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ORIGINAL ARTICLE

Effects of long-term aerobic exercise on physical fitness and postmenopausal symptoms with menopausal rating scale

Effets à long terme d'exercices de type aérobic sur la condition physique et la symptomatologie post-ménopausique

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KEYWORDS
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Menopausal rating scale

Summary
Objectives. — The purpose of this study was to determine the effects of a 24-week aerobic callisthenic exercise program administered on menopausal women on some physical fitness parameters and to look at its effects on symptoms in the post-menopausal period.
Methods. — This study was conducted with the voluntary participation of 65 menopausal women whose age and height averages were 50.13 ± 3.38 years and 154.23 ± 4.51 cm, respectively. The study group was given a 55-minute aerobic exercise program 3 days in a week for 24 weeks. The training intensity was determined 75—80% according to the Karvonen method. Before and after training, the body weight, body mass index, resting heart rate, blood pressures, flexibility, aerobic power, body composition, sit-ups, push-ups and hand grips were measured, thus determining the probable symptoms and complaints with the help of the Menopause Rating Scale (MRS) method.
Results. — As a result of the study, significant reductions were observed in body weight, body mass index, body fat percentage, fat weight resting heart rate, systolic and diastolic blood pressures of the subjects, whereas significant increases were observed in aerobic power flexibility, right hand grip, sit-up and push-up values ($p < .01$, $p < .05$). 3-month and 6-month periods of exercise were observed to lead to significant reductions in somatic, psychological and urogenetic symptoms and complaints ($p < .05$).
Conclusions. — As a result, a 12—24 week aerobic exercise was determined to result in a positive effect on menopausal women's physical fitness parameters, as well as having significant effects on reducing menopausal symptoms and problems.

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MOTS CLÉS
Ménopause ;
Sédentaire ;
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Forme physique ;
Echelle d'évaluation des troubles liés à la ménopause

Résumé
Objectifs. — Déterminer les effets d'un programme d'exercices aérobie callisthéniques, de 24 semaines, sur certains paramètres de la forme physique et les symptômes et problèmes liés à la ménopause.
Méthodes. — L'étude a été réalisée avec la participation volontaire de 65 femmes ménopausées dont l'âge moyen était de 50,13 ± 3,38 ans et la taille de 154,23 ± 4,51 cm. Le groupe d'étude effectuait un programme d'exercices aérobie de 55 minutes par session, trois jours par semaine pendant 24 semaines. La densité de l'exercice a été déterminée à 75—80 % de la fréquence cardiaque suivant la formule de Karvonen. Les symptômes et problèmes qui pouvaient survenir pendant la ménopause ont été évalués par le MRS (Echelle d'évaluation de la ménopause). Ont été mesurées les valeurs du poids du corps, de l'indice de masse corporelle, de la fréquence cardiaque au repos, de la pression artérielle, de la souplesse, de la puissance aérobie, de la composition du corps, du nombre de pompes et d'abdominaux pratiqués, de la force de préhension de main avant et après de l'exercice.
Résultats. — À la fin de l'étude, on a observé une réduction significative du poids moyen du corps et des moyennes de l'indice de masse corporelle, du pourcentage de graisse corporelle, de la masse grasse, de la fréquence cardiaque au repos, de la pression artérielle diastolique et systolique chez les membres du groupe exercice et une augmentation significative des valeurs de la puissance aérobie, de la souplesse, de la force de préhension de main droite et gauche, du nombre de pompes et d'abdominaux pratiqués ($p < 0,05$). Il a été confirmé que l'exercice fait sur des périodes de trois à six mois a permis de diminuer les symptômes et les problèmes somatiques, psychologiques et urogénitaux ($p < 0,05$).
Conclusion. — La pratique d'exercices aérobie sur une durée de 12 à 24 semaines a un effet positif sur certains paramètres de forme physique et entraîne une diminution des symptômes et des problèmes liés à la ménopause chez les femmes.

1. Introduction

The menopause is a normal physiological process that all women reaching a certain age will undergo. It signals the end of the reproductive years and is associated with signs of estrogen deficiency and has a considerable impact on women's health-related quality of life (HRQoL) [17,39].

Progressive estrogenic deficiency during the menopausal transition leads to the presentation of a wide array of clinical signs and symptoms [4,9]. The clinical manifestations of this transition to menopause are not well understood; however, some symptoms such as hot flushes begin in the perimenopause and increase as women progress through the menopause. Such symptoms as hot flushes and night sweat, insomnia and vaginal dryness, during or following the menopausal period, are associated with estrogen deficiency [5].

Nonspecific somatic and psychological symptoms, including tiredness, irritability, insomnia, palpitations, memory or concentration difficulties, and mood swings or depression have been commonly reported. However, the prevalence of symptoms differs widely and their relationship with the menopause transition varies. In addition, the specific symptoms associated with menopause vary among cultures, races/ethnic groups, social groups, and persons [38].

The precise time of the onset of the menopause cannot be ascertained due to intra-individual, intracultural and various environmental factors [26]. Menopause occurs at around the age of 50—51 years in the Western world [29] while the median age for menopause is 47 years in Turkish women [37].

The Menopause Rating Scale (MRS) is a self-administered standardized questionnaire for complaints in menopausal women [34]. MRS is a well-known and validated instrument for assessing the frequency and intensity of menopausal symptoms [21]. For assessment of the menopausal symptoms, the MRS was chosen as a standardized instrument over others available for its reliability, its short format encompassing all the associated symptoms and the simple scoring [32].

In many studies, long-term and moderate intensity aerobic exercise program was performed to sedentary women and at the end of the program; it was obtained great changes in their body composition and Max VO_2 values [3,6] and it was stated that increasing fitness level can be related to menopausal symptoms [15]. As there are these negative effects in the menopausal period, regular exercises during this period are meaningful and important.

The purpose of this study was to investigate the effects of long-term aerobic exercise in terms of MRS scores and some physical fitness parameters in post-menopausal women.

2. Method

2.1. Subjects

One hundred and twelve women participated in the study, they had naturally entered the menopausal period and their ages were between 46 and 55. As a result of the questionnaire conducted in order to determine the menopausal stories, demographic characteristics, physical activity levels and health levels of the participants, 47 of them, 12 of whom

Table 1 Physical characteristics of the subjects.

Age (year)	Body height (cm)	Body weight (kg)	Menopausal age (year)
50.13 ± 3.38	154.23 ± 4.51	74.31 ± 10.95	48.53 ± 2.65

did regular exercises, 17 of whom had hysterectomies and 18 of whom did not take part regularly in the 3-month and 6-month exercise program were excluded from the study. The study was thus completed with 65 subjects. The mean age, height, body weight, and menopausal age of women ($n = 65$) were determined as 50.13 ± 3.38 years, 154.23 ± 4.51 cm, 74.31 ± 10.95 kg, 48.53 ± 2.65 years (Table 1).

2.2. Exercise Program

The exercise groups participated in 75—80% of heart pulse number according to the Karvenon method [16] for about 6 months, 3 days per week and 55 minutes of aerobic and callisthenic exercise was performed. The exercise program was composed of 10 minutes of warm-up exercises, 40 minutes of aerobic exercise, 15 minutes of exercises for the abdomen, hip, leg muscles and 5 minutes for the cool-down and stretching exercises.

2.3. Measurements

2.3.1. The Menopause Rating Scale

The scale is designed and standardized to act as a self-administered scale to assess the occurrence and severity of the symptoms/complaints of the menopausal women. The MRS is composed of 11 items assessing menopausal symptoms divided into three subscales: psychological (P): depressive mood, irritability, anxiety and physical and mental exhaustion (items 4—7, respectively); somatic-vegetative (S): hot flushes, heart discomfort, sleeping problems and muscle and joint problems (items 1—3 and 11, respectively); and urogenital (U): sexual problems, bladder problems and dryness of the vagina (items 8—10, respectively). Each of the 11 symptoms contained in the scale can get 0 (no complaints) or up to 4 scoring points (severe symptoms) depending on the severity of the complaints perceived by the women completing the scale (an appropriate box is to be ticked). For a particular individual, the total score per each subscale is the sum of each graded item contained in that subscale. Total MRS Scores is the sum of the scores obtained for each subscale [18,33]. Heinemann et al. published translations of MRS in various languages. The Turkish version of MRS was used in this study [19].

2.3.2. Height and weight

The weights of the women were measured by using a scale with 0.01 kg sensitivity and their heights were measured by using a metal meter with 0.01 cm sensitivity.

2.3.3. Resting heart rate and blood pressure

Resting heart rate was measured by counting the pulses in a minute by touching the carotid artery on the neck after the subjects' 15 minute period of relaxation systolic and diastolic blood pressures were measured by using a stethoscope and sphygmomanometer in mmHg.

2.3.4. Sit-and-reach test (SRT)

The subjects' flexibility measurements were done by using the flexibility board with sit-reach test [25].

2.3.5. Aerobic Power

The aerobic power of the women was measured with a 12 minute jog-walk (Cooper test) and Balke formula was used for $MaxVo_2$ values [1].

$$Vo_2\ \text{ml/kg-min} = 33.3 + (X - 150) \times 0.178\ \text{ml/kg-min}$$

2.3.6. Hand grip strength

The handgrip strength of the subjects was measured by using Takei Grip —D trademark hand dynamometer. The left and the right hand grip strength of each woman were measured three times and the highest values were recorded.

2.3.7. Body composition

Cliffon N.J. trademark skin fold caliper was used for the determination of the females' body fat percentage. The body fat percentage was determined by using the Sloan and Weir formula with triceps and suprailiac form values taking by a skin fold [16].

$$\text{Fat\%} = (4.57/\text{density} - 4.142) \times 100$$

$$\text{Body Density(gr/ml)} = 1.0764 - 0.0081(\text{suprailiac}) - 0.0088(\text{triceps})$$

$$\text{Fat weight} = \text{Body weight} - \text{Fat\%}/100$$

$$\text{Lean Body Mass} = \text{Body weight} - \text{Fat weight}$$

$$\text{Body mass index} = \text{kg/m}^2$$

2.3.8. Sit-up and push-up

Thirty-second sit-up and push-up exercises were applied to the subjects [25].

2.4. Statistical analysis

Data were analyzed using Statistical Package for Social Sciences (SPSS) MS Windows Release 10.0 (SPSS Inc.). Data appearing as a result of the measurements was recorded immediately. The comparison of the first, second and the third measurements values was done with One-Way Anova for repeated measures test. Bonferroni correction was used in order to assess the statistically significant periods. A p value of < 0.05 was considered as statistically significant.

Table 2 The ANOVA test results of the subjects' resting heart rate, systolic, diastolic blood pressure flexibility and aerobic power values.

Variables	Test	$\bar{X}$	F	*p*	Difference Bonferroni
Resting heart rate (pulse/min)	1	78.43 ± 7.62	50.62	0.00**	1—2
	2	74.52 ± 6.41			1—3
	3	73.84 ± 5.82			
Systolic blood pressure (mmHg)	1	130.23 ± 14.72	45.27	0.00**	1—2
	2	124.00 ± 12.84			1—3
	3	122.92 ± 12.46			
Diastolic blood pressure (mmHg)	1	82.00 ± 8.13	5.93	0.05*	1—3
	2	80.07 ± 8.40			
	3	79.53 ± 8.32			
Flexibility (cm)	1	26.25 ± 6.79	84.88	0.00**	1—2
	2	28.48 ± 6.41			1—3
	3	28.67 ± 6.34			2—3
Aerobic power (ml/kg-min)	1	25.96 ± 2.54	107.12	0.00**	1—2
	2	28.06 ± 2.73			1—3
	3	28.19 ± 2.78			2—3

*$p < 0.05$, **$p < 0.01$.

3. Results

Table 1 shows the physical characteristic of the subjects.

There were significant differences in resting heart rate, and systolic blood pressure between the 1—2nd and 1—3rd measurements, in diastolic blood pressure between the 1—3rd periods and finally in flexibility and aerobic power between the 1—2nd, 1—3rd and 2—3rd measurements (Table 2).

Significant increases were observed in the sit-up which is one of the strength parameters between the 1—2nd, 1—3rd and 2—3rd measurements, and in push-up, right hand grip and left hand grip between the 1—2nd, 1—3rd periods (Table 3).

Significant reductions were observed in body weight, body mass index, body fat % and fat weight between the 1—2nd and 1—3rd measurements whereas no significant difference was observed in lean body mass value (Table 4).

Fig. 1 shows that there were significant decrease in hot flushes and night sweats between the 1st and the 3rd periods, in cardiac symptoms and muscle and joint pain between 1—2nd, 1—3rd, and 2—3rd periods and lastly in sleeping disorder symptom between the 1—2nd and the 1—3rd measurements.

There were significant decrease in depressive mood, irritability and anxiety symptoms between 1—2nd, 1—3rd, and 2—3rd periods while significant reduction was observed in exhaustion between 1—2nd and 1—3rd periods (Fig. 2).

Significant reductions were observed in sexual problems between the 1—2nd and 1—3rd periods and in urinary symptoms between the 1—3rd periods. No significant change was observed in vaginal dryness (Fig. 3).

Table 3 The ANOVA test results of the subjects' sit-up, push-up, right and left hand grip strength values.

Variables	Test	$\bar{X}$	F	*p*	Difference Bonferroni
Sit-up	1	6.56 ± 2.26	105.96	0.00**	1—2
	2	8.33 ± 3.02			1—3
	3	9.46 ± 2.49			2—3
Push-up	1	5.95 ± 2.60	46.08	0.00**	1—2
	2	7.10 ± 3.38			1—3
	3	7.67 ± 3.78			
Right Hand Grip Strength (kg)	1	23.38 ± 3.94	66.55	0.00**	1—2
	2	24.54 ± 3.77			1—3
	3	24.99 ± 3.76			
Left Hand Grip Strength (kg)	1	21.89 ± 3.77	68.77	0.00**	1—2
	2	23.08 ± 4.01			1—3
	3	23.40 ± 3.95			

**$p < 0.01$.

Table 4 The ANOVA test results of the subjects' body composition values.

Variables	Test	$\bar{X}$	F	*p*	Difference Bonferroni
Body weight (kg)	1	76.19 ± 11.37	35.76	0.00**	1—2
	2	74.96 ± 10.99			1—3
	3	74.70 ± 10.90			
Body mass index (kg/m^2)	1	32.04 ± 4.54	36.02	0.00**	1—2
	2	31.52 ± 4.43			1—3
	3	31.42 ± 4.40			
Body fat (%)	1	25.13 ± 2.76	62.77	0.00**	1—2
	2	24.46 ± 2.77			1—3
	3	24.46 ± 2.72			
Fat weight (kg)	1	19.36 ± 4.63	49.35	0.00**	1—2
	2	18.53 ± 4.42			1—3
	3	18.52 ± 4.34			
Lean body mass (kg)	1	56.75 ± 7.30	1.97	2.37	
	2	56.42 ± 7.08			
	3	56.39 ± 7.03			

**$p < 0.01$.

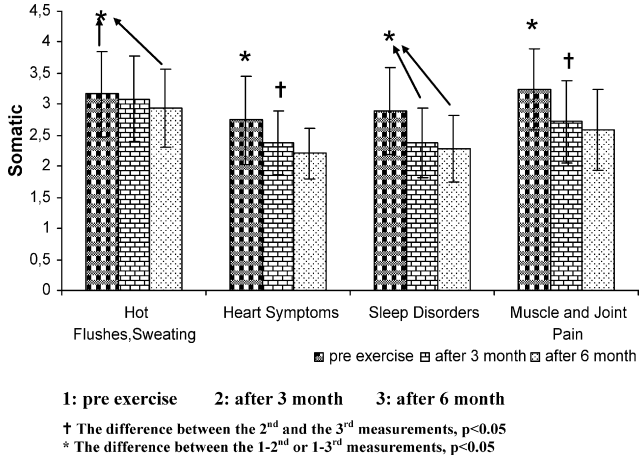

Figure 1 Somatic symptoms before and after exercise of the subjects.

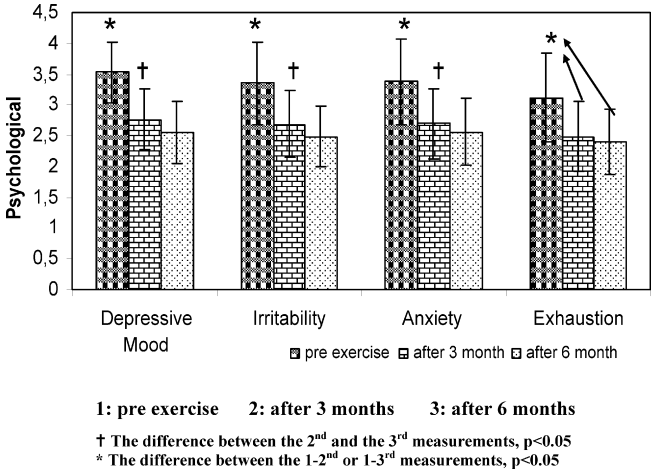

Figure 2 Psychological symptoms before and after exercise of the subjects.

4. Discussion

The present study hypothesized that aerobic exercises administered for a 24-week period resulted in a significant reduction in the somatic symptoms including in hot flushes, night sweats, cardiac symptoms, muscle joint pain and sleeping disorder symptom, psychological symptoms include in depressive mood, irritability, anxiety symptoms, and exhaustion and urogenital symptoms include in sexual problems and urinary symptoms experienced by menopausal women in their menopausal period and in positive developments in blood pressures, flexibility, aerobic power, body composition and, strength values.

The menopause is a natural event in a woman's life after the reproductive years. It is associated with a number of physical, psychological, and social changes [22]. Although menopausal symptom rates change from woman to woman, it is estimated that 80—85% of them experience bad symptoms during this period [15,28].

Physical and psychological changes associated with the menopause may be the result of a loss of ovarian func-

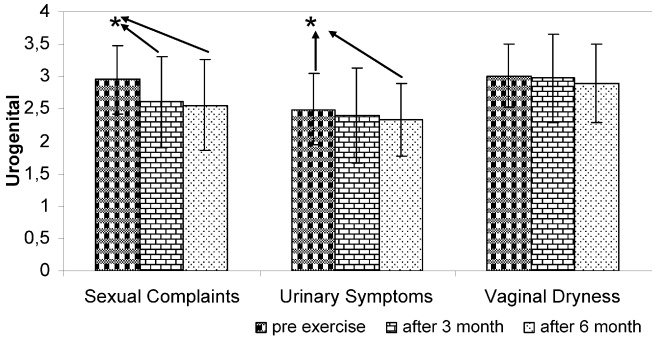

Figure 3 Urogenital symptoms before and after exercise of the subjects.

tion associated with estrogen depletion and may include the sequelae to sleeplessness and other symptoms associated with the climacteric syndrome [14].

In observational studies, physically active women reported fewer and less severe somatic symptoms than an age-matched control group with sedentary lifestyles; significant decreases of more than 50% were noted. Low levels of physical activity are reported to lead to an increase in hot flushes. However, exercise, especially strenuous exercise that causes perspiration, may trigger hot flushes in symptomatic women. No randomized, controlled trials have examined the efficacy of exercise in managing hot flushes [28]. Through a course of long-term aerobics and callisthenic, this study revealed that somatic symptoms were shown to be significantly reduced.

Estrogen is the most effective treatment for the management of hot flashes and night sweats [29]. On the other hand, some other studies suggest that exercise is less effective than hormone replacement therapy (HRT) on reducing vasomotor symptoms [12,28]. The effects caused by falling levels of estrogen may be alleviated by HRT but there has been a marked global decline in the prescription and use of HRT due to concerns about the risks and benefits of HRT; consequently many women are now seeking alternatives. As large numbers of women are choosing not to take HRT, it is increasingly important to identify evidence based lifestyle modifications, which can have a positive effect on menopausal symptoms [37]. For this reason, exercise can be preferred as a natural method with no side effects in order to reduce menopausal symptoms [8]. The present study revealed that regular and long-term aerobic exercises result in significant reductions in the vasomotor symptoms of the women who do not undergo any hormone therapy.

In many studies reported that vasomotor symptom rates were associated with body overweight [13,22]. The preexercise body weight averages of the women were 76.19 ± 11.37 kg when their vasomotor symptoms were severe whereas these symptoms decreased to a moderate level when their body weight averages were lowered to 74.70 ± 10.90 kg after exercise.

Mood changes, irritability, anxiety and depression, which are among the psychological symptoms, have been linked to hormonal changes in menopausal women. There are conflicting objective data that relate estrogen withdrawal to mood changes or depression. Clinical studies showed that estrogen increased serotonin and nor epinephrine release by affecting the level of central neurotransmitter. These hormones are known to be reduced during depression [2]. Another hypothesis of the study was that psychological symptoms experienced in menopausal periods could be reduced by long-term sub-maximal aerobic callisthenic exercises. Supporting data was obtained from an analysis of the MRS, which is evaluated as one of the life quality tools related to menopausal health. It was seen that 3-month and 6-month aerobic callisthenic exercises were effective in reducing psychological symptoms unique to menopausal periods.

Changes in the menopausal symptoms could be related to the type of the exercise. Exercises which include physical and mental integrity, relaxing at the same time, such as yoga were reported to have positive effects on reducing climacteric symptoms as well as ameliorating emotional moods [8].

Following three and six-month regular exercises, significant reductions in hot flushes, sweating, anxiety, sleep disorders, irritability, depressive moods, which are menopausal symptoms, were determined in the present study. Symptom reduction could be associated with the type of the exercise, the intensity, duration and the frequency of it.

Vaginal dryness, one of urogenital symptoms is frequently reported during menopause [29]. According to a study, vaginal dryness was considered to be related to libido reduction and, as a result, sexual problems were reported to be experienced by menopausal women [10]. Besides, low exercise levels were reported to have an impact on libido reduction and on negative mood [11]. As a result of aerobic callisthenic exercise administration, no significant change was observed in complaints of vaginal dryness, while significant reductions were determined in sexual problems.

Some studies suggest that incontinence is increased with menopausal symptoms, whereas other studies do not relate incontinence to this period [9,30]. Post-menopausal changes in the urinary tract that may account for irritating voiding symptoms (frequency and urgency) and incontinence include: vaginal dryness; atrophy of the bladder trigone; decreased sensitivity of α-adrenergic receptors of the bladder neck and urethral sphincter; and thinning of the urethral mucosa [17].

The vagina, vulva, urethra, and trigone of the bladder all contain estrogen receptors and undergo atrophy when estrogen levels decrease [7]. Our study reported that urinary symptoms were reduced via regular exercises.

Whether menopausal symptoms increased or decreased appeared to be partly determined by whether there were increases or decreases in physical fitness across the intervention.

In many studies, it was emphasized that regular and long term exercises decrease the body weight and body mass index, body fat mass and body fat percentage [3,27]. It was also observed that aerobic power [35] and muscle strength [20] were increased by regular exercises. It was seen the aerobic callisthenic exercises and particular training done through using their own body weight, affected the subjects' power values in a positive way. In other words, it can be said that these kinds of exercises improve physical fitness and they help people achieve their everyday tasks more effectively and in a shorter time.

In a study, 3 months aerobic exercise 30 minutes per 3 days was applied and at the end of the program, it was seen a meaningful increase in the aerobic power of the group but there was no considerable change in their body composition values [24]. In another study, 6 months weight lose program, weight lose program with aerobic exercises, weight lose program with resistance exercises were performed 3 days per week to menopausal women and at the end of the program in the three groups it was determined a significant decrease in their body weight and body mass index values [31]. Body fat should be associated with increased menopausal symptoms especially depressive mood and hot flashes [23,36]. Menopause was associated with an increase in total body fat and visceral fat in this study.

Regular and long-term aerobic callisthenic exercises were reported to have positive effects on both the physical fitness parameters and on menopausal symptoms. A high level of cardiorespiratory fitness might be effective on the reduction of menopausal symptoms [15]. One of the main reasons for the lack of movement/exercise is that machines are now doing much of the work that was previously done manually. Diseases emerging as a result of people forgetting to remain active have become a global problem. Several of the severe and sometimes fatal diseases of today are reported to be associated directly or indirectly with the sedentary life. As the life cycle of human beings is lengthened, the health and quality life for menopausal women is of vital importance. Physiological and psychological diseases, foremost in menopausal periods, and which affect life quality negatively, can be reduced by getting accustomed to regular exercise which has no active effects on economy and health.

Conflict of interest

None.

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