

Original Article

Study of Selected Physical Fitness Parameters in Male Yoga Practitioners

Omkar S. Kulkarni and A.G. Joshi*

Department of Physiology,
KIMSDU, Karad

Abstract

Background: Extensive research is going on in the field of Yoga by various researchers. Even though there is less work in effect of Yoga on physical fitness parameters.

Objectives: The present study was aimed to find out the exact effects of Yoga and Surya Namaskar (SN) on the selected physical fitness parameters.

Material and Methods: In this cross sectional descriptive study, subjects doing regular Yoga and SN (n=51) for more than 6 months and age, sex matched control subjects (n=52) were selected by convenience sampling technique. Parameters compared were shoulder wrist flexibility, hip trunk flexibility, aerobic capacity, peak anaerobic power and peak expiratory flow rate.

Results: Study group had significantly higher scores of shoulder wrist flexibility and hip trunk flexibility ($p \leq 0.001$) and peak anaerobic power ($p = 0.018$). And no significant differences were observed in aerobic capacity ($p = 5.22$) and peak expiratory flow rate ($p = 0.139$).

Conclusion: Subjects who were practicing Yoga and SN, have better flexibility and peak anaerobic power than control group.

Introduction

Yoga is an ancient Indian practice, first described in Vedic scriptures around 2500 B.C., which utilizes mental and physical exercises to attain samadhi, or the union of the individual self with the infinite.

However, Yoga and Surya Namaskar (SN) has become more popular because it improves physical health of the subjects (1). SN, a traditional Indian Yogic practice, involves performing twelve physical postures with alternate forward and backward bending. Practicing twelve physical postures of SN constitute one round of its practice. The practice of SN has become very popular amongst people since its practice gives the benefit of aerobic exercise along with stretching of muscles. The deep breathing performed with each posture also renders some benefits of breathing exercise (2). Traditional athletic training utilizes specific activities to improve the

***Corresponding author :**

Dr. A.G. Joshi, Professor, Department of Physiology,
KIMSDU, Karad.

(Received on June 10, 2019)

specific domains of fitness. For example, repeated periods of long distance running will challenge the cardiovascular system and therefore, increase the cardiovascular fitness (3). Thus, athletic performance is believed to be improved as performance in the components of fitness related to that sport improves. Although such training maximizes the specific components of fitness, difficulties occur in utilizing these specific fitness gains to enhance athletic performance (2, 3). There are claims that regular Yoga and SN practice are useful for improving physical fitness standards like BMI, cardiorespiratory fitness, upper and lower body flexibility, anaerobic power (2).

However few research workers suggest that Yoga and SN is not that useful for improving all physical fitness standards (4).

So, present study is undertaken to study effect of Yoga and SN on above mentioned physical fitness parameters.

Methods

For present study 103 male subjects were selected by convenience sampling technique. Yoga group consisted of 51 males doing Yoga and SN under guidance and supervision of a Yoga teacher and control group consisted of 52 males.

Inclusion criteria for Yoga group were

1. Apparently healthy males of 30-50 years age.
2. Practicing Yoga and SN for more than 6 months minimum 5 days a week for 1 hour.

Inclusion criteria for control group were

1. Apparently healthy males of 30-50 years age.
2. Having sedentary lifestyle.
3. Not doing exercise of any form, any sports or activities involving heavy exertion.

Exclusion criteria for Yoga group were

1. Cardiovascular and respiratory disorder.
2. Musculoskeletal disorder, fracture, arthritis.
3. Any endocrine disorder like Diabetes, Thyroid disorders.
4. Addictions like Chewing tobacco, smoking, alcohol etc.
5. Having any major illness.
6. Doing exercise of any form other than Yoga, exercise of any form, any sports or work involving vigorous activities.

Exclusion criteria for control group were

1. Cardiovascular and respiratory disorder.
2. Musculoskeletal disorder, fracture, arthritis.
3. Any endocrine disorder like Diabetes, Thyroid disorders.
4. Addictions like Chewing tobacco, smoking, alcohol etc.
5. Having any major illness.
6. Involved in doing Yoga, exercise of any form any sports, or work involving vigorous activities.

Informed written consent of all participants was taken prior to the study.

The University Ethical Committee approval (Ref.no.KIMSDU/IEC/03/2015) to carry out the study was taken prior to data collection.

Subjects were allowed to take morning tea and not the breakfast before 9:00 a.m. Study was carried out in department of physiology at 10:00 am.

Subjects were asked to take rest in supine position for 10 minutes then following parameters were measured by standard method.

1. Pulse rate per minute
2. Blood pressure systolic and diastolic by mercury sphygmomanometer.
3. Respiratory rate per minute.

Also following parameters were measured and calculated (5-10).

1. Height in centimeter (cm)
2. Weight in Kilogram (kg)
3. Body mass index (B.M.I) by formula $B.M.I = \text{Body weight in kg}/(\text{Height in meter})^2$ in kg/m^2 (5).
4. Waist to hip ratio (6).

Following physical fitness parameters were measured and calculated as per standard procedures.

1. Shoulder and wrist elevation test for measuring shoulder wrist flexibility (7).

Material required: Two Scales, Glass/wooden rod, Mat

Starting position:

Subject was asked to lie prone on the floor with the arms fully extended over the head and asked to grasp a yardstick with hands shoulder width apart.

Movement:

Subject raised the stick as high as possible. The vertical distance (nearest the 0.1 cm) the yardstick rose from the floor was measured, the arm length from the acromion process to tip of the longest finger was measured, the average vertical score was subtracted from the arm length. As per the formula Shoulder-wrist flexibility score is equal to arm length

minus average vertical score. When flexibility is less, vertical score will be less. So, less the vertical score, more will be the final Shoulder-wrist flexibility score.

Score: Arm length – vertical score (nearest 0.1 cm)

2. Modified sit and reach test for measuring hip trunk flexibility (7).

Material required: Flexibility box, Scale, Chalk, Mat

Starting position:

Subject was seated on the floor with back and head against a wall, with legs fully extended, with the bottom of feet against the sit and reach box. Subject placed hands on top of each other, stretched arms forward while keeping head and back against the wall. The distance from finger tips to the box edge, was measured with yard stick. This represented the zero or the starting point

Movement:

Subject slowly bent and reached forward as far as possible (moved head and back away from the wall, sliding the fingers along the yard stick, held the final position for 2 seconds.

Score:

Total distance reached to the nearest 0.1 cm represented the final score.

3. Step test for measuring aerobic capacity ($VO_{2\max}$) (8).

Material required:

16 1/4 inch 3 steps gymnasium benches, Stop watch, Metronome

Step test:

The step test began after a brief demonstration and practice period. 3 minute step test to evaluate heart rates after the exercise was used. Subject was asked to perform twenty four complete step-ups per minute,

regulated by a metronome at 96 beats per minute. Subjects performed each stepping cycle to a four step cadence “Up- Up- Down- Down”. After completion of stepping, subject was asked to remain standing while pulse rate was measured for 15 seconds, 5 to 20 seconds in recovery. Recovery heart rate was converted to beats per minute (15-s HR x 4) and entered in formula, $VO_{2\max} = 111.33 - (0.42 \times \text{Step Test pulse (Beats per minute)})$.

4. Vertical jump test for measuring peak anaerobic power (PAP) (9).

Material required: Scale, Board, and Chalk

Procedure:

Standing reach height was established first. Subject was asked to stand with preferred shoulder adjacent to the wall with feet flat on the floor, hands reaching as high as possible. Subject was asked to bend knees to about 90° angles while moving arms back in a winged position. Then subject was asked to thrust forward and upward, as high as possible on the wall. Three trails of jump test were performed. We used the highest score as the vertical height. We then computed the vertical height (cm) as the difference between standing reach height and vertical jump height achieved in the jump.

PAP output was calculated by following formula:

$$PAP (w) = 60.7 (VJ \text{ cm}) + 45.3 (BM \text{ Kg}) - 2055$$

PAP (w) = Peak anaerobic power output in watts

VJ cm = Vertical jump height in cm

BM Kg = Body mass in kilogram

5. Peak expiratory flow rate (PEFR) measured by breathe-o meter as per EU scale, (CIPLA LTD, Mumbai central, Mumbai 400008). Each subject was given three trials and maximum readings were considered (10).

Mean and standard deviation were calculated for both groups and unpaired t test was used to find out

whether differences were statistically significant or not. IBM SPSS Statistics for Windows, Version 20. Armonk, NY: IBM Corp. was used. p values were considered as follows:

1. $p \geq 0.05$ not significant
2. $p \leq 0.05$ significant
3. $p \leq 0.001$ highly significant

Results

TABLE I : Showing values of mean, standard deviation (SD) and p values of Shoulder wrist flexibility, Hip trunk flexibility and PAP scores of Yoga and Control group.

Parameter	Yoga subjects (n=51)	Control subjects (n=52)	p value
Shoulder-wrist flexibility (cm)	20.66±12.33	33.49±11.56	<0.001**
Hip-trunk flexibility (cm)	43.32±7.03	33.14±7.88	<0.001**
PAP (w)	3531.67±513.33	3264.30±609.88	0.018*

$p \geq 0.05$ not significant %, $p \leq 0.05$ significant*, $p \leq 0.001$ highly significant **

TABLE II : Showing values of mean, SD and p values of $VO_{2\max}$ and PEFR scores of Yoga and Control group.

Parameter	Yoga subjects (n=51)	Control subjects (n=52)	p value
$VO_{2\max}$ (ml/kg/min)	50.66±6.42	49.71±8.51	0.522%
PEFR (L/min)	512.94±55.90	491.15±88.57	0.139%

$p \geq 0.05$ not significant %, $p \leq 0.05$ significant*, $p \leq 0.001$ highly significant **

TABLE III : Showing values of mean, SD and p values of height, weight, BMI and waist hip ratio of Yoga and Control group.

Parameter	Yoga subjects (n=51)	Control subjects (n=52)	p value
Height (cm)	169.35±7.03	171±5.63	0.142%
Weight (kg)	72.25±11.13	70.31±11.11	0.377%
B.M.I (kg/m ²)	25.08±3.31	23.97±3.60	0.107%
Waist hip ratio	0.94±0.04	0.95±0.04	0.27%

$p \geq 0.05$ not significant %, $p \leq 0.05$ significant*, $p \leq 0.001$ highly significant **

TABLE IV: Showing values of mean, SD and p values of resting pulse, respiratory rate and blood pressure of Yoga and Control group.

Parameter	Yoga subjects (n=51)	Control subjects (n=52)	p value
Pulse (beats/min)	70.68±9.16	72.51±9.44	0.320%
Respiratory rate (cycles/min)	15.80±3.23	19.09±2.35	<0.001**
Systolic blood pressure (mmHg)	127.05±10.10	127.53±8.25	0.793%
Diastolic blood pressure (mmHg)	80.27±8.23	79.96±6.99	0.836%

p≥0.05 not significant %, p≤0.05 significant*, p≤0.001 highly significant **

Discussion

In present study it was observed that difference between age and sex matched yoga group and control group for shoulder wrist flexibility and hip trunk flexibility were statistically highly significant (p≤0.001) (Table I).

During Yoga and SN there are certain yogic postures because of which shoulder and vertebral column movements take place to its full Range of Motion (ROM), when someone does Yogic exercise repeatedly the ligaments get stretched and flexibility of joints increases (11).

Our study strongly concluded that that Yoga and SN exercises are useful way to improve upper and lower body flexibility.

Immediate and short term energy is derived from anaerobic mechanism. PAP gives information on how effective body is in doing high intensity work in short duration (9).

In present study it was observed that difference between yoga group and control group for PAP was statistically significant (p≤0.018)

It will be difficult to explain these changes, however this may be due to balanced conversion taking place between three fiber types (Fast Oxidative Glycolytic (FOG), Slow Oxidative (SO), Fast Glycolytic (FG)). As the basic nature of yoga is to maintain 'balance' or homeostasis/or equilibrium (12, 13). Our findings are consistent with findings of other research worker (14).

Difference between yoga group and control group for VO_{2max} and PEFr are not statistically significant (p≥0.05) (Table II) However few other workers have got significant differences (9, 13-22, 23-29).

Difference between yoga group and control group for height, weight, B.M.I and waist hip ratio are not statistically significant (p≥0.05) (Table III).

In present study it was observed that difference between yoga group and control group for resting respiratory rate was statistically significant (p≤0.001) (Table IV). Similar findings were reported by various research workers (10, 30).

Difference between yoga group and control group resting heart rate and blood pressure are not statistically significant (p≥0.05) (Table IV).

Conclusion:

Practicing Yoga and SN shows improvement in body flexibility and PAP, however no significant differences were observed in VO_{2max} and PEFr. Further study is required with longer duration of Yoga and SN, SN at a faster pace and perfection in Yoga asanas.

Limitations:

1. Present study was done on small sample size.
2. Perfection of Yoga asanas and pace of SN were not monitored.

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