

LITERATURE REVIEW

The role of pelvic floor muscle exercise in the treatment of female sexual dysfunction

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Abstract

The pelvic floor muscles (PFMs) have close links with the sexual organs, and PFM exercise (PFME) has been recommended for the treatment of female sexual dysfunction (FSD) on the basis of anecdotal evidence. The aim of this study was to ascertain the effect of this form of exercise on FSD. Eight relevant research papers were identified and analysed. Study heterogeneity prevented a meta-analysis, and therefore, key themes are discussed instead. Five papers investigated the effect of PFME on women with incontinence. Although there was a general trend of improvements in FSD, most authors were unable to quantify their results. Two studies reported significant ($P \leq 0.01$) improvements in desire, arousal, lubrication, orgasm and satisfaction. Conflicting evidence was identified with regard to the effect of PFME on sexual pain disorders: although one study described a significant ($P \leq 0.01$) improvement in this area, others reported no difference or even adverse results. The authors of a well-executed randomized controlled trial involving post-partum women found significant ($P \leq 0.01$) improvements in lubrication, orgasm and arousal. Many of these studies were open to bias. It appears likely that PFME can improve arousal, lubrication, orgasm and desire in post-partum women and those with incontinence. However, the use of PFME to treat sexual pain disorders remains contentious. Further high-quality studies that focus on the impact of PFME on subtypes of FSD are required in order to quantify the effects of this form of treatment.

Keywords: exercise, female sexual dysfunction, pelvic floor muscles.

Introduction

Sexuality, intimacy and optimum sexual function are important aspects of overall human well-being, and these all depend upon the effective combination of hormonal, physical, neurological and emotional factors. The aetiology of female sexual dysfunction (FSD) is often multifactorial, difficult to isolate, and given the embarrassing nature of the condition, under-reported. Epidemiological studies have shown that between 30% and 50% of the general female population have some form of sexual dysfunction (Laumann *et al.* 1999), with post-partum, ageing women and those who have undergone gynaecological surgery experiencing an even higher prevalence of this condition (Spector &

Carey 1990; Rosen *et al.* 1993). Sexual dysfunction is defined by the World Health Organization (WHO 2010, Chapter V, F52) as “the various ways in which an individual is unable to participate in a sexual relationship he or she would wish”, and has been categorized by international consensus (Basson *et al.* 2000) (see Table 1).

The pelvic floor muscles (PFMs) have close links with the sexual organs, and PFM exercise (PFME) has been proven to be effective in treating erectile dysfunction in men (Claes & Baert 1993; Van Kampen *et al.* 2003; Dorey *et al.* 2005). However, the efficacy of such exercises in women remains in dispute. The evidence for the impact of the pelvic floor on female sexual function is inconclusive, and therefore, the role of PFME requires further exploration (Rosenbaum 2007).

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Table 1. Classification and definition of forms of female sexual dysfunction (adapted from Basson *et al.* 2000)

Classification	Definition
Sexual desire disorders:	
hypoactive sexual desire disorder	Persistent or recurring deficiency of sexual fantasies/thoughts, and/or receptivity to sexual activity that causes personal distress
sexual aversion disorder	Persistent or recurrent phobic aversion to and avoidance of sexual contact with a sexual partner that causes personal distress
Sexual arousal disorder	Persistent or recurring inability to attain or maintain sufficient sexual excitement that causes personal distress
Sexual pain disorders:	
dyspareunia	Recurrent or persistent genital pain associated with sexual intercourse
vaginismus	Recurrent or persistent involuntary spasms of the musculature of the outer third of the vagina that interfere with vaginal penetration and cause personal distress
other sexual pain disorders	Recurrent or persistent genital pain induced by non-coital sexual stimulation
Female orgasmic disorder	Persistent or recurring difficulty with, delay in or absence of attaining orgasm after sufficient sexual stimulation and arousal that causes personal distress

Sexual dysfunction in women

Table 1 shows the classification of all FSDs. The causes of these dysfunctions are numerous and correlate with various factors. Clitoral and vaginal vascular insufficiency resulting from various cardiovascular conditions are associated with loss of smooth muscle and vaginal dryness (Goldstein & Berman 1998). This may interfere with normal responses to stimulation, potentially resulting in pain, and arousal and/or orgasmic disorders. Neurological injuries can occur either peripherally, as a result of trauma or neuropathies, or centrally, as in cases of spinal cord injury (Kreuter *et al.* 2011), multiple sclerosis or stroke, and are documented comprehensively by Rees *et al.* (2007). Hormonally, decreased oestrogen levels following oophorectomies, menopause or medication are associated with vaginal atrophy, loss of libido and arousal disorders (Castelo-Branco *et al.* 2009). There is a significant correlation between urinary incontinence and musculo-skeletal pain disorders, and FSD (Rosenbaum 2007, 2010). The psychosocial influence on sexual dysfunction is complex in females within the UK, as determined in a study by Burri & Spector (2011), and includes relationship satisfaction, emotional intelligence, and a past history of abuse and anxiety.

How pelvic floor muscle exercise influences sexual function in women

The PFM's support the abdominal and pelvic organs, thereby maintaining continence of faeces and urine. The perineal membrane consisting of the ischiocavernosus, bulbospongiosus and superficial perineal muscles is anatomically close to the vestibular bulbs and the clitoris, and these

all enhance the sexual response (Chambless *et al.* 1984; Shafik 2000). Contraction of the PFM's pulls the rectum, vagina and urethra anteriorly towards the pubic symphysis, and spasm of these muscles may cause vaginismus, anismus and other pain disorders (Rosenbaum 2008). Conversely, hypotonia of the muscles following childbirth or ageing may result in prolapse, incontinence or vaginal hypoanaesthesia, and subsequent problems with self-esteem and libido. Pathophysiological reasoning suggests that increased blood supply following pelvic floor activation should encourage microvascular blood flow, and hence, lubrication, efferent sensation and autonomic responses.

In principle, exercises including appropriate stretching and strengthening of the pelvic floor should improve or restore sexual function.

The aim of the present literature review was to identify and analyse trials pertaining to this subject in order to ascertain the role of PFME in treating FSD.

Materials and methods

Data sources

The Medical Literature Analysis and Retrieval System Online (via PubMed), the Cumulative Index to Nursing and Allied Health Literature, the Allied and Complementary Medicine Database, and the Cochrane Library were searched for the purposes of the present literature review. Manual searches through relevant systematic reviews and trials were also employed in order to identify further relevant papers.

Study selection

Because of the lack of high-quality trials in this area, broader selection criteria were adopted.

Box 1. Search terms

(pelvic floor AND exercise*) OR (pelvic floor AND rehabilitat*) OR (pelvic floor AND train*) OR (pelvic floor AND stretch*) OR PFME OR PFMT OR PFE	AND	Sexual dysfunction OR vaginismus OR dyspareunia OR (orgasmic dysfunction)	AND	women* OR female*
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Full texts (written in the English language) of randomized controlled trials (RCTs), cross-over trials and case reports examining PFME, and its effect on sexual function or satisfaction, either as a primary or thoroughly reported secondary outcome measure, published between 1991 and March 2011 were included. Box 1 lists the search terms employed. A total of eight relevant papers were found and analysed.

Data extraction and quality analysis

Studies were judged on the level of the evidence that was reported. This was done using a seven-point scale that was adapted from the work of Guyatt *et al.* (1995):

- (1) systematic reviews and meta-analyses;
- (2) RCTs with definitive results;
- (3) RCTs with non-definitive results;
- (4) cohort studies;
- (5) case-control studies;
- (6) cross-sectional surveys; and
- (7) case reports.

The data extracted are presented in Table 2, and although it had been planned to do a meta-analysis of the results, the lack of homogeneity between the studies and RCTs necessitated a qualitative discussion instead.

Results and discussion

All of the studies reviewed varied greatly with regard to the type of research conducted, statistical power, patient population, outcome measures used and results. Because of the heterogeneity of these trials, a statistical comparison and analysis was not possible, and therefore, sub-groups and common themes are discussed instead.

Five studies (Wilson & Herbison 1998; Bø *et al.* 2000; Beji *et al.* 2003; Zahariou *et al.* 2008; Rivalta *et al.* 2010) examined sexual function as a secondary outcome measure, as well as its relationship to PFME and the treatment of urinary incontinence. Wilson & Herbison (1998), Bø *et al.* (2000) and Beji *et al.* (2003) demonstrated that, although PFME has a positive effect on sexual dysfunction, this outcome is either not significant or difficult to substantiate.

Because of the nature of secondary outcomes, the above studies were not necessarily designed with sexual dysfunction in mind. All but one (Beji *et al.* 2003) did not specify the inclusion and exclusion criteria, or if the participants were sexually active or not. Furthermore, baseline characteristics associated with sexual dysfunction were not monitored. This is an issue for Bø *et al.* (2000) since 20% of their participants were not sexually active. Additionally, the outcome measure used for sexual dysfunction had not been validated, and therefore, this calls internal validity of their study into question. The RCT by Wilson & Herbison (1998) was flawed by very high rates of withdrawal (52% and 22% in the intervention and control groups, respectively), and an inconclusive intention-to-treat analysis. No statistical analysis was undertaken by Beji *et al.* (2003), making the statistical significance of their results unclear.

However, Zahariou *et al.* (2008) and Rivalta *et al.* (2010) demonstrated significant improvements in levels of desire, arousal, lubrication, orgasm and satisfaction, although the latter study was the only one to report a significant improvement in pain levels. It should be noted that these two trials were not randomized or controlled, and therefore, the results are much more at risk of bias. The shortcomings of all of the above studies mean that the overall treatment effect of PFME in this subset of women is inconclusive.

Dean *et al.* (2008) were the only authors who reported results that demonstrated that there were differences between women with or without incontinence, and they described isolated results for continent females: PFME improves levels of desire and orgasm, but does not have an effect on arousal. These findings concur with those of Beji *et al.* (2003). Interestingly, Dean *et al.* (2008) also identified a relationship between increased levels of sexual pain in women performing PFME with incontinence compared to those without. Incontinence is linked directly to FSD (Rosenbaum 2007), and the positive effects of PFME on incontinence have been well reported (Hay-Smith *et al.* 2008; Dumoulin & Hay-Smith 2010). Since these two variables are common to

Table 2. Summary of the eight research papers under review: (RCT) randomized controlled trial; (PFME) pelvic floor muscle exercise; (GRISS) Golombok–Rust Inventory of Sexual Satisfaction (Rust & Golombok 1986); (BFLUTS) Bristol Female Lower Urinary Tract Symptoms questionnaire; (FES) functional electrical stimulation; (FSFI) Female Sexual Function Index (Rosen *et al.* 2000); (FSD) female sexual dysfunction; and (KHQ) King’s Health Questionnaire

Reference	Study type*	Patient population (n)	Treatment versus control	Outcome measures	Results
Wilson & Herbison (1998)	RCT (3)	230 women with postnatal urinary incontinence from New Zealand	Treatment: four one-to-one sessions with physiotherapy and home PFME, or cone therapy, or both. Control: standard PFME, as taught by physiotherapists	Primary: other incontinence outcomes Secondary: validated 1-year follow-up questionnaire of sexual function (GRISS)	No significant difference in sexual function between groups; $P \geq 0.1$ across all questions
Bø <i>et al.</i> (2000)	RCT (2)	59 women with genuine stress incontinence from Norway	Treatment ($n = 29$): weekly physiotherapist-led PFME class and daily exercises Control ($n = 30$): no input	BFLUTS quality of life score, with four questions relating to sexual function	Fewer women in the exercise group reported an unsatisfactory sex life because of urinary symptoms; however, once pre-intervention differences between groups were controlled for, $P = 0.9$
Beji <i>et al.</i> (2003)	Non-randomized uncontrolled study (4)	42 sexually active women with urinary incontinence from Istanbul, Turkey; average age = 44 years	Treatment: all participants were prescribed PFME regimes; 20 min of FES was used in 18, thrice-daily sessions (10–30 contractions) Control: none	Pad test, pelvic floor strength, and subjective symptom resolution/improvement or no change in various sexual components	26 of the 42 participants showed some improvement in at least one area of sexual function; no statistical analysis was completed
Dorey (2006)	Case report (7)	One 67-year-old woman	Three treatment sessions of PFME	FSFI	Improved symptoms of orgasmic dysfunction
Zahariou <i>et al.</i> (2008)	Cohort study (4)	58 women with genuine stress incontinence from Greece	Treatment: a 12-month PFME programme with four office biofeedback sessions and a home exercise regime Control: none	FSFI and pelvic floor strength	All six sections of the FSFI showed significant improvements after the 12-month programme; $P < 0.001$ for all but the pain section, which had a value of $P < 0.05$
Dean <i>et al.</i> (2008)	Retrospective cohort study (3)	2765 women who were 6 years post-partum from New Zealand, Scotland and England	Arm 1: self-reported, currently performing PFME Arm 2: self-reported, not currently performing PFME	10 sexual function questions based on the GRISS (see ‘‘Appendix 1’’)	A significant difference between arms 1 and 2 was found in the questions pertaining to desire, orgasm, arousal and satisfaction; $P \leq 0.001$

Continued

Table 2. (Continued)

Reference	Study type*	Patient population (n)	Treatment versus control	Outcome measures	Results
Citak <i>et al.</i> (2010)	RCT (2)	75 post-partum women from Turkey	Treatment (n=37): PFME taught and validated by a specialist nurse (10 slow and 10 quick contractions daily) Control (n=38): no input	FSFI, and pelvic floor strength at rest and straining; measured at 4 and 7 months post-partum	For the treatment group, the sections of the FSFI relating to arousal, lubrication, orgasm and total FSD showed a significant difference ($P \leq 0.05$) compared to the control group at 7 months; although significantly improved in the treatment group ($P \leq 0.001$), the sections for desire, satisfaction and pain were not significantly different when compared with the control group ($P \geq 0.05$)
Rivalta <i>et al.</i> (2010)	Prospective cohort study (4)	16 non-pregnant women with urinary incontinence from Italy; average age=48.5 years	Treatment: combined pelvic floor rehabilitation, including biofeedback, electrical stimulation, vaginal cones and PFME Control: none	FSFI and KHQ incontinence outcome measures	Significant improvements in desire, arousal, lubrication, orgasm, satisfaction and pain ($P \leq 0.001$)

*The numbers in brackets are the scores of each study on a seven-point scale (adapted from Guyatt *et al.* 1995) rating the level of the evidence presented.

all of the studies under review, it is difficult to establish the direct impact that PFME has on sexual function. However, it is clear that PFME does have a generally positive effect on levels of desire and orgasm, but the significance of this is disputed, as is whether this form of exercise may be associated with increased sexual pain in this population.

Citak *et al.*'s (2010) study focused on post-partum Turkish women, and found that PFME does have a significant impact on all domains of the Female Sexual Function Index (FSFI); the six areas include arousal, lubrication, orgasm, satisfaction, pain and desire. When the participants were compared with a control group, significantly better results ($P \leq 0.05$) were reported for the arousal, lubrication and orgasm domains. Citak *et al.*'s (2010) trial is by far the most internally valid of all the studies examined in the present review, with satisfactory randomization, blinding, outcome measures, and equal and relevant baseline differences. However, it is weakened because there is no mention of any intention-to-treat analysis, and given that the attrition rate was approximately 20% during the intervention, this could have created a significant variation in the results. Desire, satisfaction and pain did not demonstrate a significant improvement in either the treatment or control group; however, all participants did improve significantly post-partum. It is most likely that the pain experienced by these individuals was related to birth trauma, fatigue and the altered family dynamics associated with a newborn. This form of pain declines over time, and this alleviation may have played a larger part than PFME.

The PFMEs described in the studies under review vary extensively. In Dean *et al.* (2008), the exercises were self-reported and not monitored, and therefore, the participants were more equivalent to the control subjects than the intervention group in Citak *et al.* (2010). The treatment arms of the trials by Rivalta *et al.* (2010), Beji *et al.* (2003) and Wilson & Herbison (1998) used different treatments in both isolation and combination, including vaginal cones, PFME, and in the first two, functional electrical stimulation. The studies that described the PFMEs that were performed detailed a daily home exercise programme consisting of a combination of long and short contractions, and a progressive increase in number of repetitions and holds over a period of 3 months or more. Most included additional one-to-one sessions:

Citak *et al.* (2010) employed telephone reviews, and Wilson & Herbison (1998), Beji *et al.* (2003), Rivalta *et al.* (2010) and Bø *et al.* (2000) used clinic sessions; only Bø *et al.* (2000) arranged a group PFME class. All but Dean *et al.* (2008) used biofeedback or manual palpation to validate good exercise technique. Although most of the studies are consistent with regard to the validation of correct muscle activity, and the use of short and long daily contractions over at least 3 months, any conflicting results could be attributed to other variables, such as the number of repetitions, the use of an exercise diary, electrical stimulation, vaginal cones and differing amounts of one-to-one care. The optimum training regime for the pelvic floor has yet to be established for even the well-researched topic of stress urinary incontinence (Dumoulin *et al.* 2011), and therefore, similarities with PFME programmes for FSD are likely to remain wide-ranging for now. However, Citak *et al.*'s (2010) results suggest that standard antenatal and postnatal PFME advice appears to be significantly less effective than regular intervention, daily PFME and phone reviews for FSD.

It is clear that studies that have used the FSFI, which is validated for all types of FSD (Wiegel *et al.* 2005), have been better able to measure the relevant components of sexual function in women. The authors of those trials that included quality of life scores reported a more general impact of sexual function. It is likely that the combination of the clarification of FSD terminology by Basson *et al.* (2000) and the establishment of the FSFI has been instrumental in diagnosing and, hence, researching the effects of interventions.

Different types of trials were included in this literature review, ranging from case reports to RCTs, and the present author's qualitative analysis indicates that there is a definite need for higher-quality trials in this area since the current lack of evidence makes it difficult to draw conclusions about the effect of PMFE on FSD.

No studies were identified that focused on post-surgical or ageing women, two groups who do demonstrate significant levels of FSD. Additionally, vasculogenic, hormonal, neurogenic and psychogenic factors are very often filtered out by exclusion criteria. For future studies to be relevant to the normal female population, these components of FSD should be included in future trials.

Conclusions

Female sexual dysfunction affects a large number of women, and clinical professionals encounter a variety of co-morbidities and psychosocial attributes. Although studies exist that assess the role and efficacy of PFME for FSD, the literature is specific only to certain patient groups and the results cannot be widely extrapolated to the general female population. It is quite probable that arousal, lubrication, orgasm and desire can be improved by prescribing such exercises to post-partum women and those with incontinence. Pain disorders seem to be less influenced by PFME, but little work has been published on specific PFMEs for sexual pain to date. Now that the FSFI has been established and validated as an outcome measure for this very hampering condition, it should be utilized consistently in future trials. High-quality studies that evaluate the effect of PFME on individuals with various subtypes of sexual dysfunction and utilize validated primary outcome measures should be carried out to accumulate more conclusive evidence about this most contentious of topics.

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has had a special interest in women's health, pelvic floor dysfunction and the impact of this condition on female quality of life since completing her undergraduate research in this area. Her eclectic mix of interests means that Anna has a secondary role as a physiotherapist specializing in climbing-related injuries, which led to her being invited to be a guest speaker at a climbing symposium on women-specific injury prevention and treatment.

Appendix 1

The 10 sexual function questions based on the Golombok–Rust Inventory of Sexual Satisfaction (Rust & Golombok 1987) that were used by Dean *et al.* (2008).

Desire

Do you feel uninterested in sex?

Arousal

Do you become easily sexually aroused?

Do you feel moisture or lubrication during sexual activity?

Orgasm

Are you able to experience orgasm with your partner?

For some women, both the vagina and clitoris are important for sexual pleasure. How important for you, at present, are the vaginal feelings?

Satisfaction

Do you find your sexual relationship with your partner satisfactory?

How adequate do you think your vaginal tone is for your own satisfaction?

How adequate do you think your vaginal tone is for your partner's satisfaction?

Other

Do you ever have pain with sexual intercourse?

Does urinary incontinence interfere with your sex life?