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## Investigation of the effects of hatha-yoga exercises on some physiological and motoric parameters in sedentary women

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### Abstract

The aim of this study was to investigate the effects of 8 weeks of Hatha Yoga exercises on some physiological and motor parameters in sedentary women. The descriptive characteristics of 30 sedentary women living in Ula district of Mugla province; Experimental Group (DG) (n = 15) (age  $X = 48.27 \pm 3.51$  years, height  $X = 160.26 \pm 3.47$  cm, Body Weight  $X = 62.78 \pm 4.60$  kg.), Control Group (KG) (n = 15) (age  $X = 46.07 \pm 5.75$  years, height  $X = 149.66 \pm 41.71$  cm, body weight  $X = 62.68 \pm 299.59$  kg). For the effects of 8 weeks of hatha yoga exercises on some physiological and motoric parameters (body fat, strength, balance, flexibility), pre-test and post-test comparisons were made between the control and experimental groups. In addition to their normal programs, they performed ath ‘hatha yoga’ 2 twice a week for 8 weeks. The control group continued their weekly schedule. Pre-tests (body weight, flexibility, body fat ratio, strength and balance) of the 2 groups were taken before the studies. At the end of 8 weeks, posttest measurements were taken. The measurements were taken in a yoga hall in Ula by a trainer with a yoga coaching certificate from Mugla Sitki Kocman University School of Physical Education and Sports. In the research, arithmetic means (X) standard deviations, independent samples t-Test (Independent Samples t-Test), and difference between pre-test and post-test t-Test (Paired Samples t-Test) were examined at 0.05 significance level. As a result; It was observed that hatha yoga exercises applied to sedentary women for 8 weeks provided positive improvement on all physiological and motor parameters ( $p < 0.05$ ). Hatha Yoga program can be recommended to coaches to develop physiological and motoric features in different sports and age groups.

**Keywords:** Sedentary woman, exercise, hatha yoga, motoric features

### 1. Introduction

Yoga; It affects the whole of the human being, helps the body to be flexible, strengthens the muscles and helps to learn relaxation. It makes one feel healthier, more alive and lighter. Yoga is an ancient method based on India, whose philosophy is based on body balance, physical, mental and emotional well-being<sup>[15]</sup>. The application includes a number of asana, which are protected during a certain period of time. Yoga also means voluntary breath control (pranayama), voluntary concentration on thoughts (med yoga). Yoga also means voluntary breathing control (pranayama), voluntarily concentrating on thoughts (meditation), integrating, tying and combining, and it consists of repeated verbal expressions<sup>[16]</sup>. The Iyengar yoga system is named after Iyengar, the best yoga master in the world. In this yoga system, postures are performed in a systematic order starting from an outpatient shoulder, hip and sitting positions. In this system, asanas movements applied with the feet first, then sitting movements on the floor, and finally relaxation exercises are completed. Iyengar likened the parts of Yoga to the parts of a tree. According to Iyengar, the roots of the yoga tree are patches, trunk niyama, branches hanged, leaves pranayama. The sap of the tree is dhrana, the flower is dhyana, the fruit is samadhi. What Iyengar wants to say here is that a tree can only be one if all of these parts are together<sup>[10]</sup>.

Although there are many types of yoga, they do not contradict each other. Therefore, the practice of many types of yoga can be considered as practicing other types of yoga. Because all of these yoga types have the same purpose. The main known yoga types include Laya, Tantric, Mantra, Bhatki, Karma, Raja, Yin, Jnana and Hatha Yoga.

Among these various types of yoga is hatha yoga, which appears to be close to physiotherapy [12]. Hatha yoga is a comprehensive program in which concentration, relaxation, breathing and physical exercises are used together as a whole, with proper body position affecting the mind [7].

Physical activity is very important for adults. It should be based on improving exercise endurance in adults, running large muscle groups, increasing mobility of joints. Yoga is a comprehensive exercise program that can be recommended for adults [8]. Exercise, which is necessary for a healthy life in our period, is considered among the main principles. However, with a regular and conscious exercise program, healthy living is possible. Therefore, protocols for exercise practices should be planned according to different gender and age differences [18]. The study is important for the development of quality of life, physiological structure and motor parameters of sedentary women. The word “Ha, means both positive current (positive) and sun; The word “Tha” is means negative current (negative) and moon. Hatha Yoga is a method that is applied with the aim of providing harmonious combination of these two currents or energy and includes physical exercises and postures applied together with meditation and respiratory [2, 11].

## 2. Materials and Methods

### 2.1 Research Model

Experimental research method was used in the study.

### 2.2 Research Group

In the study, experimental group with control group pre-test and post-test design was used. A total of 30 volunteer sedentary women, aged between 35-55 years experimental (n = 15) and control (n = 15), participated in the study.

### 2.3. Data Collection Tools and Measurements

Pre-test measurements of the women in the experimental and control groups were taken before the studies. The control group performed a weekly training program for 8 weeks. The experimental group participated regularly. At the end of 8 weeks posttest measurements of both groups were taken.

#### 2.3.1 Obtaining Data

The physiological and motoric characteristics of the sedentary women in the experimental and control groups, the measurement tools and the training program applied are as follows.

#### 2.3.2 Height and Body Weight Measurement

During the deep inspiration in the standing upright position

with the bare foot, a thin bar parallel to the head contacting the head and height measurements of 0.5 cm between the base of the foot and the top of the head were taken. Body Weight Measurement; light weight sporty clothes and weighing on 100 gr. Measurements were taken on an empty stomach and standing [6].

#### 2.3.4 Flexibility Measurement

Sit-in test was used. Women sitting on the floor and barefoot soles flat and fixed on the test table, tilting the body part forward, knees without stretching the hands as far as the front of the body can stretch forward, pushing the ruler forward or backward at the farthest point. movement and yawning was repeated for 1-2 seconds and the highest value was measured and repeated twice [6].

#### 2.3.5 Balance Measurement

Flamingo Balance Test (PDT) was applied to determine the static balance of sedentary women. While sedentary women were on balance on one foot, the time was started and they were instructed to try to stay in this position for 1 minute. Time and time were stopped as soon as the balance was broken. When the participant stabilized, the period of time remaining was maintained. The test was performed in this manner for one minute. When the time was completed, sedentary women were added to the total time in every effort to achieve balance and recorded as test score [9].

#### 2.3.6 Force Measurements

Leg, back and hand grip force; measurements were taken with Takei brand digital dynamometer hand grip, hand grip (handgrip) tool in standing position with one hand grasping the fingers towards the palm by tightening the maximum force was asked and recorded [6]. Subcutaneous Fat Measurements: Skinfold Caliper and skinfold measurement (from Supscapula, Triceps, Tie, and Suprailiac regions) were compared to determine body fat percentages of sedentary women who participated in the study group [13].

#### 2.3.7 Training Program

Sedentary women were examined for 12 weeks of Hatha Yoga exercise program [6, 14, 17] for 8 weeks according to the characteristics of the age group. Training program; 2 days of the week general warm-up, special warm-up for training and Iyengar hatha training system according to the movements were applied. Using a wave training method, 30 seconds between movements and 2-5 min. rest between sets were applied for a total of 50-60 minutes (including warming-cooling).

Hatha Yoga Exercises	1-2. Week, Time /2 sets	3-4. Week, Time / 3 sets	5-6. Week, Time /4 sets	7-8. Week, Time /4 sets
1. Ardha Chandrasana	20 sn	25 sn	30 sn	25 sn
2. Dandayamana	20 sn	25 sn	30 sn	25 sn
3. Dandayamana Bihaptakada	20 sn	25 sn	30 sn	25 sn
4. Ustrasana	20 sn	25 sn	30 sn	25 sn
5. Pavana Muktasana	20 sn	25 sn	30 sn	25 sn
6. Ardha Kurmasana	20 sn	25 sn	30 sn	25 sn
7. Tadasana	20 sn	25 sn	30 sn	25 sn
8. Bhoyangasana	20 sn	25 sn	30 sn	25 sn
9. Phorna Salathasana	20 sn	25 sn	30 sn	25 sn
10. Jarushirasana	20 sn	25 sn	30 sn	25 sn
11. Supta Vajrasana	20 sn	25 sn	30 sn	20 sn
12. Paschimothanasana	20 sn	25 sn	30 sn	20 sn

Fig 1: 8-week Hatha Yoga Training Program applied to the experimental group

## 2.4 Statistical Analysis of the Data

Arithmetic means (X) standard deviations (ss) were taken as descriptive statistics of the experimental and control groups in the study and after the 8-week training program, the differences between the post-tests of the experimental and control groups were examined. The pre-test comparisons of the groups were analyzed with independent samples t-Test (Independent Samples t-Test).

## 3. Results & Discussion

### 3.1. Findings

The analysis of age, height, body weight, subcutaneous fat measurement, flexibility, balance, strength measurements taken from the experimental and control groups before and after the 8-week hatha yoga exercise program are shown in the tables below.

**Table 1:** Descriptive statistics of sedentary women

Variables	Groups	n	(X ± ss)	t	p
Age (Years)	KG	15	48,27±3,51	1,264	,217
	DG	15	46,07±5,75		
Height (cm)	KG	15	160,26±3,47	,981	,335
	DG	15	149,66±41,71		
Body Weight (Kg)	KG	15	62,78±4,60	0,600	,952
	DG	15	62,68±299,59		

$p > 0.05$

Age, height of sedentary women participating in the study. body weight, mean and standard deviation values; The

experimental group was  $48.27 \pm 3.51$  years, height was  $160.26 \pm 3.47$  and weight was  $62.78 \pm 4.60$  years, the control group was  $46.07 \pm 5.75$  years, height  $149.66 \pm 41.71$  years and weight.  $62,68 \pm 299,59$ .

**Table 2:** Comparison of experimental and control group pretest

Variables	Groups	n	(X ± ss)	t	p
Flexibility	KG	15	34,90±2,67	,694	,494
	DG	15	33,96±4,47		
Balance	KG	15	2,20±1,37	-,204	,840
	DG	15	2,33±2,12		
(Suprailliac)	KG	15	19,88±1,59	-3,409	,122
	DG	15	22,18±2,06		
(Triceps)	KG	15	20,71±1,71	,644	,525
	DG	15	20,23±2,34		
(Supscapula)	KG	15	16,96±1,61	1,003	,325
	DG	15	16,48±1,23		
(Tie)	KG	15	17,68±1,17	-5,872	,254
	DG	15	16,51±1,29		
Leg Strength	KG	15	39,46±11,46	-,888	,382
	DG	15	40,46±8,27		
Back Strength	KG	15	35,02±8,43	-1,783	,085
	DG	15	40,48±7,27		
Hand Grip Strength	KG	15	21,93±4,00	-,804	,428
	DG	15	22,53±4,68		

$p > 0.05$

There was no statistically significant difference between the pre-test measurements of the experimental and control groups ( $p > 0.05$ ).

**Table 3:** Experimental and Control group posttest comparison

Variables	Groups	n	(X ± ss)	t	p
Flexibility	KG	15	35,06±1,98	-,041	,007*
	DG	15	38,76±4,16		
Balance	KG	15	1,93±,96	3,263	,003*
	DG	15	,800±,941		
(Suprailliac)	KG	15	19,69±1,62	-2,315	,018*
	DG	15	21,07±1,62		
(Triceps)	KG	15	20,43±1,76	2,034	,000*
	DG	15	18,66±2,26		
(Supscapula)	KG	15	16,70±1,55	1,339	,000*
	DG	15	14,01±1,26		
(Tie)	KG	15	17,42±1,12	-2,940	,000*
	DG	15	15,17±,78		
Leg Strength	KG	15	38,62±10,31	-1,794	,000*
	DG	15	45,73±11,37		
Back Strength	KG	15	34,33±8,81	-2,789	,009*
	DG	15	43,35±8,90		
Hand Grip Strength	KG	15	21,23±4,20	-1,793	,000*
	DG	15	25,02±4,30		

$p > 0.05$

There was a statistically significant difference in flexibility, balance, suprailliac, triceps, supscapula, tie, leg strength, back

force and hand grip strength variables between the experimental and control groups ( $p < 0.05$ ).

**Table 4:** Comparison of pretest and posttest of experimental group

Variables	n	Experiment Pretest (X±ss)	Experiment Posttest (X±ss)	t	P
Body Weight (kg)	15	62,68±5,07	60,76±4,68	5,409	,000*
Flexibility (cm)	15	33,96±4,47	38,76±4,16	-5,281	,000*
Balance (sec)	15	2,33±2,12	,800±,941	3,286	,005*
Suprailliac (mm)	15	22,18±2,06	21,07±1,62	5,014	,000*
Triceps (mm)	15	20,23±2,34	18,66±2,26	5,049	,001*
Tie (mm)	15	16,51±1,29	15,17±,78	5,801	,000*
Subscapula (mm)	15	16,48±1,23	14,01±1,26	6,174	,000*

Leg Strength	15	40,46±8,27	45,73±11,37	-3,718	,002*
Back Strength	15	40,48±7,27	43,35±8,90	-7,302	,000*
Hand grip Strength	15	22,53±4,68	25,02±4,30	-5,649	,000*

$p < 0.05$

A significant difference was found in all pre-test and post-test variables of women participating in 8-week Hatha Yoga ( $p < 0.05$ ).

**Table 5:** Control group pre-test and post-test comparison

Variables	n	Control Pretest (X±ss)	Control Posttest (X±ss)	t	P
Body Weight (kg)	15	34,9±2,67	35,06±1,98	-,542	,596
Flexibility (cm)	15	2,2±1,37	1,93±,96	,807	,433
Balance (sec)	15	19,88±1,59	19,69±1,62	,893	,387
Suprailiac (mm)	15	20,71±1,17	20,43±1,76	1,363	,194
Triceps (mm)	15	17,68±1,17	17,42±1,12	2,465	,127
Tie (mm)	15	16,96±1,61	16,70±1,55	4,392	,146
Subscapula (mm)	15	39,46±11,46	38,62±10,31	1,168	,262
Leg Force (N)	15	35,02±8,43	34,33±8,81	1,286	,219
Back Force (N)	15	21,93±4,00	21,23±4,20	,058	,955
Hand grip Force (N)	15	34,9±2,67	35,06±1,98	-,542	,596

$p < 0.05$

There was no statistically significant difference in body weight, flexibility, balance, suprailiac, triceps, tie, subscapula, leg strength, back strength and hand grip strength of the control group ( $p > 0.05$ ).

#### 4. Conclusion and Discussion

As a result of 8 weeks of hatha yoga exercises in sedentary women, a statistically significant increase in body weight, flexibility, strength, balance, body fat percentage parameters was found ( $p < 0.05$ ). When the related literature is examined; Baş; found that both yoga and exercise reduce body weight and body mass index. While it was determined that Hatha Yoga increased balance and anaerobic power, no significant difference was found in these elements in the experimental group [2].

Engelman *et al.*; reported that the body image of the group performing hatha yoga exercises was higher than the therapy group after ten weeks of yoga program. Many research findings to determine the effects of exercise on body composition reveal changes in body composition after exercise. The results of the research are in parallel with our study [5].

Grabara and Szopa in their study; 56 healthy women aged 50 years and over participated in the Yoga program for 20 weeks, 90 minutes once a week [8]. In addition, it is emphasized that yoga exercises can be recommended to adult individuals in order to increase the flexibility of muscles, range of motion and quality of life [17].

At the end of the 8-week hatha yoga exercise program, which was applied to 25 healthy sedentary women aged 30-45 years to examine the effect of hatha yoga on flexibility and balance; flexibility in individuals develops; as a result of balance assessments, the right and left extremity stay on the increase in time, hatha yoga and callisthenic exercises reported that the development of static balance in young [3].

In another study; men and women who did not have any health problems were included in the 6-month yoga class program, one group had active yoga program, another group had exercise and another group had daily housework 30-56 minutes. At the end of pre-test and post-test assessments; The results of the evaluation of length of stay on one leg, trunk

flexion and sit-and-lie measurements showed significant increases in all 3 groups and reported that the rates of increase in yoga group were higher than other groups [1]. In this study, the effects of callisthenic exercise and hatha yoga on static balance were examined. compared their effects on 33 healthy subjects aged between 18 and 26 years. The first group received hatha yoga for 4 hours a week for 6 weeks and the second group received callisthenic exercise training at the same time and frequency. According to the findings of the study, it was seen that hatha yoga training increased the static balance [3]. The data obtained from the studies in the field show parallelism with our study. In our study, it was found that the positive development of flexibility and balance strength values of sedentary women doing Hatha yoga supports our research.

As a result, hatha yoga exercises applied to sedentary women for 8 weeks showed positive improvement in physiological (weight, body fat percentage) and motoric (flexibility, strength, balance) characteristics ( $p < 0.05$ ). With the application of the program in different age and sports groups, it can be recommended as a training model for coaches.

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