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Effect of Aerobic Exercise Assisted With Soy Products on Hot Flushes and Quality of Life in Postmenopausal Women

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ABSTRACT

Objective: This study was conducted to determine the effect of aerobic exercise assisted with soy products on hot flushes and quality of life in postmenopausal women. **Methods:** Forty postmenopausal women complaining from hot flushes were selected from outpatient clinic of Faculty of Physical Therapy, Cairo University, their age ranged from 50-55 years old and their body mass index ranged from 30-32 kg/m², they were all divided randomly into two equal groups. Group (A) (study group): 20 women who received treadmill exercise program for 30 minutes at a level corresponding to 13-16 on the scale of ratings of perceived exertion (RPE) 3 times per week for 12 weeks in addition to daily intake of soy products (phytoestrogen) as 100 milliliters soy milk and 100 grams soybean. Group (B) (control group): 20 women who received only soy products (phytoestrogen) as 100 milliliters soy milk and 100 grams soybean daily for 12 weeks. All participants were assessed before and after the treatment program through hormonal analysis to show level of F.S.H and L.H, and modified MENCAL quality of life questionnaire in addition to hot flushes evaluation using dairy card. **Results:** revealed that level of F.S.H and L.H showed a statistically highly significant ($P < 0.001$) reduction in group (A) than group (B). Also, there was statistically significant improvement in quality of life and decrease severity of hot flushes in group (A) comparing group (B). **Conclusion:** Regular aerobic exercise assisted with soy products appears to be an effective, safe and successful alternative method to decrease hot flushes and improve quality of life in postmenopausal women.

Key words: Aerobic exercises, Hot flushes, Soy products, Quality of Life.

INTRODUCTION

Menopause is diagnosed after 12 months of amenorrhea resulting from the permanent cessation of ovarian function at a mean age of about 51 years. The pre-menopause, a time of changing ovarian function, precedes the final menses by several years. The physiology and clinical manifestations of this transition to menopause are not well understood; however, some symptoms related to menopause begin during pre-menopause. Causal associations of menopause with several symptoms and diseases are proposed [1,2].

The mean age of the menopause in Egypt is 46.7 years, which is low compared to many countries, but this age has been rising recently, the incidence of premenopausal and menopause-associated symptoms in Egyptian women is higher than in the west, probably because of the different 'socio-cultural attitudes' towards

menopause in different communities [3].

Symptoms ascribed to menopausal changes have embraced every body system: vasomotor, cardiovascular, metabolic, sensory, digestive, skeletal, muscular, glandular and central nervous system, in addition to symptoms which may be due to coincidental pathologic changes, concomitant cardiovascular change, or other age-related changes [4].

Hot flushes are defined as transient, recurrent periods of heat sensation and redness, often concomitant with sweats, increase in peripheral vasodilatation, skin temperature and skin moisture has been demonstrated during such episodes by the registration of skin conductance, thermograms or plethysmography in the affected areas of the face, neck, head or breast [5].

However, Development of hot flushes which occur in about 80% of the female population and persist for up to

5 years after the menopause are associated with an increase in skin temperature and conduction, it may be associated with high gonadotrophin levels [6].

Hot flushes are typically more frequently and severe at night (often awakening a woman from sleep) or during times of stress. One of the major complaints associated with hot flushes is insomnia, which can have a domino effect on the woman's overall quality of life [7,8].

It was observed that 23–37% of women in their 60's and 11–20% of women in their 50's reported hot flushes with reported sleep disruption, poorer memory performance, depressed mood and overall poorer quality of life, most women with menopausal symptoms, principally hot flushes, seek treatment for them [9].

Regulation of serotonin and norepinephrine may change as estrogen levels fluctuate and thus contribute to depression and impaired quality of life. Decline in estrogen concentrations may, in turn, decrease levels of these hormones, leading to psychological symptoms in the menopausal transition of some women [10].

Aerobic exercise is an exercise having adequate oxygen supply to the working groups of muscle without exhaustion and describes metabolic process utilizing oxygen [11].

Fewer physically active women had severe vasomotor symptoms compared with sedentary women this due to the fact of physical exercise on regular timing effects neurotransmitters which regulate central thermoregulation [12].

Soy products represented an excellent source of high quality protein and they are low in saturated fat and cholesterol free. But, moreover, soy contains a great amount of dietary fiber; it is the second largest component in soy, and it has shown to reduce risk of colon cancer and other diseases [13].

Soy products contains Phytoestrogens which are plant substances functionally similar to 17-estradiol or that produce estrogenic effects; they have a structure similar to estrogen [14].

So, this study was therefore designed to investigate the effect of aerobic exercise assisted with soy products on hot flushes and quality of life in postmenopausal women.

METHODS

This study was carried out on forty postmenopausal women suffering from hot flushes were participated in this study, their age were ranged between 50-55 years and their body mass index ranged from 30 to 32 kg/m² as shown in table (1), this study was approved by Research Ethical Committee, Faculty of Physical Therapy, Cairo University No: P.T.REC/012/00719.

All participant were recruited from outpatient clinic of

Faculty of Physical Therapy, Cairo University, they were all free from diseases that interfere with the procedure and results of the study, women on hormonal replacement therapy were excluded from this study. They were divided randomly into two equal groups.

Table 1: Patients physical characteristics.

	Group (A) (n= 20)	Group (B) (n= 20)	t-value	P-value	Significance
Age(years)	52.7± 1.5	52.2±1.7	0.83	0.4	NS
BMI(kg/m ²)	31.1±0.5	30.9±0.6	0.86	0.46	NS

NS: non-significant

Group (A): Consisted of twenty women who practiced treadmill exercise program for 30 minutes at Ratings of perceived exertion (RPE) were used to check the intensity of aerobic training. Participants were instructed to exercise at a level corresponding to 13–16 on the Borg Rating of Perceived Exertion (RPE) Scale 15 that ranged from 6 to 20 which corresponds to about 64%–80% of maximal heart rate, started by 5 minutes warming up in the form of walking on the treadmill by low speed, followed by 20 minutes walking at moderate intensity then followed by 5 minutes cooling down of walking as in warming up the exercise sessions were repeated 3 times per week for 12 weeks in addition to daily intake of soy products (phytoestrogen) as 100 milliliters soy milk and 100 grams soybean.

Group (B): Consisted of twenty women who received a daily intake of soy products (phytoestrogen) as 100 milliliters soy milk and 100 grams soybean for 12 weeks.

A) Assessment tools

Height and Weight scale: was used to measure the body weight and height for each participant before starting the study in order to determine the body mass index (BMI), according to the following equation:

$$\text{BMI} = \text{Mass (Kg)} / (\text{Height (m)})^2.$$

IMMULITE 1000 immunoassay analyzer and SimuTRAC* LH [57Co]/FSH [125I] RADIOIMMUNOASSAY KIT: were used to evaluate level of follicle stimulating hormone (F.S.H) and luteinizing hormone (L.H) for all groups before and after the study.

Hot flushes assessment by dairy card: The number of hot flushes (day and night) and its severity were recorded daily by the patient herself [16].

Modified MENCA V quality of life questionnaire: was used to determine physical and emotional state as well as evaluation of social support for each patient in both groups [17].

B) Treatment tools

Electrical Treadmill: (vega max 6000 AC): used to apply exercise program for group (A).

Soy Products: Such as Soy milk, every woman in both groups received 100 milliliters of soy milk daily; in addition to 100 grams soybean/day.

All women in both groups (A&B) were given a full explanation of protocol of the study and consent form signed by each patient before participation, they were subjected to history taking; accurate evaluation and then the subjects were referred to the gynecologist to confirm the diagnosis.

Treatment procedures

For group (A)(study group): the treadmill (vega max 6000AC) was used for 30 minutes as following: 5 minutes warming up by walking on the treadmill by low speed, 20 minutes walking at a level corresponding to 13–16 on the scale of ratings of perceived exertion (RPE), then followed by 5 minutes cooling down by walking on the treadmill by low speed as in warming up the treatment sessions was repeated 3 times per week for 12 weeks in addition to diet modification contains soy products (phytoestrogen) as 100 milliliters soy milk and 100 grams soybean in the morning as a breakfast alone to ensure its absorption, this dose was received for 12 weeks.

For Group (B) (control group): this group received only the diet modification contained soy products (phytoestrogen) as 100 milliliters soy milk and 100 grams soybean daily in the morning as a breakfast alone to ensure its absorption, this dose was taken for 12 weeks.

Statistical Analysis

Results are expressed as mean \pm standard deviation (SD), median (minimum-maximum) or number (%). Comparison between values of different variables in the two studied groups was performed using unpaired t-test or Mann-Whitney U whenever it was appropriate while comparison between pre- and post-treatments within the same group was performed using paired t-test or Wilcoxon Signed Ranks Test. Comparison between categorical data was performed using Chi square test. SPSS computer program (version 16 windows) was used for data analysis. P value \leq 0.05 was considered significant and $<$ 0.01 was considered highly significant.

RESULTS

The mean value and standard deviation of the level of

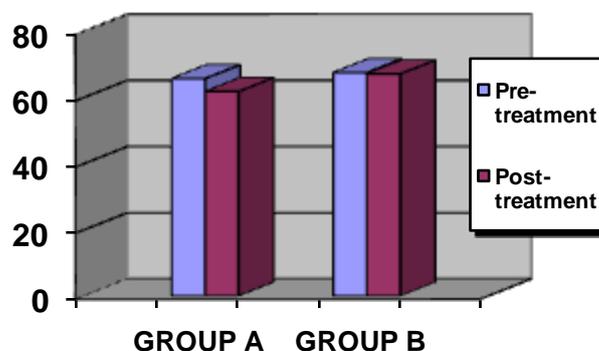
F.S.H before the treatment for group (A) was (65.7 \pm 7.3) IU/L and post-treatment was (61.8 \pm 6.9) IU/L indicating highly significant difference as the t-value was (6.37) and P-value was (0.0001), for group (B) there was non-significant difference between level of F.S.H before and after the study, the mean value and standard deviation of F.S.H pre-treatment was (67.49 \pm 7.6) IU/L and post-treatment was (67.11 \pm 1) IU/L where the t-value was (1.12) and P-value was (0.28) as shown in table (2) & Fig. (1).

Table 2: level of F.S.H and L.H pre-treatment and post-treatment in both groups (A&B)

	Group (A) (n= 20)	Group (B) (n= 20)	t-value	p-value
Pre-treatment	65.7 \pm 7.3	67.49 \pm 7.9	0.041	0.97(N S)
Post-treatment	61.8 \pm 6.9	67.11 \pm 1	2.3	0.025 (S)
Mean difference	3.9	0.38		
% of improvement	5.9%	0.6%		
t-value	6.37	1.12		
P-value	0.0001	0.28		
Significance	HS	NS		

P: probability, S: significance, HS:highly significant, NS: non-significant

Fig. 1: level of F.S.H pre-treatment and post-treatment in both groups (A&B)



The mean value and standard deviation of the level of L.H before the treatment for group (A) was (39.13 \pm 6) IU/L and post-treatment was (36.53 \pm 5.7) IU/L indicating significant difference as the t-value was (8.24) and P-value was ($<$ 0.0001), there was no significance difference between level of L.H before and after the treatment, the mean value and standard deviation of the level of L.H before the treatment for group (B) was (41.3 \pm 5.5) IU/L and post-treatment was (41.34 \pm 5.4) IU/L where the t-value was (0.04) and P-value was (0.97) as shown in table (3) & Fig. (2).

The Severity of hot flushes after treatment revealed significant difference between the severities of hot flushes after treatment between two groups favoring

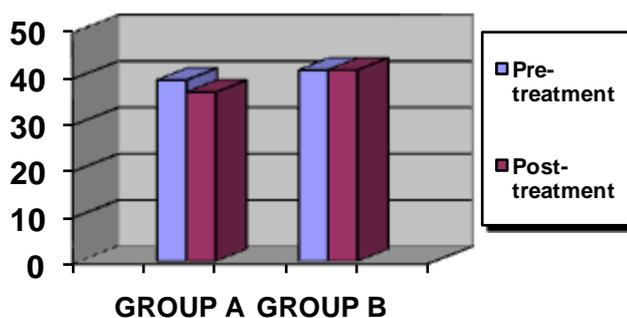
group (A) as revealed by Chi-Square Tests. The percentage of women with hot flushes in group (A) after treatment was (46.7% none, 46.7% mild, 6.6% moderate, 0.00% severe), while the percentage of women with hot flushes in group (B) after treatment was (6.7% none, 40.0% mild, 33.3% moderate, 20.0% severe) and the P-value was (0.025) as shown in table (4) & Fig (3).

Table 3:level ofLH pre-treatment and post-treatment in both groups (A&B)

	Group (A) (n= 20)	Group (B) (n= 20)	t-value	P-value
Pre-treatment	39.13±6	41.3±5.5	0.045	0.96 (NS)
Post-treatment	36.53±5.7	41.34±5.4	2.7	0.009 (S)
Mean difference	2.6	0.04		
% of improvement	6.6%	0.1%		
t-value	8.24	0.04		
P-value	0.0001	0.97		
Significance	S	NS		

P: probability S: significance NS: non-significant

Fig. 2:level ofLH pre-treatment and post-treatment in both groups (A&B)



There was a highly significant improvement in quality of life in group (A) as the median value of the quality of life before treatment was 84.5 with minimum and maximum values of (77.0-92.0) and post-treatment was 71.5 with minimum and maximum values (56.0-88.0) where Z-value was (-3.885) and P-value was 0.001, also there was significant difference between quality of life in group (B) as the median value before treatment was 83.0 with minimum and maximum values (70.0-90.0) and post-treatment was 79.0 with minimum and maximum values (73.0-88.0) where Z-value was (-2.120) and P-value was (0.034). In comparing both groups post

treatment the results revealed a highly significant improvement in group (A) than group (B) as Z value was -3.578 and $p < 0.01$ as shown in table (5) Fig.(4).

DISCUSSION

Menopause is the permanent shutting down of the women's reproductive system, although a technical definition of menopause refers to the last period; it is not

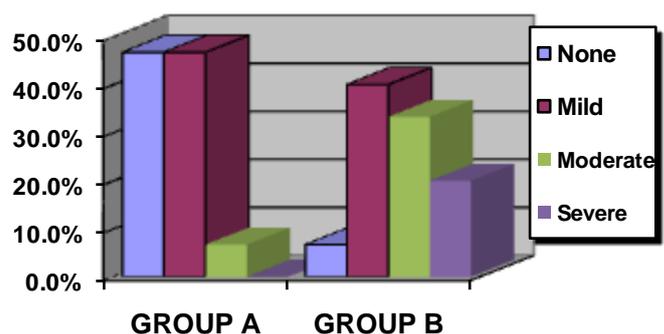
Severity of hot flushes	Before treatment		After treatment	
	Group (A) (n=20)	Group (B) (n= 20)	Group (A) (n=20)	Group (B) (n= 20)
None	33.3%	13.3%	46.7%	6.7%
Mild	20.0%	33.3%	46.7%	40.0%
Moderate	46.7%	46.7%	6.6%	33.3%
Severe	0.00%	6.7%	0.00%	20.0%
P-value	0.204		0.025	
	NS		S	

an abrupt event but a gradual process.

Table 4:Severity of hot flushes after treatment between two groups (A&B)

S: significance, p: probability

Fig. 3:Severity of hot flushes after treatment between two groups (A&B)



A natural or physiological menopause is that which occurs as a part of a woman's normal aging process, it is the result of eventual atresia of almost all oocytes in the ovaries. This causes an increase in circulating Follicle Stimulating Hormone (FSH) and Luteinizing Hormone (LH) levels as there are a decreased number of oocytes responding to these hormones and producing estrogen [18].

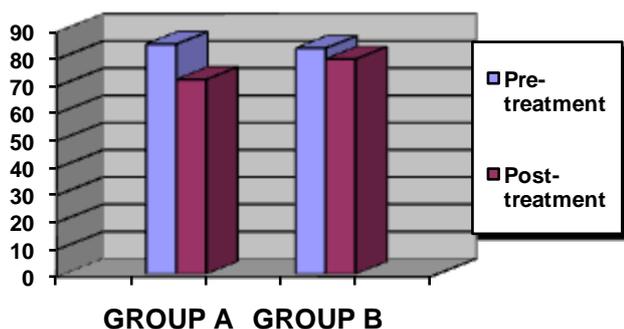
This decrease in the production of estrogen leads to the menopausal symptoms of hot flushes, insomnia and mood changes, as well as post-menopausal osteoporosis and vaginal atrophy. Some main effects of menopause are vasomotor instability, urogenital atrophy (vaginal atrophy), skeletal, psychological and sexual changes. In terms of quality of life, all of these symptoms can be detrimental to a healthy quality of life [18].

Table 5: quality of life score pre-treatment and post-treatment in both groups (A&B)

	Group (A) (n= 20)	Group (B) (n= 20)	t-value	p-value
Pre-treatment	84.5(77.0-92.0)	83.0(70.0-90.0)	-1.468	0.142
Post-treatment	71.5(56.0-88.0)	79.0(73.0-88.0)	-3.578	0.001
Median difference	13	4		
% of improvement	15.39%	4.82%		
Z-value*	-3.885	-2.120		
P-value	0.001	0.034		
Significance	HS	S		

P: probability, S: significance, HS: highly significant, Z-value: Mann-Whitneytest

Fig. 4: Quality of life score pre-treatment and post-treatment in both groups (A&B)



Menopausal symptoms may lead to social impairment and work related difficulties that significantly decrease the overall quality of life. Menopausal symptoms are associated with significant direct and indirect costs. Overall costs of traditional pharmacotherapy or complementary and alternative medicine modalities managing menopause-related symptoms. Additional costs include laboratory testing, management of adverse events, loss of productivity at work and personal and miscellaneous costs [19].

Vasomotor symptoms are the main physical signs of

the menopause. Although hot flushes and night sweats tend to occur in most societies, their prevalence, frequency, severity and duration have been found to vary considerably [20].

The analysis of the results of the current study showed that the level of FSH and LH, hot flushes frequency and severity was significantly decrease in addition to significant improvement in quality of life in group (A) than in group (B).

These results came in accordance with Moilanen et al., [21], who examined the impact of aerobic exercises on 176 post-menopausal women with night sweats, mood swings, and irritability in a randomized controlled study. Looking at the results, in sedentary women, aerobic training for 6 months may decrease the typical menopausal symptoms, especially night sweats, mood swings, and irritability.

These results are consistent with Lee et al., [22], who conduct a study to determine the effects of regular aerobic exercises on decrease serum FSH level and vasomotor symptom and recommended that many strategies should be applied to decrease vasomotor symptoms by changing life style from inactivity to exercise training in order to support postmenopausal women somatic health.

Physical exercise is known to increase hypothalamic β -endorphin production, which may stabilize thermoregulation known to be disturbed during menopausal hot flushes [23].

These results confirmed with those of Chun et al., [24], who conducted a study to examine the effect of exercise therapy on quality of life in postmenopausal women, this meta-analysis revealed better improvement in physical function, pain relief and physical activity.

These results are consistent with Faure et al., [25], who conducted a study on outpatients according to a multicenter, randomized, double-blind, placebo-controlled, parallel-group design. A total of 75 patients in natural or surgical menopause suffering from at least seven hot flushes per day were randomized to receive during 4 months either soy isoflavone extract or placebo. They found that soy isoflavone extract may help to reduce the frequency of hot flushes in climacteric women and provides an attractive addition to the choices available for relief of hot flushes.

Estrogen increases the effects of serotonin and norepinephrine, which are thought to be the neurotransmitters most related to depression and quality of life impairment. Among other mechanisms, estrogen decreases monoamine oxidase (MAO) activity in the CNS, hindering the breakdown of serotonin and norepinephrine, In addition, estrogen increases serotonin synthesis, upregulates 5-hydroxytryptamine (5-HT)-1 (5-HT1) receptors, and downregulates 5-HT2 receptors.

Estrogen also increases norepinephrine activity in the brain, perhaps by decreasing reuptake and degradation [26].

Kroenke et al., [27], stated that additionally, women who participated in a dietary modification trial that encouraged them to decrease fat and increase fruit, vegetable, and whole grain intake, were significantly more likely to eliminate vasomotor symptoms. Given the possible adverse effects of hormone therapy on breast cancer and cardiovascular disease risk, intentional weight loss following a healthy diet may be an important, alternative means of reducing vasomotor symptoms without exacerbating risk of disease.

The results of this study were contradicted with Ann et al., [28], who stated that soy products have minimal effect on hot flashes, as soy reducing hot flashes 45% and placebo causing a 30% reduction compared with estrogen replacement therapy.

CONCLUSION

So, in the present study, aerobic exercises assisted with soy products was found to be effective, safe, simple and successful in reducing level of FSH and LH, decreasing hot flashes frequency and severity in addition to improving quality of life in post-menopausal women.

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الملخص العربي

تأثير التمريينات الهوائية بمساعدة منتجات الصويا على الهبات الحرارية وجودة الحياة للسيدات بعد سن اليأس

هدف البحث: - تحديد تأثير التمريينات الهوائية بمساعد منتجات الصويا على الهبات الحرارية وجودة الحياة للسيدات بعد سن اليأس. **تصميم البحث:** - برنامج علاجي باستخدام التمريينات الهوائية بمساعدة منتجات الصويا للسيدات بعد سن اليأس. **مقاييس النتائج الرئيسية:** - تحليل هرمون المنبة للجريب و هرمون المُلوتن، أستبيان جودة الحياة المعدل (MENCAP) بالإضافة إلى تقييم الهبات الحرارية باستخدام بطاقة التسجيل اليومي للأعراض. **طريقة البحث:** - قد تم إجراء الدراسة على أربعين سيدة متطوعة تعانين من الهبات الحرارية بعد سن اليأس من العيادة الخارجية لكلية العلاج الطبيعي، جامعة القاهرة، و قد تراوحت أعمارهن بين 50-55 عاما، ومؤشر كتلة الجسم يتراوح بين 30-32 كيلو جرام/متر مربع، وقسمت تلك العينة عشوائيا إلى مجموعتين متساويتين. المجموعة (أ) (مجموعة الدراسة): تكونت من 20 سيدة تم علاجهن ببرنامج التمريينات الهوائية لمدة 30 دقيقة على المستوى الموافق ل 13-16 على مقياس المجهود 3 مرات في الأسبوع لمدة 12 أسبوعا بالإضافة إلى الأستهلاك اليومي لمنتجات الصويا (الاستروجين النباتية) و التي تحتوى على 100 مليلتر حليب الصويا و 100 جرام من فول الصويا. المجموعة (ب) (المجموعة الضابطة): تكونت من 20 سيدة تم علاجهن فقط بمنتجات الصويا (الاستروجين النباتية) و التي تحتوى على 100 مليلتر حليب الصويا وفول الصويا 100 جرام يوميا، لمدة 12 أسبوعا. و قد تضمنت القياسات المسجلة تحليل هرمون المنبة للجريب و هرمون المُلوتن، أستبيان جودة الحياة المعدل (MENCAP) بالإضافة إلى تقييم الهبات الحرارية باستخدام بطاقة التسجيل اليومي للأعراض. **النتائج:** - أظهرت النتائج انخفاض ذودلالة معنوية عالية في مستوى الهرمون المنبة للجريب و هرمون المُلوتن في مجموعة (أ) بالمقارنة مع المجموعة (ب). أيضا، كان هناك تحسن ذودلالة معنوية في انخفاض شدة الهبات الحرارية وجودة الحياة في المجموعة (أ) مقارنة بالمجموعة (ب). **الخلاصة:** - يمكن ان نخلص إلى أن التمريينات الهوائية بمساعدة منتجات الصويا وسيلة فعالة وآمنة وناجحة لتقليل الهبات الحرارية وتحسين جودة الحياة للسيدات بعد سن اليأس.

مفتاح كلمات البحث: - التمريينات الهوائية، الهبات الحرارية، منتجات الصويا، جودة الحياة.