

Sexual Function and Exercise in Postmenopausal Women Residing in Chalous and Nowshahr, Northern Iran

Soheila Nazarpour,¹ Masomeh Simbar,^{1*} Fahimeh Ramezani Tehrani,² and Hamid Alavi Majd³

¹Department of Midwifery and Reproductive Health, Shahid Beheshti University of Medical Sciences, Tehran, IR Iran

²Reproductive Endocrinology Research Center, Shahid Beheshti University of Medical Sciences, Tehran, IR Iran

³Department of Biostatistics, Faculty of Paramedicine, Shahid Beheshti University of Medical Sciences, Tehran, IR Iran

* Corresponding author: Masomeh Simbar, Department of Midwifery and Reproductive Health, Shahid Beheshti University of Medical Sciences, Tehran, IR Iran. Tel: +98-212257571, Fax: +98-2188202516, E-mail: msimbar@yahoo.com

Received 2015 May 23; Revised 2015 June 16; Accepted 2015 July 11.

Abstract

Background: The sexual function of menopausal women is influenced by several factors.

Objectives: We aimed to investigate the association between exercise and sexual function among postmenopausal women residing in Northern Iran.

Patients and Methods: Using a multistage, randomized sampling method, 405 postmenopausal women, aged 40 to 65 years, were recruited to participate in this population-based, cross-sectional study. The female sexual function index (FSFI) questionnaire and a researcher-designed questionnaire were completed by every subject.

Results: Overall, 61% of the women reported having experienced sexual dysfunction, and 53.6% reported that they had not performed any kind of exercise within the last 6 months; among those who did exercise, the most common form was walking (79.8%). The FSFI total scores ($P = 0.013$), as well as the scores in the lubrication ($P = 0.007$) and pain ($P < 0.001$) domains, were significantly lower for the women who performed exercises other than walking compared to those who only walked or who did not exercise at all. The frequency of weekly exercise had a positive correlation with the scores in the lubrication ($r = 0.18$, $P = 0.014$) and orgasm ($r = 0.146$, $P = 0.045$) domains. The logistic regression analysis demonstrated that the chances of reduced sexual desire were decreased by 80.2% ($P = 0.044$) with every unit increase in the frequency of weekly exercise.

Conclusions: More frequent exercise will improve the sexual function of post-menopausal women.

Keywords: Sexual Dysfunction, Menopause, Exercise

1. Background

Sexual function is influenced by several physiological and pathological changes that occur during menopause (1).

In the diagnostic and statistical manual of mental disorders (DSM-IV), sexual dysfunctions are defined as disturbances in sexual response cycle or pain associated with sexual intercourse. Sexual dysfunctions include sexual desire disorders, female sexual arousal dysfunction, male erectile dysfunction, male and female orgasm dysfunction, premature ejaculation, and sexual pain (vaginismus and dyspareunia) (2, 3).

Due to the growing global population and an increased life expectancy, the number of postmenopausal women is on the rise. Studying this group of women, and especially the sexual difficulties they face, could be of significant value. However, it seems that the sexual problems of postmenopausal women have been given little attention to date; thus, it may be found that these types of problems are very common among these individuals (4).

According to community-based studies, the prevalence of sexual dysfunction among all women is between 25% and 63%, and among postmenopausal women, between 68% and 86.5%, depending on the setting of the study (5).

Postmenopausal sexual dysfunction in women is a complex disorder that has many etiologies. To determine the optimal treatment for such disorders, a careful study of physiological, psychological, and lifestyle-related variables, as well as a study of interpersonal relations, is necessary (1). Other variables, such as social status, cultural issues, and beliefs and opinions prevalent in society, also play a role. One of the factors that could be considered as having an influence on the sexual function of postmenopausal women is physical activity/exercise.

Limited numbers of studies have been conducted regarding the effects of exercise on sexual function in women, and the relationship between physical activity/exercise and sexual function remains obscure. Some previous studies have found a significant relationship be-

tween physical activity/exercise and sexual function in postmenopausal women (6-10). Other studies, however, show that there is no relationship whatsoever between the two in postmenopausal women (11-13).

Exercise may enhance woman's sexual activity via several biomechanisms. It is known, for instance, that exercise stimulates the production of the corticotropin-releasing hormone (CRH), leading to the increased production of ACTH and endorphins (14). Moreover, endogenous opioids related to exercise may have a positive effect on sexual function (15).

Some studies have shown that exercise increases sexual arousal in healthy women, likely due to increased activity of the sympathetic nervous system (SNS) (16, 17).

One study has shown that sexual satisfaction is heightened in women who experience regular physical activity (6). In addition, it has been demonstrated that early postmenopausal women who exercise more frequently have a higher degree of sexual desire. In other words, the amount of exercise may be predictive of a significant increase in sexual desire (9).

On the other hand, a lack of physical activity can lead to diabetes, hypertension, and obesity, all of which could result in decreased libido and sexual dysfunction (18).

Physical activity may be an effective way of preventing menopause-related symptoms. Studies have shown that physical activity and exercise are associated with reduced psychosocial and physical menopause symptoms (19, 20).

Exercise is the best general method for reaching a normal mental state (21). Exercise, then, can have a positive impact on an individual's sexual health.

However, some studies have not shown a positive effect of exercise on sexual function. One study indicated that a 12-month, moderate-intensity exercise intervention among postmenopausal women resulted in significant decreases in serum estrogens (22). Since estrogen plays an essential role in sexuality (5, 23), its deficiency would lead to low libido, as well as to a range of menopausal symptoms in women (24). The results of this study therefore should be taken into consideration.

Another study measured the effects of an intensive, 6-month-long behavioral weight-loss intervention on the sexual function of overweight and obese women. The intervention failed to improve the sexual function of the subjects to a considerable degree (25).

The results of some studies also suggest that exercise could strengthen the pelvic floor muscles; however, the results have not always supported that assumption (26).

2. Objectives

Given the fact that few studies have been conducted in this subject area-especially with postmenopausal women-in order to eliminate settle the discrepancies regarding the relationship between exercise and sexual function in postmenopausal women and also to provide assistance in designing interventions intended to promote sexual health in this group, the present study aimed to determine the effects of exercise on sexual function in postmenopausal women.

3. Patients and Methods

3.1. Subjects

This population-based, cross-sectional study, conducted from October 2013 to May 2014, was conducted on 405 postmenopausal women residing in Chalous and Nowshar, two cities located in Northern Iran. The inclusion criteria were as follows: natural menopause (neither surgical nor premature menopause); menopause occurring within the previous 3 years; no history of heart or serious mental disorder; an absence of severe psychological stress, such as involvement in an accident or the loss of a family member within the previous 3 months; being sexually active; the absence of sexual dysfunction in the husband; and not using herbal medicines containing phytoestrogens or supplements of sexual hormones. The sole exclusion criterion was the presence of flaws in, or the incompleteness of, the questionnaires.

3.2. Sampling Method

The minimum sample size was calculated to be 319, using the following formula:

$$n \geq \left[\frac{(z_{1-\frac{\alpha}{2}} + z_{1-\beta})^2}{0.5 \times \ln\left[\frac{(1+r)}{(1-r)}\right]} \right] + 3 \quad (1)$$

$$r = 0.20 \quad (2)$$

$$\begin{aligned} \alpha &= 0.05 \\ &\rightarrow z_{1-\frac{\alpha}{2}} \\ &= 1.96 \end{aligned} \quad (3)$$

$$\begin{aligned} 1 - \beta &= 0.95 \\ &\rightarrow z_{1-\beta} \\ &= 1.645 \end{aligned} \quad (4)$$

Thus, a total of 405 samples were used for this study. The expected power was calculated to be 0.95.

Questionnaires were distributed to 420 post-menopausal women, and 405 of the questionnaires were examined after excluding the flawed and incomplete ones.

A multistage, random sampling method was conducted. Initially, the files and lists of the households were analyzed in health centers, and data regarding the size of urban and rural populations were derived. Based on the proportion of the populations in the two cities (Chalous and Nowshahr), the percentage of sampling from both cities was determined by the quota method. In the second stage of the study, considering the multiple locations in each city and the size of the population in each region, the sample size for each region was determined by the quota method. In the third stage, either all or a number of eligible individuals from each city block (branch-like areas) were selected based on the area of, and on the size of, the population of each block. Via home visits or phone calls, the eligible individuals were informed about the study and were invited to participate. The individuals who agreed to participate were enrolled by completing an informed consent form.

3.3. Measuring Tools

The data were obtained through interviews via the use of the female sexual function index (FSFI), prepared by Rosen and colleagues (27), and a researcher-designed questionnaire. The questionnaires were anonymous and were completed by interviewers who were trained by the researchers and were sufficiently informed about the subject to be studied. The interviewers were able to explain any ambiguous cases to the subjects and to assist them in comprehending the questions.

The FSFI, a 19-item questionnaire, was developed as a brief, multidimensional self-report instrument for assessing the key dimensions of sexual function in women (27). It provides scores on six sexual function domains (desire, arousal, lubrication, orgasm, satisfaction, and pain) (28, 29). A total scaled score is obtained by combining scores from the six domains. The method of scoring is designed so that higher scores indicate better sexual function. The minimum and maximum scores for a total scaled score are 1.2 and 36, respectively. This tool examines the subjects' sexual function as experienced during the previous 4 weeks. For this questionnaire, a total score equal to or less than 26.55 is considered female sexual dysfunction (FSD). The reliability and validity of this questionnaire has been previously confirmed (27): The questionnaire has been used in many studies and has shown a high degree of internal consistency and reliability. It has also determined significant differences between patients and control groups

in the six domains identified (30). The validity of the Persian version of the questionnaire was confirmed by Mohammady et al. (29) and Fakhri et al. (31). In this study, the reliability of the FSFI was determined by the test-retest method. Cronbach's alpha and the ICC were 0.938 and 0.997, respectively. The translation validity of the FSFI has been verified by Fakhri et al. (2012) through forward and backward translation.

The researcher-designed questionnaire addressed personal and demographic characteristics, profile data about physical activity and exercise, and questions about marital relations (sex).

To determine the validity of the researcher-designed questionnaire, the method of content validity was used. The questionnaire was distributed to 10 faculty members at Shahid Beheshti University of Medical Sciences and was used in the study after revision.

In order to determine the reliability of division of marital relations, the test-retest method was used. The ICC was calculated as 0.806.

3.4. Statistical Analysis

The data were analyzed using the statistical software SPSS (version 18).

The continuous variables were checked for normality using the one-sample Kolmogorov-Smirnoff test. The results showed that all the variables had a normal distribution.

To evaluate the relationship between the FSFI scores and the exercise variables, given the normal distribution of the variables, parametric tests were used. To evaluate the questions related to marital relations sex and to marital relations in the researcher-designed questionnaire, given that the variables were ordinal, non-parametric tests were used.

To evaluate the relationship between the qualitative exercises variables-(a) exercise or the lack thereof; and (b) type of exercise-and sexual dysfunction, a t-test and the ANOVA were used. To determine the correlation between sexual dysfunction and the quantitative exercise variables: (a) frequency of weekly exercise; (b) duration of exercise at any time; and (c) duration of weekly exercise, the Pearson's correlation coefficient was used. The variables that had a significant correlation, or were close to having a significant correlation, with sexual function were included in the multiple linear regressions.

For the questions related to marital relations sex and to marital relations in the researcher-designed questionnaire, as well as to determine the correlation of different correlation of exercise with their respective variables, the Mann-Whitney (in the "no exercise" and "exercise" groups) and Kruskal-Wallis (in the "no exercise," "just walking," and

“other exercises” groups) tests were used; to determine the predictive factors of the variables, logistic regression was used. The level of significance was set at $P < 0.05$.

This study was approved by the ethical committee of Shahid Beheshti University of Medical Sciences, with the code “sbmu.rec.1392.293,” on Sep 8, 2013. Informed, written consents were also obtained from the subjects; the privacy of the subjects was maintained throughout the study.

4. Results

The mean age of the participants was 52.8 ± 3.7 (mean \pm SD) years. The characteristics of the women are shown in Table 1. In Table 2, comparisons of the two groups (exercising and non-exercising) are shown in terms of demographic and anthropometric characteristics.

The performance of at least one type of exercise was reported by 188 women (46.4%). One type of exercise was performed by 168 subjects (41.5%); 17 (4.2%) reported completing two types of exercise; and 3 (0.7%) reported doing more than two types of exercise.

Table 1. Distribution of the Demographic and Anthropometric Characteristics of the Postmenopausal Women^a

Variables	Values
Age, y	52.84 \pm 3.71
Duration of menopause, m	19.81 \pm 14.36
Age of menstrual cessation, y	50.20 \pm 3.46
BMI, Kg/m ²	29.47 \pm 5.45
Waist to hip ratio	0.87 \pm 0.08
Frequency of weekly exercise, t	4.12 \pm 3.00
Duration of exercise at any time, m	55.08 \pm 60.00
Duration of weekly exercise, h	3.82 \pm 3.00
Job	
Housekeeper	324 (80.0)
Employed	81 (20.0)
Education levels	
Illiterate or merely reading and writing	257 (63.5)
Diploma and under diploma	112 (27.7)
Higher diploma	36 (8.9)
Exercise	
Lack of exercise	217 (53.6)
Exercise	188 (46.4)

^aData are presented as No.(%) or mean \pm SD.

The most common type of exercise performed was walking (79.8%). For the women who exercised, the aver-

Table 2. Comparison of the Two Groups (Exercising and Non-Exercising) in Terms of Demographic and Anthropometric Characteristics^a

Variables	Lack of Exercise (N = 217)	Exercise (N = 188)	P Value ^b
Quantitative Variables			
Age, y	53.15 \pm 3.85	52.50 \pm 3.49	0.076
Duration of menopause, m	21.04 \pm 14.73	18.40 \pm 13.83	0.065
Age of menstrual cessation, y	50.43 \pm 3.57	49.95 \pm 3.31	0.162
BMI, Kg/m ²	29.61 \pm 5.48	29.30 \pm 5.43	0.576
Waist to hip ratio	0.88 \pm 0.08	0.86 \pm 0.09	0.020
Qualitative Variables			
Job			0.019
House-keeper	183 (84.63)	141 (75.0)	
Employed	34 (15.7)	47 (25.0)	
Education Levels			> 0.001
Illiterate or merely reading and writing	168 (77.4)	89 (47.3)	
Diploma and under diploma	43 (19.8)	69 (36.7)	
Higher diploma	6 (2.8)	30 (16.0)	

^aData are presented as mean \pm SD or No. (%).

^bP value is based on t-test for quantitative data and Chi square test for qualitative data.

age frequency of exercise per week, the duration of exercise per session, and the duration of exercise per week were calculated to be 4.12 ± 2.1 , 55.08 ± 29.7 , and 3.82 ± 3.1 (in minutes), respectively. The greatest frequency of exercise was three times a week (29.8%), 31 to 60 minutes per session (48.4%), and up to 3 hours of exercise per week (58.5%).

The evaluation of the sexual function questionnaire (FSFI) indicated that the mean total score was 24.11 (in the range of 1.2 to 36.0). Table 3 shows the mean and standard deviations of the scores in all the sexual function domains. Among them, the lowest score was associated with the arousal domain, and the highest score was associated with the satisfaction domain. Among the subjects, 61% had FSD.

The total FSFI score and the scores for the desire, arousal, lubrication, orgasm, and satisfaction domains of the women who exercised were not statistically different from those who did not exercise. There was a significant difference in the pain-domain scores ($P = 0.013$) (Table 4). No significant correlation was found between the type of

Table 3. The Mean and Standard Deviations of the Scores in the Domains and the Total Scores of Sexual Function in the Postmenopausal Women^a

FSFI Domains	Main Scores	Range (0 – 100)
Desire	3.80 ± 0.93	54.20 ± 19.41
Arousal	2.85 ± 1.10	47.53 ± 18.31
Lubrication	4.39 ± 1.38	73.26 ± 23.04
Orgasm	4.13 ± 1.33	68.90 ± 22.12
Satisfaction	4.54 ± 1.22	75.69 ± 20.32
Pain	4.39 ± 2.64	73.18 ± 27.28
Total score (six domains)	24.11 ± 6.04	65.85 ± 17.36

^aData are presented mean ± SD.

exercise performed and the FSFI total score.

Table 4. Comparison of the Scores in Different Sexual Function Domains in the Presence or Absence of Exercise

FSFI Domains	Mean Scores in Both Situations		P Value
	Exercise (N:188)	No Exercise (N:217)	
Desire	3.73	3.86	NS
Arousal	2.75	2.93	NS
Lubrication	4.29	4.48	NS
Orgasm	4.09	4.17	NS
Satisfaction	4.57	4.52	NS
Pain	4.17	4.58	0.013
Total score (six domains)	23.61	24.55	NS

Given the fact that most of the subjects who exercised (79.8%) performed walking as an exercise, after dividing the subjects into three groups (no exercise, only walking, and other exercises), the data were re-examined via the ANOVA and Scheffe post hoc tests. The results showed that the FSFI total scores were significantly different among those who were doing exercises except walking, and the group that did not exercise ($P = 0.014$) or walked ($P = 0.043$). Therefore, the group that was doing other exercises had the lowest mean total FSFI score (21.90), and those in the no exercise group had the highest mean total FSFI score (24.55) (Table 5). A study of the various FSFI domains revealed that the mean scores in the domains of lubrication and pain were significantly lower among those who were doing other exercises compared to those who did not exercise or who just walked ($P < 0.05$) (Table 4).

In calculating the Pearson correlation coefficient, it was found that among the subjects who exercised, the relationships between the FSFI total score and the frequency

of exercise per week, the duration of exercise at any time, and the duration of exercise in a week, were not significant. The results showed that the frequency of weekly exercise and the scores in the lubrication ($P = 0.014$) and orgasm ($P = 0.045$) domains had a significant positive correlation. On the other hand, a significant negative correlation was found between the duration of exercise at any time and the scores in the satisfaction ($P = 0.049$) and pain ($P = 0.008$) domains (Table 6).

In order to determine the predictive factors of the FSFI total scores and the scores in the sexual function domains, multiple linear regressions was used. The results showed that none of the exercise variables were a predictor of sexual function (Table 7).

The average frequency of weekly exercise among the subjects whose sexual relations had decreased or stopped after menopause (3.9) was significantly lower than those whose sexual relations had increased or had not changed (4.6) ($P = 0.035$). Regarding the duration of exercise at any time and the duration of weekly exercise, no significant difference was found. The logistic regression results showed that exercise ($P = 0.029$) was a predictor of the variation in sexual relations after menopause, so that the chances of decreased sexual relations was 2.76 times higher in the women who exercised (Table 7).

The average frequency of weekly exercise was significantly lower for the subjects whose sexuality had reduced or stopped after menopause (3.8) compared to those whose sexual relations had increased or had not changed (4.9) ($P = 0.001$). No significant difference was found between the groups in terms of the duration of exercise at any time and the duration of weekly exercise. The logistic regression results showed that exercise ($P = 0.011$) (Table 7) and the frequency of weekly exercise ($P = 0.044$) are predictors of the variation in sexual relations after menopause. Therefore, the chances of reduced sexual desire in the women who exercised were 3.4 times higher. However, by increasing the frequency of exercise in a week by one unit, the chances of reduced sexual desire were decreased by 80.2%.

With regard to the assessment of marital relationships (sexual) after menopause in the three groups-(1) no exercise; (2) just walking; and (3) other exercises-it was determined that 40% of those who performed exercises other than walking reported the level of their sexual relations after menopause to be "low to none," while this ratio was 19.5% in the subjects who only walked, and 18.9% in the non-exercising group. The Kruskal-Wallis test showed that satisfaction with the level of marital relations after menopause was significantly lower in the group that was doing exercises other than walking ($P = 0.002$) compared to the other two groups. The Spearman correlation coefficients were also determined for the subjects who exercised: The fre-

Table 5. Comparison of Scores in the Different Sexual Function Domains in Terms of the Three Types of Exercise^a

FSFI Domains	Three Types of Exercise			P Value	Post Hoc Test Results ^b
	No Exercise (N:217)	Just Walking (N:133)	Other Exercises (N:55)		
Desire	3.86	3.77	3.62	NS	-
Arousal	2.93	2.83	2.57	NS	-
Lubrication	4.48	4.48	3.85	0.007	Scheffe: The scores in the lubrication domain are significantly different among those who performed exercises other than walking compared to the group that did not exercise (P = 0.010) or just walked (P = 0.018).
Orgasm	4.17	4.16	3.91	NS	-
Satisfaction	4.52	4.64	4.39	NS	-
Pain	4.58	4.43	3.54	< 0.001	Scheffe: The scores in the pain domain are significantly different among those who performed exercises other than walking compared to the group that did not exercise (P < 0.001) or just walked (P = 0.003).
Total score (six domains)	24.55	24.32	21.90	0.013	Scheffe: The FSFI total scores are significantly different among those who performed exercises other than walking compared to the group that did not exercise (P = 0.014) or just walked (P = 0.043).

^aData are presented as mean score.^bThe Scheffe post hoc test results showed that the scores in the lubrication and pain domains, as well as the FSFI total scores, were significantly different for those who performed exercises other than walking compared to the group that did not exercise or just walked.**Table 6.** Correlation Between the Scores of Sexual Function and the Frequency and Duration of Exercise

Characteristics	Domains of Sexual Function ^a													
	Desire		Arousal		Lubrication		Orgasm		Satisfaction		Pain		Total Score	
	r	P	r	P	r	P	r	P	r	P	r	P	r	P
Frequency of exercise in a week	0.041	NS	0.077	NS	0.180	0.014	0.146	0.045	0.047	NS	0.142	NS	0.142	NS
Duration of exercise at any time	-0.004	NS	-0.076	NS	-0.070	NS	-0.054	NS	-0.144	0.049	-0.193	0.008	-0.125	NS
Duration of exercise in a week	-0.044	NS	-0.052	NS	0.004	NS	-0.003	NS	-0.082	NS	-0.039	NS	-0.043	NS

^aType of test: Pearson's correlation coefficient.

quency of weekly exercise, the duration of exercise at any time, and the duration of weekly exercise had no significant correlation with satisfaction with the level of marital relationship after menopause. The results of the logistic regression analysis showed that none of the variables related to exercise were a predictor of satisfaction with the level of marital relations after menopause.

It should be noted that since the data were collected through interviews in this study, there were no missing values.

5. Discussion

This study demonstrated that, for menopausal women, more frequent exercise will improve some sexual function domains.

In this study, no connection was found between exercise and the total scores, as well as the scores in the sexual function domains, with the exception of the pain domain. The results of a few other studies (12, 13, 32) also failed to show a relationship between exercise and sexual function scores. However, Gerber and colleagues found a significant correlation between exercise and sexual satisfaction (7), and Woods et al. found a significant correlation between exercise and sexual desire (9), both of which are sexual function domains. The differences between the results of these studies could be due to differences in the social and cultural fabrics of the communities under study, as well as the inclusion criteria. It should be noted that the studies of Gerber et al. (7) and Woods et al. (9) were not community-based studies.

One of the factors that could be considered a limitation of this study is the possibility that those who reported

Table 7. Multiple Linear Regression and Logistic Regression in Terms of the Contribution of Exercise in Predicting the FSFI Scores, Marital Satisfaction, and Changes in Sexual Activity and Sexual Desire After Menopause

	Beta	SE	P Value	Exp (B)
Multiple Linear Regression				
FSFI				
Desire	-0.038	.088	.577	
Arousal	-0.071	.104	.298	
Lubrication	0.024	.170	.691	
Orgasm	-0.045	.127	.504	
Satisfaction	0.027	.115	.684	
Pain	-0.038	.130	.504	
Total score	-0.046	.450	.389	
Logistic Regression				
Variations in sexual activity after menopause	1.015	.464	.029	2.760
Variations in sexual desire after menopause	1.240	.490	.011	3.456
Marital dissatisfaction	0.234	.398	.557	1.263

walking as an exercise gave a false answer. Some of the subjects might have considered their typical daily walking to be an exercise. This issue could be a limitation of this study, even though it was noted by the interviewer and was partly under control.

Therefore, given that a significant number of the exercising subjects (79.8%) reported walking as their exercise, after dividing the subjects into three groups: 1) no exercise, 2) only walking, and 3) other exercises, the analysis was conducted again in order to remove ambiguity. The results showed that the scores in the lubrication and pain domains, as well as the total sexual function scores, were significantly lower in the group that performed exercises other than walking compared to those who were only walking or were not exercising at all.

However, the study of the quantitative variables related to exercise showed that the frequency of weekly exercise had a significant positive correlation with the scores in the lubrication and orgasm domains ($P < 0.05$). In other words, when the frequency of weekly exercise increases, the postmenopausal women's sexual function improved in these domains. This illustrates the fact that when exercise becomes a regular physical activity and is performed professionally and to a greater degree, it could have positive effects on both the lubrication and orgasm domains in postmenopausal women.

There was a negative association between the duration of exercise and the satisfaction and pain domains ($P < 0.05$). That is, when the duration of exercise at any time is higher, it had a negative impact on both the domains. This

finding, however, is inconsistent with the results of the study done by Gerber et al. which found that the amount of exercise is directly correlated with sexual satisfaction. This particular finding of the present study is most likely due to the fact that most of the subjects, in their responses to the questions, reported devoting a greater length of time to walking (7).

The results of this study showed that among the subjects who exercised, the frequency of weekly exercise was significantly lower in those with decreased sex and sexual desire and in those with no sex and sexual desire compared to those with unchanged or increased sex and sexual desire.

By studying the level of satisfaction with marital relationships experienced by the subjects, it was found that in the group that was performing other exercises except walking, compared to the other two groups (no exercise and just walking), the level of satisfaction with marital relationships after menopause was lower ($P < 0.05$). Considering the variations in sex, sexuality, and satisfaction with marital relationships after menopause, it could be inferred that the women who have had undesirable experiences with respect to their sexual desires and sexual intercourse during the postmenopausal period have turned to exercise-particularly more technical exercises (not walking)-more so than others.

Perhaps this is indicative of the fact that Iranian postmenopausal women turn to exercise in order to compensate for their lack of sex and sexuality. This, of course, does not apply to those subjects who are more professional and

who engage in higher levels of weekly exercise, because, in those women, the purpose of exercise is not only to fill gaps in their lives, but has professional aspects. To reach any conclusions, however, further studies are needed. The present study explains only the correlations between the variables. In order to reach conclusions about the relationship between exercise and sexual function, analytic studies are needed.

Considering a maximum 3-year range from the onset of menopause as an inclusion criterion led to the partial control of age as an important interfering factor in sexual function and menopausal symptoms, which is considered to be a strong advantage of this study.

Our study may have been limited by possible improper answers given by some of the poorly educated, or illiterate, women in response to such sensitive questions. To overcome this limitation, establishing close relationships, creating a safe environment for questioning, and ensuring the confidentiality of information were considered a part of the research strategy.

5.1. Conclusions

In conclusion, frequent qualified exercise could improve the sexual function of postmenopausal women. Further studies with a larger sample size of women representing various ethnicities are suggested.

Acknowledgments

We are grateful to the postmenopausal women residing in Chalous and Nowshahr, located in Northern Iran, for their participation in this study.

Footnotes

Authors' Contribution: Soheila Nazarpour: project development, data collection, manuscript writing, data analysis; Masomeh Simbar: project development, data management, manuscript writing; Fahimeh Ramezani Tehrani: project development, data management, manuscript writing; Hamid Alavi Majd: data analysis management.

Financial Disclosure: The authors declare no conflicts of interest. In addition, the authors report no financial or commercial conflicts of interest.

Funding/Support: This manuscript was based on a part of a Ph.D. thesis, faculty of nursing and midwifery, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

References

- Berek JS. Berek and Novak's Gynecology. 14th. Philadelphia: Lippincott Williams and Wilkins; 2012.
- DSM-5, editor. Database on the internet. 5th ed. Am Psych Association; 2013. Diagnostic and statistical manual of mental disorders.
- Nascimento ER, Maia AC, Pereira V, Soares-Filho G, Nardi AE, Silva AC. Sexual dysfunction and cardiovascular diseases: a systematic review of prevalence. *Clinics*. 2013;**68**(11):1462-8. doi: [10.6061/clinics/2013\(11\)13](https://doi.org/10.6061/clinics/2013(11)13).
- Beigi M, Fahami F, Hassan-Zahraei R, Arman S. Sexual dysfunction in menopause.[in Persian]. *J Isfahan Med Sch*. 2008;**26**(90):294-300.
- Ambler DR, Bieber EJ, Diamond MP. Sexual function in elderly women: a review of current literature. *Rev Obstet Gynecol*. 2012;**5**(1):16-27. [PubMed: [22582123](https://pubmed.ncbi.nlm.nih.gov/22582123/)].
- Park YJ, Kim HS, Chang SO, Kang HC, Chun SH. Sexuality and related factors of postmenopausal Korean women. *Taehan Kanho Hakhoe Chi*. 2003;**33**(4):457-63. [PubMed: [15314420](https://pubmed.ncbi.nlm.nih.gov/15314420/)].
- Gerber JR, Johnson JV, Bunn JY, O'Brien SL. A longitudinal study of the effects of free testosterone and other psychosocial variables on sexual function during the natural traverse of menopause. *Fertil Steril*. 2005;**83**(3):643-8. doi: [10.1016/j.fertnstert.2004.08.028](https://doi.org/10.1016/j.fertnstert.2004.08.028). [PubMed: [15749493](https://pubmed.ncbi.nlm.nih.gov/15749493/)].
- Dabrowska J, Drosdzol A, Skrzypulec V, Plinta R. Physical activity and sexuality in perimenopausal women. *Eur J Contracept Reprod Health Care*. 2010;**15**(6):423-32. doi: [10.3109/13625187.2010.529968](https://doi.org/10.3109/13625187.2010.529968). [PubMed: [21091177](https://pubmed.ncbi.nlm.nih.gov/21091177/)].
- Woods NF, Mitchell ES, Smith-Di Julio K. Sexual desire during the menopausal transition and early postmenopause: observations from the Seattle Midlife Women's Health Study. *J Womens Health (Larchmt)*. 2010;**19**(2):209-18. doi: [10.1089/jwh.2009.1388](https://doi.org/10.1089/jwh.2009.1388). [PubMed: [20109116](https://pubmed.ncbi.nlm.nih.gov/20109116/)].
- Lorenz TA, Meston CM. Exercise improves sexual function in women taking antidepressants: results from a randomized crossover trial. *Depress Anxiety*. 2014;**31**(3):188-95. [PubMed: [24754044](https://pubmed.ncbi.nlm.nih.gov/24754044/)].
- McAndrew LM, Napolitano MA, Albrecht A, Farrell NC, Marcus BH, Whiteley JA. When, why and for whom there is a relationship between physical activity and menopause symptoms. *Maturitas*. 2009;**64**(2):119-25. doi: [10.1016/j.maturitas.2009.08.009](https://doi.org/10.1016/j.maturitas.2009.08.009). [PubMed: [19781877](https://pubmed.ncbi.nlm.nih.gov/19781877/)].
- Mirzaiinjmbadi K, Anderson D, Barnes M. The relationship between exercise, Body Mass Index and menopausal symptoms in midlife Australian women. *Int J Nurs Pract*. 2006;**12**(1):28-34. doi: [10.1016/j.ijn.2006.00547.x](https://doi.org/10.1016/j.ijn.2006.00547.x). [PubMed: [16403194](https://pubmed.ncbi.nlm.nih.gov/16403194/)].
- Haimov-Kochman R, Constantini N, Brzezinski A, Hochner-Celnikier D. Regular exercise is the most significant lifestyle parameter associated with the severity of climacteric symptoms: a cross sectional study. *Eur J Obstet Gynecol Reprod Biol*. 2013;**170**(1):229-34. doi: [10.1016/j.ejogrb.2013.06.018](https://doi.org/10.1016/j.ejogrb.2013.06.018). [PubMed: [23866909](https://pubmed.ncbi.nlm.nih.gov/23866909/)].
- Mastorakos G, Pavlatou M, Diamanti-Kandarakis E, Chrousos GP. Exercise and the stress system. *Hormones (Athens)*. 2005;**4**(2):73-89. [PubMed: [16613809](https://pubmed.ncbi.nlm.nih.gov/16613809/)].
- Bodnar RJ, Hadjimarkou MM. Endogenous opiates and behavior: 2002. *Peptides*. 2003;**24**(8):1241-302. [PubMed: [14612197](https://pubmed.ncbi.nlm.nih.gov/14612197/)].
- Lorenz TA, Meston CM. Acute exercise improves physical sexual arousal in women taking antidepressants. *Ann Behav Med*. 2012;**43**(3):352-61.
- Meston CM, Gorzalka BB. The effects of immediate, delayed, and residual sympathetic activation on sexual arousal in women. *Behav Res Ther*. 1996;**34**(2):143-8. [PubMed: [8741721](https://pubmed.ncbi.nlm.nih.gov/8741721/)].
- Angorany H. Relationship between exercise and sexual health.[In Persian] 2014.. Available from: <http://tanasob.mihanblog.com/post/225>.
- Kim MJ, Cho J, Ahn Y, Yim G, Park HY. Association between physical activity and menopausal symptoms in perimenopausal women. *BMC Womens Health*. 2014;**14**:122. doi: [10.1186/1472-6874-14-122](https://doi.org/10.1186/1472-6874-14-122). [PubMed: [25277534](https://pubmed.ncbi.nlm.nih.gov/25277534/)].
- Chang SJ, Chee W, Im EO. Menopausal symptoms and physical activity in multiethnic groups of midlife women: a secondary analysis. *J Adv Nurs*. 2013;**69**(9):1953-65. doi: [10.1111/jan.12056](https://doi.org/10.1111/jan.12056). [PubMed: [23171423](https://pubmed.ncbi.nlm.nih.gov/23171423/)].

21. Rashidi Z, Rashidi A, Rouzbahani R, Rezaei F. Effects of group exercise on depression in women: A case study. *J Isfahan Med Sch Res P*. 2013;**30**(212):1856-61.
22. McTiernan A, Tworoger SS, Ulrich CM, Yasui Y, Irwin ML, Rajan KB, et al. Effect of exercise on serum estrogens in postmenopausal women: a 12-month randomized clinical trial. *Cancer Res*. 2004;**64**(8):2923-8. [PubMed: [15087413](#)].
23. Redmond GP. Hormones and sexual function. *Int J Fertil Womens Med*. 1999;**44**(4):193-7. [PubMed: [10499740](#)].
24. Camacho ME, Reyes-Ortiz CA. Sexual dysfunction in the elderly: age or disease?. *Int J Impot Res*. 2005;**17 Suppl 1**:S52-6. doi: [10.1038/sj.ijir.3901429](#). [PubMed: [16391544](#)].
25. Huang AJ, Stewart AL, Hernandez AL, Shen H, Subak LL, Program to Reduce Incontinence by D, et al. Sexual function among overweight and obese women with urinary incontinence in a randomized controlled trial of an intensive behavioral weight loss intervention. *J Urol*. 2009;**181**(5):2235-42. doi: [10.1016/j.juro.2009.01.046](#). [PubMed: [19296980](#)].
26. Lara LA, Montenegro ML, Franco MM, Abreu DC, Rosa e Silva AC, Ferreira CH. Is the sexual satisfaction of postmenopausal women enhanced by physical exercise and pelvic floor muscle training?. *J Sex Med*. 2012;**9**(1):218-23. doi: [10.1111/j.1743-6109.2011.02516.x](#). [PubMed: [22023812](#)].
27. Rosen R, Brown C, Heiman J, Leiblum S, Meston C, Shabsigh R, et al. The Female Sexual Function Index (FSFI): a multidimensional self-report instrument for the assessment of female sexual function. *J Sex Marital Ther*. 2000;**26**(2):191-208. doi: [10.1080/009262300278597](#). [PubMed: [10782451](#)].
28. Meston CM. Validation of the Female Sexual Function Index (FSFI) in women with female orgasmic disorder and in women with hypoactive sexual desire disorder. *J Sex Marital Ther*. 2003;**29**(1):39-46. doi: [10.1080/713847100](#). [PubMed: [12519665](#)].
29. Mohammady K, Heidari M, Faghih Zadeh S. Validity of the Persian version of Female Sexual Function Index-FSFI scale as the Female Sexual Function Index. [in persian]. *J Payesh*. 2008;**7**(2):269-78.
30. Wiegel M, Meston C, Rosen R. The female sexual function index (FSFI): cross-validation and development of clinical cutoff scores. *J Sex Marital Ther*. 2005;**31**(1):1-20. doi: [10.1080/00926230590475206](#). [PubMed: [15841702](#)].
31. Fakhri A, Pakpour AH, Burri A, Morshedi H, Zeidi IM. The Female Sexual Function Index: translation and validation of an Iranian version. *J Sex Med*. 2012;**9**(2):514-23. doi: [10.1111/j.1743-6109.2011.02553.x](#). [PubMed: [22146084](#)].
32. Wilbur J, Miller AM, McDevitt J, Wang E, Miller J. Menopausal status, moderate-intensity walking, and symptoms in midlife women. *Res Theory Nurs Pract*. 2005;**19**(2):163-80. [PubMed: [16025696](#)].