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The effects of pilates exercise on female sexual dysfunction in women: a controlled, prospective study

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Abstract

Purpose/objective Numerous studies report the impact of daily exercise on many aspects of female sexual dysfunction (FSD). However, limited studies are investigating the effect of pilates on FSD. The primary aim of this study was to prospectively examine the effect of Pilates on female sexual function using the Female Sexual Function Index (FSFI), the Arizona Sexual Experiences Scale (ASEX), and Beck Depression Inventory (BDI) questionnaires.

Methods Ninety-three sexually active premenopausal women were enrolled in the study. The study group was asked to complete FSFI, ASEX, and BDI questionnaires before and after a 12-week Pilates exercise program. The control group was asked to complete FSFI, BDI, and ASEX questionnaires and continue their daily routine for 12 weeks. At the end of 12 weeks, the individuals were asked to complete the same questionnaires again.

Results FSFI, ASEX and BDI scores were compared before and after 12 weeks of Pilates exercise, and a statistically significant improvement was observed in all 3 questionnaire composite scores ($p < 0.01$). When the study and control groups were compared after 12 weeks, a statistically significant difference was observed between the study and control groups in FSFI scores ($p < 0.01$).

Conclusion Present study has demonstrated undeniable improvements in ASEX, BDI, and all domains of FSFI scores after a 12-week Pilates exercise program in women with FSD. Pilates exercise may be a supportive intervention for the treatment of FSD.

Keywords Arizona sexual experiences scale (ASEX), Female sexual dysfunction, Female sexual function index (FSFI), Pilates exercise, Sexual Well-being

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Introduction

Sexual well-being is one of the significant aspects of women's health. Sexual function is immensely complex, depending on psychological, biological and interpersonal experiences and socio-cultural factors. Experiencing one's sexuality involves multisystemic coordination, which involves many psychological functions. This coordination is participated by neuromuscular, hormonal and vascular body structures [1]. Female sexual dysfunction (FSD) is a multifactorial problem manifested by signs such as decreased quality of life, self-esteem, sexual desire, the strength of partner relationships, and general well-being. Although it is known that the prevalence of FSD increases with increasing age, recent cross-sectional studies have shown that the prevalence of FSD is undeniably high in premenopausal women [1, 2].

With a history of almost 100 years, Pilates exercise is floor-based and involves equipment that provides adjustable spring resistance. Traditional principles of Pilates exercise include centering, concentration, control, precision, flow, and breathing. Pilates exercise is defined as a mind-body exercise and mainly focuses on flexibility, basic stability, breathing, muscle strength and posture. Pilates has been shown to improve muscular endurance and flexibility of the abdomen, waist, and hips and dynamic postural control and balance around the low back-pelvic-hip complex [3]. The effect of Pilates on the human body is not only limited to the musculoskeletal system but also has positive contributions to mental health and general well-being. Pilates has been shown to provide meaningful recuperation in problems that affect people mentally, such as depression, mood, sleep quality, quality of life, and anxiety [4].

When the literature is examined, it has been seen that pelvic floor muscle dysfunction and psychological problems have negative effects on female sexual function. On the other hand, it has been shown that Pilates has positive improvements in pelvic floor muscles and mental health. Therefore, the primary aim of this study was to prospectively examine the effect of Pilates on FSD using the Female Sexual Function Index (FSFI), the Arizona Sexual Experiences Scale (ASEX), and the Beck Depression Inventory (BDI) questionnaires.

Materials and methods

The study protocol for the research project has been approved by the Ethics Committee of the institution and all participants provided written informed consent. Ninety-three sexually active women, aged between 18 and 50 years old, in a stable partner relationship were prospectively enrolled in this controlled observational study. For the present study, detailed medical histories were acquired such as age, body mass index (BMI), parity, level of education from all individuals by face-to-face

interview. The study group was asked to complete FSFI, ASEX, and BDI questionnaires before and after a 12-week Pilates exercise program. The control group was asked to complete FSFI, BDI, and ASEX questionnaires and continue their normal routine life for 12 weeks. At the end of 12 weeks, the individuals were asked to complete the same questionnaires again. While the questionnaire is being administered, the participant answered the questions alone in a separate, quiet room, away from distracting stimuli. The study group consisted of women who applied to the physical medicine and rehabilitation clinic to participate in public pilates groups. Participants were told about the study. Those with FSD and those who met the inclusion criteria were included in the study group. The control group was collected from women who applied for routine cervical smear screening to outpatient clinics.

Inclusion criteria and exclusion criteria for both the study and control groups were the same. Subjects were included from participation if they had a total FSFI score ≤ 26.55 and a regular frequency of sexual intercourse in premenopausal status. All participants were in a heterosexual, monogamous, stable relationship with the same partner for at least three months. Subjects were excluded from participation if they had any types of cancer, chronic disease, or neurologic disorder affecting sexual life, and if they had a psychiatric disorder and history of drug treatment and an anatomical abnormality or any organic cause of sexual dysfunction.

Participants participated in a 60-minute Pilates exercise session twice a week for 12 weeks. The sessions were held in the Pilates studio in the presence of experienced and qualified Pilates trainers. Before starting the active Pilates movements, sportswear was put on, and a 10-minute warm-up was completed. The sessions consisted of three stages, depending on the original Pilates traditions: a general warm-up for 10 min, a 45-minute workout with the original Pilates equipment, a 5-minute cool-down, and breathing exercise [5].

Sexual function was evaluated with two detailed questionnaires ASEX and FSFI. ASEX is available in two separate questionnaire forms for men and women, the scale consists of five items in the six-point Likert type, with a score range of 5–30, and an increase in the total score indicates sexual dysfunction. It is a scale that rates sexual drive, arousal, vaginal lubrication / penile erection, ability to reach orgasm, and satisfaction from orgasm [6]. FSFI is a questionnaire consisting of 19 questions. It measures sexual desire, arousal, lubrication, orgasm, satisfaction, and pain under six main headings during sexual intercourse. The FSFI has undergone psychometric validation research involving healthy women, as well as women diagnosed with sexual dysfunction, gynecological cancer, vulvar intraepithelial neoplasia, vulvodynia, and chronic

pelvic pain. These studies demonstrate strong internal consistency, test-retest reliability, and discriminant validity [7]. The individual is evaluated with scores ranging from 2 to 36, and women with a total score ≤ 26.55 are evaluated as having female sexual dysfunction [8]. All women were asked to answer the question: “Do you have a sexual annoyance associated with sexual dysfunction?” and only women who responded negatively were eligible to be evaluated with questionnaires. BDI was also used for each individual for psychological analysis [9].

The primary endpoints were changes in the domain of ASEX, BDI and FSFI in FSD patients before and after Pilates exercise. Secondary endpoints included differences in sexual function in the study group after Pilates exercise compared to the control group. Both groups completed all validated Turkish versions of questionnaires at the beginning of the study and after 12 weeks to report the benefits of the Pilates exercise (Fig 1).

Sample size was estimated to detect an adequate number of patients to be included in the study to yield

a significant difference between pretreatment and post-treatment FSFI scores. According to a pilot study on a 5 patients, we calculated the mean and standard values of the participants and conducted a statistical analysis (none of the data from the pilot study were included in the analysis). The standard effect size was set at 3.05 with 80% effect (1-b) and 5% standard error (a) margin. Based on the calculation, 4 cases for each group were found sufficient. SPSS 20.0 software was used for data analyses (SPSS, Version 20.0; IBM Corp, Armonk, NY). The presence of normal distribution was determined using the Shapiro-Wilk test. The demographic profile of the participants was analyzed using the χ^2 -test. The difference between dependent groups was tested by paired sample t-test. The difference between the two independent groups was analyzed by student's t-test. The results were reported as the mean and the standard deviation (\pm SD). Statistical significance was accepted $p < 0.05$.

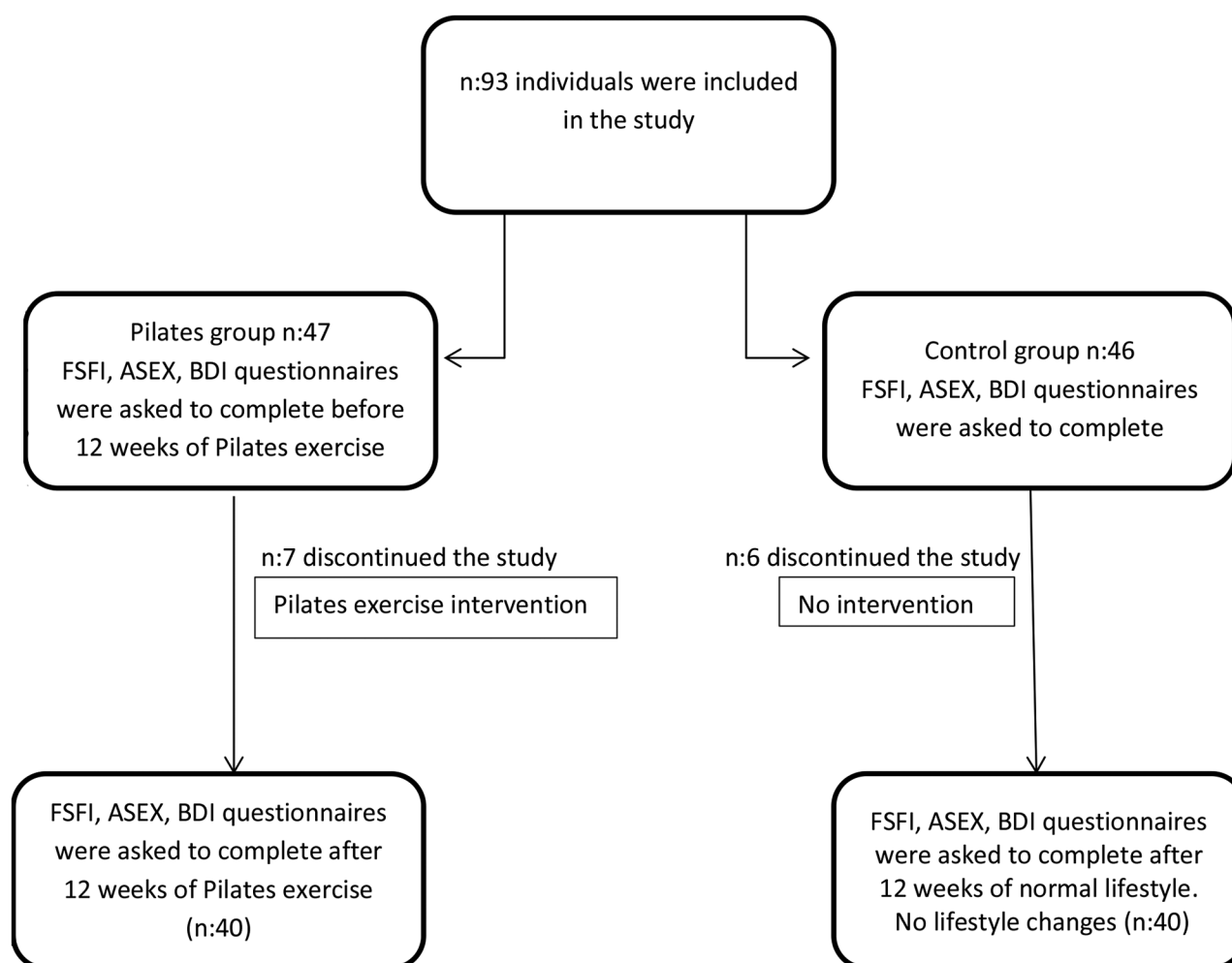


Fig. 1 Patient enrollment flowchart

Table 1 Demographic characteristics of groups

Parameter	Pilates group (n = 40)	Control group (n = 40)	p
Age (years)	32.4 ± 6	33.5 ± 6.7	> 0.05
Body mass index (kg/m ²)	27.6 ± 5.2	26.3 ± 4.5	> 0.05
Parity	1.4 ± 1.1	1.5 ± 1.2	> 0.05
Marriage (months)	97.9 ± 81	119.9 ± 75	> 0.05
Currently married	40(%100)	40(%100)	> 0.05
Education (college)	19(%46.3)	22(%53.7)	> 0.05
Employed	29(%72.5)	30(%75)	> 0.05
BDI score	22.8 ± 15.4	18.7 ± 5.8	> 0.05
ASEX score	21.9 ± 3.9	23.2 ± 1.8	> 0.05
FSFI score	13 ± 5.5	12.6 ± 1.5	> 0.05

Continuous variables are presented as the mean ± SD; categorical variables are presented as number and %

BDI: Beck Depression Inventory, ASEX: The Arizona Sexual Experience Scale, FSFI: Female Sexual Function Index

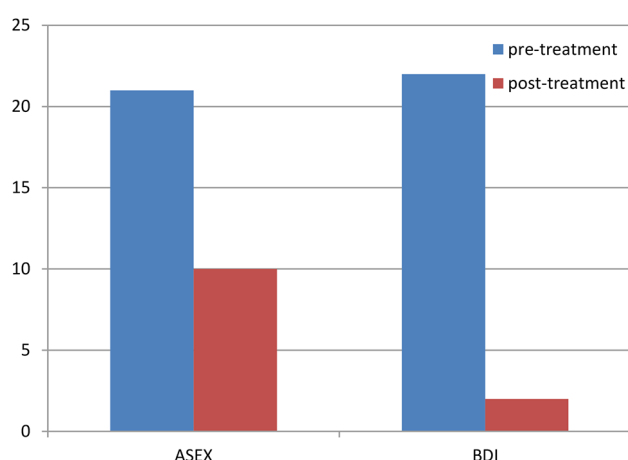


Fig. 2 Comparison chart for study group before and after the 12-week Pilates exercise program. Statistically significant results were obtained among the Pilates group in both evaluation questionnaires ($p < 0.01$). BDI: Beck Depression Inventory, ASEX: The Arizona Sexual Experience Scale

Results

The characteristics of the participants are presented in Table 1. The mean ages of the study group and control group were 32.4 ± 6 (22–47) and 33.5 ± 6.7 (21–47) years, respectively. Baseline demographic characteristics were quite similar between the study and control groups, including mean BDI, ASEX, and FSFI scores ($p > 0.05$).

ASEX and BDI scores were compared before and after 12 weeks of Pilates exercise, and a statistically significant improvement was observed in both evaluations ($p < 0.01$) (Fig 2). Pilates exercise program revealed statistically significant improvement in all FSFI domains ($p < 0.001$). When the study and control groups were compared after 12 weeks, a statistically significant difference was observed between the study and control groups in FSFI scores ($p < 0.01$). Comparing FSFI scores before and after 12 weeks of exercise program in the study group, an improvement of over 95% was observed in all six domains of FSFI. When the control group FSFI

scores were compared before and after 12 weeks within the group, no significant change was observed ($p > 0.05$) (Table 2).

Discussion

Human sexual response occurs as a result of complex interactions between psychosocial and biological factors. Female sexual dysfunction is a common problem today; in the study reported by Phillips et al., 19 to 59% of healthy women had sexual dysfunction and were sexually dissatisfied 68–75% in the United States. FSD creates problems such as lack or absence of sex drive, pain which restricts sexual intercourse, or difficulty reaching orgasm. Female sexual dysfunction may occur due to multiple causes such as lower urinary system problems, endocrine disorders, malignancies, neurological and psychological causes. Pelvic floor muscle dysfunction and psychological reasons such as anxiety and depression can be counted among the reasons for orgasmic disorders and inadequate sexual satisfaction [9, 10]. When observed the studies in the literature, we see that female sexual dysfunction focuses on especially pelvic floor muscle strength improvement with various pelvic floor muscle exercises in non-pharmacological treatment options. The current study evaluated the effectiveness of Pilates exercise with both improvements in psychological mood and pelvic floor muscle strength. Significant improvements were documented in the BDI, ASEX, and FSFI questionnaires. In particular, the improvement observed in all domains of the FSFI questionnaire revealed the positive effect of Pilates exercise on FSD.

Pilates, defined by Joseph Pilates in the 1920s, consists of a series of exercises that provide flexibility and strength for the whole body. Although there are various types of Pilates exercise, it provides significant improvements in pelvic floor strength as most of them are performed together with pelvic floor muscle contraction [12]. Several studies have reported the effects of pelvic floor dysfunction on female sexual function and quality of life. For example, a recent study reported that pelvic floor muscle training was associated with improved sexual function [13]. In another study, it was reported that after physical therapy for pelvic floor muscle disorders, improvement was observed in chronic pelvic pain and sexual dysfunction in individuals [14]. Furthermore, the recently published study demonstrated that pelvic floor physical therapy could improve symptoms of hypertonic pelvic floor disorders, including urinary incontinence, pelvic organ prolapse, fecal incontinence, dyspareunia, vaginismus, and vulvodynia in patients with pelvic floor dysfunction [15]. Recently, a prospective study investigated the effect of Pilates on women's sexual health. Significant improvements were observed with Pilates exercise in the sexual function of 34 women who were

Table 2 Change in Female Sexual Function Index (FSFI) before and after 12-week Pilates exercise program in the study group and comparison to the control group

	Pre-treatment scores in the study group	Post-treatment scores in the study group	Post-treatment improvement in the study group (n %)	Pre-treatment scores versus post-treatment scores in the study group (two-sample paired t-test)	Control group scores	Pre-treatment scores in the study group versus the control group (Student t-test)	Post-treatment scores in the study group versus the control group (Student t-test)
	Mean \pm SD	Mean \pm SD		p Values	Mean \pm SD	p Values	p Values
Desire (1,2-6)	2.1 \pm 0.8	4.6 \pm 0.7	38(%95)	<0.01	1.5 \pm 0.4	0.023	<0.01
Arousal (0-6)	2.1 \pm 0.9	4.7 \pm 0.7	40(%100)	<0.01	1.9 \pm 0.3	0.231	<0.01
Lubrication (0-6)	2.6 \pm 1	5.2 \pm 0.6	39(%97.5)	<0.01	2.7 \pm 0.4	0.398	<0.01
Orgasm (0-6)	2.1 \pm 0.9	4.8 \pm 0.6	40(%100)	<0.01	2 \pm 0.4	0.424	<0.01
Satisfaction (0.8-6)	1.9 \pm 1	5.2 \pm 0.6	40(%100)	<0.01	1.8 \pm 0.4	0.739	<0.01
Pain (0-6)	2 \pm 1	5.1 \pm 0.7	38(%95)	<0.01	2.5 \pm 0.5	0.043	<0.01
Total FSFI (2-32)	13 \pm 5.5	29.8 \pm 3.7	40(%100)	<0.01	12.6 \pm 1.5	0.690	<0.01

evaluated only with the FSFI questionnaire [16]. Additionally, Kegel exercises increase pelvic floor muscle strength and improve the sexual self-efficacy of women [17]. Therefore, it seems reasonable to expect improvement in sexual function after Pilates exercise treatment of women suffering from FSD. However, few studies are showing the relationship between Pilates exercise and sexual function in the literature.

Psychological problems, such as anxiety and depression, are also reasonable causes of FSD [11]. In the study reported by Vancini et al. [5], Pilates exercise was beneficial for anxiety and depression; with this, the quality of life was significantly improved in obese individuals. In another study, the effect of Pilates on depression, fatigue, anxiety, and quality of life in female breast cancer patients was investigated, and significant improvement was observed in each evaluation [18]. Since significant improvements in general mood, anxiety, and depression are achieved with Pilates exercise, it is possible that we can achieve similar results for FSD. According to our study, a statistically significant decrease was observed in BDI questionnaire scores after 12 weeks of Pilates exercise. No improvement was observed in the control group, who continued their everyday routine life. At the same time, significant improvements were observed in the FSFI and ASEX questionnaires, and it is promising that Pilates exercise can be preferred among non-pharmacological treatment options in FSD.

Orgasm is defined as a feeling of intense pleasure, felt after the well-being and contentment that occurs due to a physiological reaction, and is very important for satisfactory sexual intercourse. This is accompanied by involuntary rhythmic contractions of the pelvic and vaginal muscles, uterine and anal contractions, and eventually the release of tension and positive emotions. These psychological aspects lead women to perceive their lack of orgasm as a failure, feeling of shame and guilt. As a result, the woman experiences depression, anxiety, and distress, leading to reinforcing one's negative beliefs about herself. Thus, the difficulty of reaching orgasm perpetuates [19]. In order to break this cycle, clinicians resort to antidepressant drugs as medical treatment in such cases. However, these medical treatments have various side effects. Therefore, recently, clinicians recommend treatments such as psychotherapy, Kegel exercises, direct clitoral stimulation, bibliotherapy to their patients who have difficulty reaching orgasm [20]. Accompanied by this information, Pilates may be recommended as one of the first-line treatment options, as it shows improvement in depression and anxiety as well as strengthening the pelvic floor muscles on patients who suffer from FSD.

The complaint of recurrent pain or discomfort associated with full vaginal penetration or just attempt is named dyspareunia. As is the case with other FSDs,

dyspareunia is a cause of low levels of sexual satisfaction, reduced well-being, and relationship difficulties [21]. It was reported that modifying the tone of the pelvic floor muscles was effective in treating dyspareunia in a recently published randomized controlled study. It has been reported that three months of pelvic floor muscle exercises provide significant improvements in assessments of pelvic floor muscle strength and endurance, sexual function, and pain [22]. A randomized clinical trial comparing pelvic floor muscle exercises with Pilates in evaluating pelvic floor strength and pelvic rehabilitation efficiency resulted in similar improvements on pelvic floor dysfunction. In this study, encouraging results of Pilates-based exercises were reported for the treatment of patients with pelvic floor dysfunction [12]. In the light of these studies, it can be assumed that Pilates modifies the pelvic floor muscles and reduces pain during sexual intercourse, thus helping to avoid dyspareunia.

Our research had some limitations. Firstly, the number of women in the individual groups was relatively small; thus, it made the outcomes less robust, unfortunately. Secondly, women's menstrual cycle was not considered, and hormonal differences between cycles may cause variability in our results. Future studies may consider examining hormonal changes across menstrual cycles. Thirdly, partner relationships, which may be considerable in evaluating the sexuality of the women surveyed, were not examined. Fourthly, there is no information on whether there is evidence of gynecologic pain syndromes such as pelvic floor muscle hypertonia, endometriosis, or vulvodynia. Future studies may also consider some diseases that may affect the results.

In conclusion, our study has demonstrated undeniable improvements in ASEX and BDI scores and demonstrated significant improvement in all domains of FSFI after a 12-week Pilates exercise program in women with FSD. Pilates exercise may be a supportive intervention for the treatment of FSD. More studies with a larger sample size are needed to support the effectiveness of Pilates on FSD.

Abbreviations

FSD Female Sexual Dysfunction
FSFI Female Sexual Function Index
ASEX Arizona Sexual Experiences Scale
BDI Beck Depression Inventory

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Not applicable.

Author contributions

HIC and HSS: project development and data collection. DG and MYA: data collection and analysis. RBD: manuscript writing. All authors have read and approved the manuscript.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethical approval and consent to participate

This study was performed in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and received approval from the ethics committee of Sakarya University. We took informed consent from the patients.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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