100 mA (depending on patient tolerance); the application time equals 20 minutes [26].

Some results of studies on men with CPPS/CP have shown that biofeedback therapy plays a significant role in retraining PFM and reducing symptoms. If the cause of the sexual dysfunction is related to the involvement of lower urinary and excretory tract (anorectal section) with no specific pathology, or is related to tonicity changes of PFM, physiotherapy and rehabilitation constitute the first-line treatment. These patients usually suffer from sexual dysfunction, loss of lust, and pain during sexual intercourse, accompanied with spasm and increased muscle tone (hypertonicity), which can ultimately lead to anxiety and depression. PFM hypertonicity can result in shortened muscle fibres, contracted sarcomeres, ischaemia, and poor mobility of muscle, connective, visceral, and neural tissues. Muscle spasm itself can cause severe pain in the anus and rectum, as well as intestinal disorders, such as functional constipation, faecal incontinence, and obstructed defecation syndrome [14]. Regarding the mechanism described, reducing (normalizing) muscle tone is a major part of the treatment and reduces pain and other symptoms. Therapy aimed at correcting motor control and function involves manual lengthening of muscle fibres and muscle movement retraining. In the treatment of overactive PFM, the patient learns how to downtrain, or actively relax, the muscles. Downtraining is accomplished through specific movement-based exercises, often paired with active relaxation and diaphragmatic breathing [19].

Biofeedback therapy can help strengthen and retrain PFM and, in particular, normalize the tonus of these muscles. In this therapeutic approach, the patient learns to improve their understanding of how PFM actions work by visual or auditory feedback. In the event of muscle hypotonia, the patient tries to make stronger and more precise contractions with the help of feedback received, without the intervention of the synergist muscles; in turn, in the case of hypertonia, the individual attempts to relax the muscles by focusing on the feedback received, so that the tone returns to normal [27]. Cornel et al. [27] investigated the effect of biofeedback on reducing CPPS/CP symptoms in men. In this study, 31 men with chronic pelvic pain diagnosis were treated with a pelvic floor retraining program with biofeedback. Then, PFM tonus and function were evaluated with the NIH Chronic Prostatitis Symptom Index (NIH-CPSI) and an electromyography questionnaire. The assessment demonstrated that after 6–8 treatment sessions, the NHI-CPSI score changed from 23.6 to 11.4, and the mean muscle tone decreased from 4.9 before the treatment to 1.7 after the end of the treatment sessions. These results indicate an important role of PFM in CPPS/CP pathophysiology. Chiarioni et al. [28] also found that biofeedback was preferable to electrogalvanic stimulation and massage for the treatment of levator ani syndrome. In a study by Zimmermann et al. [29], CPPS patients were treated with a shock wave (for 4 weeks) at 3000 pulses with a maximum energy of 0.25 mJ/mm² and a frequency of 3 Hz. The penetration depth of the therapy was 35–65 mm on the prostate and pelvic floor (the hand piece was displaced every 500 pulses). The results after the first week showed a recovery of 34% with a visual analogue scale questionnaire, and after 4–12 weeks of follow up, 50% recovery was achieved without any complications.

If there are trigger points in the pelvic muscles, they should be released. Before beginning the release, the cause and

the way of work are first explained to the patient to increase their perception and cooperation. Then, in the dorsal lithotomy position, a PFM release technique is performed for the patient. Depending on the patient's condition, the therapist can apply one release technique (e.g. manual therapy, dry needling, massage, acupuncture, a relaxation technique) or their combinations. It should be noted that prostatic massage is not recommended for bacterial inflammation such as acute bacterial prostatitis [30]. To accelerate the treatment, patients should be trained to release their own muscles at home. Anderson et al. [31], in a study among patients with CPPS who were resistant to traditional treatments, indicated that chronic pain could be managed by retraining the patients to release their trigger points in the pelvic muscles, as well as by paradoxical relaxation training and using cognitive behavioural methods.

A variety of physiotherapy modalities can be applied to reduce the pain caused by PFM disorders. One of these methods is acupuncture. The neuromodulatory effect of acupuncture may break the defective cycle of pain by reducing afferent projections to the sacral reflex arc. It lowers muscle tone, which can have a positive effect on the function of the pelvic organs. Also, acupuncture can increase the activity of endorphins and exert an analgesic impact by stimulating the hypothalamus and the pituitary gland.

Another technique for controlling pain in CPPS/CP is neuromodulation [32]. It is a process in which neural activity is regulated by controlling the physiological levels of neurotransmitters. More precisely, in neuromodulation therapy, it is allowed to transmit electrical signals to a targeted area in the nervous system to improve the nervous system. According to the literature, the neuromodulation techniques include pudendal nerve stimulation (PNS), sacral nerve stimulation (SNS), and percutaneous tibial nerve stimulation (PTNS). In PNS and SNS, an implant electrode is used for stimulation, but in the PTNS method, a needle electrode is inserted approximately 5 cm cephalad to the medial malleolus (between the posterior margin of the tibia and soleus muscle) with a surface electrode on the arch of the foot (along the posterior tibial nerve pathway). In various studies, neuromodulation techniques were also used to improve the function of the urinary system [33, 34]. Van Balken et al. [35] investigated the effect of PTNS among 33 patients with chronic pelvic pain, demonstrating that both quality of life and the total pain intensity score were significantly improved in all participants. The findings of studies by Aggamy et al. [36] and Gokyildiz et al. [37] confirmed these results. Another study, performed in 27 chronic pelvic pain patients with a mean pain duration of 51 months treated with SNS, revealed a significant reduction in pain even after 37 months of follow-up [38].

The role of physiotherapy in improving erectile dysfunction in patients with cardiovascular disease

Erectile dysfunction is one of the most common problems in cardiovascular disease patients. The prevalence of erectile dysfunction in cardiac patients after acute myocardial infarction is reported to be 38–78%. Although the exact pathophysiological mechanism of the issue is not yet known, vascular disorders are often seen in patients with an erection problem with psychological problems [14]. Reduced exercise capacity, endothelial dysfunction, depression, and heart medication intake can be other causes for erectile dysfunction. Studies have shown that there is a direct relationship between sexual dysfunction and heart disease (such as cardi-

ac ischaemia), diabetes, and hypertension due to atherosclerosis. Vascular endothelial dysfunction can lead to functional impairment or blockage of the corpora cavernosa, which is called arteriogenic erectile dysfunction. Research has implied that erectile dysfunction can predict cardiovascular disease; therefore, its early detection can prevent progression of cardiovascular problems. Factors such as smoking, obesity, alcohol, and decreased physical activity can be among the contributing components.

Erection is a hemodynamic process in which arterial input increases and venous output stops. These phenomena are initiated by the coordinated action of the corpora cavernosa, penis arteries smooth muscle relaxation, and proper functioning of PFM. The occurrence of any problems in this mechanism can lead to erectile dysfunction. Although the aetiology of this disorder is multifactorial, atherosclerosis is considered to be one of the main reasons for erectile dysfunction because of an impairment of blood flow into the cavernous tissue. Endothelium is an important part of the blood vessels that plays a role in determining vascular tone, blood flow, and inflammation. Nitric oxide (NO), released from endothelial cells, contributes to vasodilatation. NO is the result of the synthesis of L-arginine by the NO synthase enzyme. It is released in response to sexual stimulation and by increasing intracellular accumulation of cyclic 3',5'-guanosine monophosphate (cGMP), which causes relaxation and vasodilatation of smooth muscles of the penis vessels. All these processes allow the sinusoidal space to be filled with blood, which leads to the emergence and maintenance of penile erection.

Medical treatment for arteriogenic erectile dysfunction is the use of phosphodiesterase 5 inhibitors or vasoactive injections such as prostaglandin E1 and papaverine in the cavernous tissue. These medications are temporarily functional, and in addition to their side effects, the individuals will be indefinitely dependent on them for their sexual experiences. Another prominent and effective way to resolve or reduce the problem is through the revascularization of the penis by exercise. The results of the 5 randomized controlled trials included in a meta-analysis showed that continuous and regular aerobic exercises could have significant effects on alleviating arteriogenic erectile dysfunction and cardiovascular disorders (hypertension and ischaemic heart disease [IHD]). This can be attributed to biochemical, neural, and hormonal changes in the blood vessel wall, which induces acute and prolonged relaxation of the blood vessels. Blood vessels can be relaxed after any exercise session owing to the thermal effects of the body, localized production of certain chemicals, such as lactic acid and NO, and changes in specific hormones and their receptors. Regular and prolonged exercise can gradually reduce the accumulation of inflammatory markers and eventually improve erectile dysfunction [39].

Kařka et al. [40] investigated the effects of cardiac rehabilitation in erectile dysfunction among patients with IHD. The study included 124 men with IHD and erectile dysfunction. Of these, 89 patients underwent a 6-month cardiac rehabilitation program, whereas 35 did not. The results revealed that after the 6-month cardiac training program, the parameters of erectile dysfunction and heart rate recovery (HRR) improved significantly, and there was a relationship between HRR and the severity of erectile dysfunction in the studied patients. According to this study, cardiac rehabilitation had a sizable effect on autonomic balance in patients with IHD and erectile dysfunction, which plays a significant role in the mechanism of erection improvement. Exercise stress can lead to dynamic changes in the behaviour of both

the sympathetic and parasympathetic subsystems of the autonomic nervous system. After an exercise stress, HRR occurs owing to the gradual deactivation of the sympathetic nervous system and the reactivation of the parasympathetic nervous system. Therefore, most problems with HRR are likely to result from both vagus nerve dysfunction and sympathetic hyperactivity. From a physiological perspective, the autonomic system also plays a role in penile erection in men. The gradual domination of the parasympathetic over the sympathetic nervous system can lead to the synthesis of nitrogen monoxide and cyclic guanosine-5'-monophosphate (GMP), relaxation of muscles in the corpora cavernosa, and an increased inflow of blood, which causes erection and allows sexual intercourse. In pathological conditions such as IHD, autonomic dysfunction and damage to the vascular endothelium can result in erectile dysfunction. Disorders in the autonomic regulation of the circulatory system lead to a decrease in HRR among patients with IHD. In addition to medication for treating IHD, cardiac rehabilitation programs (physical training) improve HRR because of the sympatholytic and parasympathicotonetic activity and exert a proven beneficial effect on erection quality [40].

In a systematic review, Brunckhorst et al. [41] investigated the long-term effect of low-intensity shockwave therapy (LISWT) over 6 months on vasculogenic erectile dysfunction (e.g. resulting from diabetes or cardiovascular disease). LISWT is a novel modality that may become a causative treatment for erectile dysfunction. The precise mechanism of its action is not fully understood; however, it is believed that the compression and subsequent negative pressures created by the shockwave energy, the so-called cavitation phenomenon, are important factors. These tensile forces lead to shear stress on cell membranes, which have been shown to have the potential to treat the underlying cause of vascular erectile dysfunction by prompting increased expression of vascular endothelial growth factor, recruitment of perivascular stem cells, and recruitment of endothelial progenitor cells, resulting in neovascularization of penile arteries. This systematic review demonstrated that LISWT could be a treatment modality to improve erectile function, with results lasting over 6 months. Whilst LISWT may be a safe and acceptable long-term erectile dysfunction treatment method, it is clear that further investigation is still needed through larger and more standardized trials to broaden its evidence base [41].

Esposito et al. [42], in a randomized controlled trial, examined the effects of physical activity in 110 obese patients. Their results showed a significant impact of physical activities on the body mass index and improvement of erectile function. Obesity is associated with endothelial dysfunction, which reduces the synthesis of L-arginine and increases the accumulation of vascular inflammatory markers such as interleukin 6, interleukin 8, and C-reactive protein in the serum. Obesity leads to chronic oxidative stress and inflammation, thus increasing the formation of free radicals and ultimately inactivating NO. A disturbance in NO access plays an important role in the pathology of erectile dysfunction. Researchers believe that aerobic exercises can bring stress on the vessels to release NO. The release of NO from endothelial cells activates the guanylate cyclase enzyme, which results in the relaxation of the corpus cavernosum smooth muscles. This relaxation allows continuation of vasodilatation of the cavernous arteries, as well as stretching and compression of the subtunical veins, which ultimately leads to penile erection. Weight loss, physical activity, and exercise regimens can reduce oxidative stress, resulting in improved access to NO. These changes can help improve male sexual function [42].

Of course, more studies are needed in this regard owing to lack of high-quality randomized controlled trials. In addition to the role of aerobic exercises, PFM exercises also can help to alleviate erectile dysfunction. Dorey et al. [4, 43] investigated 55 patients with erectile dysfunction in 2 (study and control) groups. They concluded that the study group, who had been treated for 3 months with pelvic floor exercise by using biofeedback and lifestyle changes, reported better recovery than the control group, who received a recommendation to change their lifestyle only. After 6 months of exercise, 40% of the men returned to their normal erection, 35.5% progressed to varying degrees, and only 24.5% of the patients failed treatment.

The role of physiotherapy in premature ejaculation

Premature ejaculation is a prevalent disorder in males that leads to such complications as lack of self-confidence, depression, anxiety, and unsatisfactory intercourse for these men and their partners. Currently, there are no consistent criteria for treatment approaches for premature ejaculation. One of the therapeutic protocols is pelvic floor rehabilitation. It is worth mentioning that rehabilitation can be used in patients with acquired premature ejaculation. Primary premature ejaculation is characterized by a short intravaginal ejaculation latency time (IELT) and associated with genetic and neurobiological factors. It is treated with SSRIs. The true fact is that dapoxetine is the only short-acting SSRI approved for the treatment of premature ejaculation.

In 1970, Masters and Johnson introduced the classical therapy called squeeze manoeuvre for premature ejaculation rehabilitation. In this manoeuvre, the pressure on glans penis activates the bulbospongiosus reflex, and the contraction of the muscle suddenly reduces or stops the ejaculation. During the ejaculation, a stronger contraction of the bulbospongiosus muscle results in facilitation of the prostate and semen ejaculation, and also increases the pleasure of orgasm [12].

Few studies have been conducted on the effect of PFM rehabilitation on premature ejaculation. La Pera [44] emphasized that factors such as awareness of PFM, learning the timing of execution and maintenance of PFM contraction during the sensation of the pre-orgasmic phase, and PFM rehabilitation are essential for the treatment of lifelong premature ejaculation. The study involved 78 patients with lifelong premature ejaculation. They were taught to carry out the execution and maintenance of PFM contraction during the sensation of the pre-orgasmic phase to control the ejaculatory reflex. In order to improve the awareness and the tone and endurance of PFM, the participants were treated with PFM rehabilitation, consisting mainly in biofeedback, pelvic exercises, and electrostimulation. The training was carried out for a period of about 2–6 months. By using the premature ejaculation diagnostic tool (PEDT) and IELT, the results implied that 54% of the patients were cured of premature ejaculation and learned over time to be able to postpone the ejaculation reflex.

According to the neurobiological hypothesis presented by Waldinger [45], a dysfunction in the serotonin pathway of the central system such as serotonin-2C hyposensitivity and/or serotonin-1A receptor hypersensitivity is a possible cause of lifelong premature ejaculation. Experimental animal models have shown that the serotonergic activity at the hypothalamic level inhibits the ejaculation reflex. On the basis of this physiological effect, SSRIs and serotonin ago-

nists increase IELT. A number of studies have demonstrated that exercise can increase the functional effect of serotonin in the human brain [46]. In the context of the hypothesis by Waldinger [45], Yildiz et al. [47] examined 112 males who regularly performed callisthenic and/or fitness exercise in a sports centre for at least 6 months and 126 individuals leading a sedentary lifestyle. A comparison was made by using metabolic equivalents, PEDT, and IELT. The group who practised sport was found to have longer IELT and lower PEDT scores. It was also established that premature ejaculation was less frequent in the regularly exercising men compared with the sedentary individuals. It can be assumed that regular physical activity may be effective in gaining a sexual life of higher quality [47].

Pastore et al. [48] compared 2 methods of treatment in patients with premature ejaculation. The first group underwent PFM rehabilitation through physiotherapy, electrical stimulation, and biofeedback, and the second group was treated with medical therapy involving SSRIs. The 12-week evaluation of IELT revealed that although the pharmaceutical method provided better results, the rehabilitation group also obtained promising outcomes; moreover, rehabilitation can lower the risk of drug dependency, in addition to a significant reduction in costs.

Apart from what was said before, other disorders such as joint dysfunctions (especially in the spine, lower extremities, and sacroiliac joints), which are usually caused by pain or inappropriate postures, can also lead to sexual dysfunction. Owing to pain and/or movement constraints and reduced motility during a sexual intercourse, couples become dissatisfied with sex. Physiotherapy interventions can help to improve sexual relationships and sexual satisfaction by using various modalities and performing manual therapy (such as stretching and soft tissue release procedures around the joints). Pain reduction and postural correction restore the full range of motion and increase the mobility of couples. These are important factors for sexual satisfaction during an intercourse. Studies have shown that moderately intense exercise as a habit in life (regular exercise), in addition to its effects on the musculoskeletal system, can help to improve sleep, decrease pain, and increase the level of sex hormones, which results in better sexual function in males [49].

At the end of this paper, it should be noted that given the very important role of psychological factors (such as anxiety, depression, and other psychosocial disorders) in sexual dysfunctions, physiotherapy interventions should be considered in conjunction with psychological interventions (such as medication therapy, behaviour therapy, couple therapy, relaxation therapy, and lifestyle modification) [50–52].

Conclusions

Sexual health is one of the important aspects of human life and has a direct impact on the quality of life and marital relationships. Therefore, any dysfunction in sexual health may seriously affect the quality of life. The causes of sexual problems in men (erectile dysfunction and premature ejaculation) are multifactorial; also, psychosocial, biological, and social disorders play an important role in their development. It would be therefore necessary to introduce a teamwork cooperation and to apply multidisciplinary approaches. In cases where the cause of sexual problems is pain and musculoskeletal disorders or when the pathology remains unknown, physiotherapy approaches should be emphasized (especially manual therapy and therapeutic exercises).

Ethical approval

The conducted research is not related to either human or animal use.

Disclosure statement

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Conflict of interest

The authors state no conflict of interest.

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