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Original Article

The Effect of Mindfulness and Pilates on Female Sexual Function

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Abstract

Background: sexual dysfunction is common amongst women and is considered one of the important causes of divorce. The current research aims to investigate the effect of mindfulness and Pilates exercises on the amount of female sexual function. The current research is a semi-experimental study with a pretest-posttest design.

Methods: The current research participants consisted of 44 married women (mean age = 35.8 ± 5.1 years) with sexual dysfunction. They were selected as samples using the convenience sampling method. They were matched and divided into four groups: mindfulness, Pilates, combined exercises (mindfulness-Pilates), and control groups. Mindfulness and combined groups participated in mindfulness interventions for eight sessions (8 weeks, 1 session per week) and Pilates and combined groups performed Pilates exercises for 24 sessions (8 weeks, 3 sessions per week). During this period, the participants assigned to the no-intervention control group did their daily activities. Before and after intervention, data were collected using the Female Sexual Function Index questionnaire.

Results: Results from covariance analysis showed all three types of interventions have led to sexual function increase. However, combined exercises were more effective than the other two interventions.

Conclusion: Our findings suggest that Pilates and mindfulness exercises may improve sexual function in women with sexual dysfunction.

Keywords: Sexual dysfunction, Female, exercise, Cognitive- behavioral

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Introduction

Sexual dysfunction (SD) is defined as "the different ways in which an individual is not capable of participating in a sexual relationship as he or she would like." (World Health Organization International Classifications of Diseases-10 (ICD-10).

According to the report of the International Consensus Development Conference on Female Sexual Dysfunction (FSD), it is classified into four categories: designated desire disorders (DD), arousal disorders (AD), orgasmic disorders (OD), and pain disorders (PD) (1). It turns out that SD is quite common in both genders, ranging from 10% to 52% in men and 25% to 63% in women (2,3).

The prevalence rate of SD varies amongst women of different countries; for instance, the SD rate was reported to be 43% in America(4), 40% in Finland (5), 40% in Sweden (6), 36% in Australia (7), 29.6% in Malaysia (8), and about 43.9 % in Iran (9).

FSD is a prevalent disorder that detrimentally affects woman's quality of life (10**).** Additionally, familial discord and divorce are the consequences of female sexuality disturbance (11). According to the presented statistics, the annual divorce rate in Iran is increasing. In 2010, one divorce occurred per 6.6 marriages, while in 2017 one divorce occurred per 4.4 marriages (12). This statistic is related to the number of real divorces and does not embrace the large number of emotional divorces. Many couples may get an emotional divorce but continue to live with each other for some reason. In a study on divorce applicants in Iran, it was found that 66.7 % of males and 68.4% of females who had applied for divorce were not satisfied with their sex lives (13). The etiology of SD is frequently multifactorial as it relates to anatomical, physiological, medical, psychological, and social components (14). Additionally, cultural and religious factors *significantly contribute to* the development and progression of FSD (15).

In a study (16). assessed risk factors associated with FSD in Iran. He found that a history of psychological problems, low physical activity, chronic disease, menopause status, and spousal erectile dysfunction were significantly associated with FSD in Iranian women.

In order to improve sexual function, a variety of solutions have been proposed, including hormonal therapy (17), cognitive-behavioral therapy, and performing physical activity (18-23).

In some research studies, the effect of cognitive-behavioral interventions such as mindfulness on women's sexual function was investigated. They referred to the positive

effect of mindfulness on sexual function (24). For example, Adam, Heeren, Day, and de Sutter (25) found that mindfulness levels varied during partnered sexual activity between women with and without orgasm problems.

Stephenson & Kerth (26) conducted a literature review to identify all published trials of mindfulness for FSD. They found that all aspects of sexual function and subjective sexual well-being significantly improved with mindfulness, while generally representing medium effect sizes. However, they suggested that additional research is needed to incorporate larger and more diverse samples using a wider variety of control conditions to report outcomes more comprehensively.

In several other research studies, the effect of physical activity on sexual function was assessed, for instance, Lara et al., (18) investigated the effect of physical activity on improvement of sexual function in women with polycystic ovary syndrome. Armbruster et al., (19) studied the effect of physical activity on sexual function in women with endometrial cancer. Nazarpour, Simbar, Ramezani, Tehrani and Alavi (27) investigated the effect of sport exercises on sexual function in postmenopausal women, Liebergall-Wischnitzer et al, (20) studied the effect of sport exercises on sexual function in women with urinary incontinence. Additionally Lorenz and Meston (21) investigated the effect of sport exercises on sexual function in women with depression. These studies referred to the positive effect of sport exercises or the lack of sport exercises effect on sexual function in women.

Though previous research studies have investigated the effect of physical activity on sexual function, research studies in this area are new and restricted to samples with specific diseases (women with polycystic ovary syndrome, endometrial cancer, postmenopausal women, and women with urinary incontinence, depression and obesity). Additionally, in some of these studies aerobic exercises were used, while resistance exercises have more considerable effect on testosterone hormone (which plays a role in female sexual function) than aerobic exercises (28).

The Pilates exercise, regarded as a popular option, is a unique system of stretching and strengthening exercises. Pilates helps one create a relationship between body and mind; concentration, focus and meditation togetherness help boost mental health (29). In addition, Pilates helps to increase one's flexibility and blood circulation (30).

An important part of Pilates is that it causes one to focus on his body, breathing, and how they all work and move together. Focusing and concentrating makes it more likely that the

person benefits from the exercise. Pilates exercise is amongst practices that strengthen the pelvic floor muscles and thus support the uterus, bladder, small intestine and rectum. There are several exercises that mimic its similar action (31). They involve lifting your pelvic floor, strengthening those muscles and increasing sexual satisfaction (32). According to the above, the current research aimed at determining the effect of Pilates exercises, mindfulness, and combined exercises (mindfulness and Pilates) on sexual function in women with Sexual dysfunction.

Material and methods

46 married women (age 35.8 ± 5.1 years) who attended the sexual dysfunction clinic and their problems were diagnosed by the consultant physician in the clinic volunteered to participate in this research.

Subjects were eligible if they were in pre-menopausal status, were in a stable relationship with their husbands, did not have a history of psychiatric disorder and drug treatment, got a score below the cut-off point of 26.5 from Female Sexual Function Index (FSFI) questionnaire, did not have any other malignancy or chronic diseases which might interfere with mental and sexual health

Data Collection

All participants signed informed consents resultant from institutional ethical approval prior to commencing the study. The Ethics Committee of the institution approved the protocol for the research Project. Based on their age range and the amount of disorder, participants were matched and divided into 4 groups of mindfulness, Pilates, combined exercises (mindfulness-Pilates) and control groups. Mindfulness intervention was held in 8 weeks, 1 session per week (table 1). Pilates course included 8 weeks of exercise, 3 sessions per week, each session for 60 minutes. Combined group participated in both interventions. Participants in the control group were instructed to maintain their current life style practices and were not provided with any information or instructions. Women were asked to complete FSFI questionnaires before and after 8-week exercise programs. FSFI is a 19-item questionnaire developed as a brief, multidimensional self-report instrument for assessing the key dimensions of sexual function in women (1). Scores on six aspects of sexual function, including desire (2 items), arousal (4 items), lubrication (4 items), orgasm (3 items),

satisfaction (3 items), and pain (3 items) as well as a total score are provided by FSFI. The psychometric evaluation of the scale, including studies of reliability, convergent validity, and discriminant validity was performed (33; 1). As a powerful and useful diagnostic tool, this questionnaire is used to diagnose FSD and monitor treatment (33). The FSFI total score of 26.55 was considered to be the optimal cut score to differentiate women with and without sexual dysfunction (34). The cut point for subscales are 3.3 for desire, 3.4 for mental arousal, 3.4 for lubrication, 3.8 for satisfaction, and 3.8 for sexual pain. In other words, scores higher than the cut points indicate good performance **.**

Data Analysis

Data were analyzed using SPSS software version 23 in 2 descriptive and inferential statistics parts. At the descriptive level, the mean, and standard deviation of the scores were investigated, and at inferential level, data were analyzed using multivariate analysis of covariance (MANCOVA). The significance level of 0.05 was used in all the assumptions tests.

Ethical Consideration

This study was approved by the ethics committee of Islamic Azad University.

Table 1. Summary of mindfulness in sex therapy and intimate relationships protocol

First session	Mindful movement; raisin; body scan
Second session	Mindful movement; body scan In pairs: learning to search and discover sensory sexual points with the aid of their husbands, initially with eyes closed Introduction to mindful enquiry, in pairs. Silent listening
Third session	Mindful movement; sitting meditation In pairs: choosing a picture from a selection, one describing to the partner the reason for its choice and its meaning, the other mindfully listen and enquire
Fourth Session	Mindful movement; sitting meditation: exploring sexual discomfort Walking in pairs, one guiding, the other blindfold or eyes closed
Fifth meeting	Mindful movement; sitting meditation; exploring sexual self In pairs: intimate question with mindful listening "Meanings game": in small groups, to discuss alternative meanings to sexual/relationship-based situations
Sixth session	Mindful movement; sitting meditation: compassion In pairs: listening to one another's pulse
Seventh session	A composite of mindfulness exercises over a whole day with a silent lunch (a) Sharing present experience in pairs, taking it in terms of speaking/listening followed by mindful enquiry (b) Mindful movement

	(c) Review of homework in plenary or dyads (i.e. pair work) (d) Plenary and small group discussions to consider relevance to sex and intimacy Home practice sheets were given out each week, including: body scan, sitting meditation; mindful listening exercises; other mindful activities Recordings of in-session body scans and sitting meditations were given to participants.
Eighth session	A composite of mindfulness exercises over a whole day with a silent lunch (a) Sharing present experience in pairs, taking it in terms of speaking/listening followed by mindful enquiry (b) Mindful movement (c) Review of homework in plenary or dyads (i.e. pair work) (d) Plenary and small group discussions to consider relevance to sex and intimacy Home practice sheets were given out each week. Including: body scan, sitting meditation; mindful listening exercises; other mindful activities Recordings of in-session body scans and sitting meditations were given to participants.

* From Kocsis & Newbury-Helps (2016)

Pilates Exercise Program

Participants attended in a thrice-weekly 60-minute exercise session for 8 weeks. This resulted in a total of 24 sessions completed. An experienced Pilates instructor performed exercise program. It consists of the main movements on mats and the movements using traditional Pilates equipment and accessories.

Results

Table 2 shows the means and standard deviations for all dependent variables

Table 2. Means and standard deviations for variables

Group	Control		Mindfulness		Pilates		Combined	
Variable	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
Desire	3.6±.75	3.6±1.1	3.3±.94	4.3±.75	3.8±.61	4.2±.75	3.6±.94	5.1±.58
Arousal	4.0±1.1	4.1±1.2	3.7±1.3	4.5±1.4	4.4±.99	4.2±1.3	3.1±1.3	4.7±.51
Lubrication	3.0±.41	2.4±.47	3.1±.55	3.6±.49	3.3±.84	3.9±.74	3.1±.44	4.4±.61
Orgasm	3.6±.87	3.8±.75	3.7±.44	4.1±.44	4.1±.31	4.3±.51	4.2±.54	4.9±.41
Sexual satisfaction	4.8±.99	4.8±1.0	4.3±1.5	4.7±1.4	4.9±.86	5.1±.81	4.6±.91	5.3±.62
Pain	2.4±1.1	2.1±1.1	2.6±1.3	2.1±1.3	2.1±.78	1.9±.71	2.6±1.6	2.4±1.6
Sexual function	21.5±2.7	20.8±2.6	21.1±3.1	23.32±2.6	22.2±2.8	23.6±2.4	21.5±2.5	26.8±.98

Results presented in table 2 show those scores of sexual function in experimental groups (mindfulness, Pilates and combined) are higher on the post-test than on the pre-test.

Results of covariance analysis are presented in brief in table 3.

Table 3. Covariance analysis of scores of sexual function in groups

Variation source	Type III Sum of Squares	df	Mean Square	F	Sig	Partial Eta Squared
Pre-test	131.053	1	131.053	65.380	.000	.626
Group	199.506	3	66.502	33.177	.000	.718
Error	78.175	39	2.004[b]			

Considering the significant group differences, Bonferroni follow up test was used to identify difference points. Table 4 shows the results of this test.

Table (4): Estimation of Bonferroni follow up test to compare groups mean difference

(I) group	(J) group	Mean Difference (I-J)	Sig.[b]
control	Mindfulness	-2.841*	.000
	Pilates	-2.435*	.002
	Combined	-5.988*	.000
Mindfulness	control	2.841*	.000
	Pilates	.407	1.000
	Combined	-3.147*	.000
Pilates			
	Combined	-3.553*	.000

The results of table 4 yield a significant difference between sexual function scores of mindfulness, Pilates, and combined groups and that of control group. In other words, mindfulness, Pilates and combined exercises have been capable of increasing sexual function in comparison to control group. Additionally, there is a significant difference between sexual function scores of combined group and that of mindfulness and Pilates groups, and combined exercise has been capable of better increasing sexual function compared to mindfulness and Pilates groups.

Discussion

The current research aimed at investigating the effect of mindfulness and Pilates on female sexual function. Findings of this study show mindfulness interventions led to sexual function

improvement in women. This is in agreement with those obtained by Kocsis and Newbury (35), Brotto et al., (36), Adam et al., (25), Brotto and Basson (37) indicating the effect of mindfulness on sexual function.

In order to explain this finding, we can refer to increased understanding of intrinsic stimuli and awareness of sexual responses without judgment (36), attention setting and experience discovering (25), reduction of experiential and behavioral sexual avoidance (35), expansion of the acceptance and compassion (38, 39), reduction of depression and anxiety symptoms (40) coming after mindfulness exercises.

In his review study, Stephenson (26) shows the positional mechanisms of action for SD treatment using empirically supported theoretical SD models and mindfulness meditation. "These mechanisms include (a) shifting locus/ quality of attention during sex, (b) decreasing negative sexual schemas, (c) altering negative expectancies/goals for sex, (d) reducing behavioral/experiential avoidance, (e) lessening engagement with negative sex-related cognitions, and (f) improving the relational context.

During implementation steps of this research study, some of the participants acknowledged that they feared and hated being touched some points on their bodies by their partners. Others considerd their sexual relationship as a responsibility they always bear and only their sexual partner's satisfaction was important. These issues caused them to be unwilling to have sexual relationship. Additionally, some of the women said their past memories of dyspareunia acts as a mental barrier to sexual intercourse and leads to their hate. It seems that women who have experienced feeling of hatred in their relationship are significantly sensitive in response to pain and predict pain in some parts of the body. By touching those parts, a sensory concentration is called which still may be accompanied by an unpleasant feeling, because in the cortex of body senses, by each touch with a separate emotional and background music, sensory inputs are coded in posterior insular cortex which mediates the ability to percept intrinsic stimuli (41). It seems that participants had a cognitive-behavioral sexual avoidance and following this feeling of avoidance and focusing on extrinsic stimuli (hate, fear, and pain) instead of intrinsic stimuli (feelings, thoughts, and body senses at that moment) a cognitive distraction had been developed in them diverting their capacity of attention to intrinsic stimuli during sexual relationship. During mindfulness exercises, participants in eating raisins exercise found that they are automatically guided in most of their life situations and they can experience new feelings by remaining in the present

time (attention setting and experience discovery), and then by paying attention to different parts of the body and focusing on a special core they could directly experience their feelings, thoughts, and body sense and become aware of them (becoming aware of intrinsic stimuli). Though they might repeatedly divert from body or breathing, they learned to focus again on their body or breathing (acceptance) by tracking and observing the distraction agent. They learned to consider their feelings or thoughts as temporary or choose to directly face them in long term (reduction of avoidance and self-judgment) and through awareness from breathing, calm body senses induced by negative feelings (reducing depression and anxiety symptoms). In the current research, attempts were made to invite women to be physically intimate with themselves (self-compassion). Perhaps, these reasons caused mindfulness to significantly affect the improvement of women with DS.

Another finding of this research showed that Pilates exercises affected FSD. This is compatible with finding that the regular physical activity positively correlates with sexual function (42; 43). Regular physical activity seems to affect sexual function improvement through useful physiological and psychological effects. Regular exercise leads to increased muscular endurance and cardiovascular endurance and, improves blood circulation in the organs (44) and affects hormones and neurotransmitters level (44). In addition, physical readiness after sport exercises causes individuals to less likely experience weakness and fatigue in sexual relationships. The better blood circulation of organs, especially the female sex organ (clitoris) resulting from sport exercises, makes sexual performance more enjoyable (43).

Additionally, changes in the hormones and neurotransmitters level lead to the sexual function improvement (45; 46). Resistance exercises generally include increased secretion of androgen (47), catecholamines and increased compatibility in testosterone (48). In women with low libido, the level of androgens is low (49). Resistance exercises increase libido and good humor by increasing androgen level and lead to the sexual function improvement (45).

Some research studies also referred to the change of testosterone-cortisol ratio during resistance exercises and stated that this ratio is directly correlated with sexual function (46). Variation of catecholamines (adrenaline, noradrenaline and dopamine) after physical exercise plays 2 roles in improving sexual function; one is using catecholamines to increase sex hormone testosterone (47) and the other to improve mental states and good humor (44). The last finding of this study showed combined exercises have more effect on FSD as the

effects of mindfulness and Pilates on FSD were discussed and both exercises lead to the improvement of SD in women. Performing these 2 exercises besides each other had a significant effect on sexual function.

Conclusion

Generally, findings of the current research showed that Pilates exercises have led to the improvement of sexual function in women with sexual dysfunction. This finding creates a more profound attitude toward the effect of physical activity and exercise on sexual function. Previous research studies investigated the positive effect of physical activity on improvement of sexual function in women with polycystic ovary syndrome (18), endometrial cancer (19), postmenopausal women (27), women with urinary incontinence (20), and sexual function in women with depression (21). According to the results from this research, physical activity improves sexual function in women without specific disease but with sexual dysfunction. Moreover, performing mindfulness exercises besides physical activity has a better effect on the improvement of sexual function in women with sexual dysfunction.

Declaration

Competing interests

There is no competing interest to disclose.

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