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Original

## EFFECTS OF SELECTED ASANAS IN HATHA YOGA ON AGILITY AND FLEXIBILITY LEVEL

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## ABSTRACT

The present study was conducted to determine the effects of selected asanas in hatha yoga on agility and flexibility level. The subjects for the study were selected on the basis of random group design. Thirty (N=30) male students were selected as subject for the present study from D.A.V. Institute of Engineering and Technology, Jalandhar (Punjab), INDIA. All the subjects ranged between the chronological age of 18-25 years. The selected subjects were further divided into two groups. Experimental treatment was then assigned to group "A" while group "B" acts as control. "Hexagonal Obstacle Test" was used to measure Agility whereas "Sit and Reach Test" was used to measure Flexibility. The subjects were subjected to the six week yogasanas training programme that includes Swastikasana, Mayurasana, Matsyendrasana, Paschimottanasana and Gomukhasana.

The difference in the mean of each group for selected variable was tested for the significance of difference by "t" test. The level of significance was set at 0.05. The results have shown the significant improvement in flexibility, since cal. t (= 8.122) > tab t .05 (14) (= 2.145). The treatment of six week yogasanas training programme also shown significant improvement in case of agility, since cal. t (= 7.376) > tab t .05 (14) (= 2.145).

**Key words:** Yogasanas, Hatha Yoga, Agility, Flexibility, Hexagonal Obstacle Test, Sit and Reach Test.



## INTRODUCTION

Hatha Yoga has become increasingly popular in western countries as a method for coping with stress and as a means of exercise and fitness training<sup>[1]</sup>. However, little is known about the physiological and psychological effects of hatha yoga practice. The school of hatha yoga attaches a lot of importance to the perfect physical form, believing it to be a way of attaining spiritual perfection and to this end it takes the help of pranayama (breath-control exercises) and mudras (hand gestures) to attain self-realization. Often seen as part of Raja Yoga, the origins of hatha yoga can be traced to Gorakhnath, the 12th-century founder of the Kanphata Yogis. The word 'hatha' is derived from the two root terms, 'ha' meaning 'the sun' and 'tha' meaning 'the moon'. Taken together, the term stands for 'union of force'. Hence, central to hatha yoga disciplines is the harmonizing of its positive (sun) and negative (moon) currents.

Hatha yoga is the most popular branch of yoga. It is known as a branch of yoga that unites pairs of opposites, and its goal is to achieve balance between body & mind by:

*Postures (physical tone & awareness);*

*Breathing techniques (controlled breathing);*

*Meditation (controlled concentration).*

The three main elements used in hatha yoga to attain its purposes are the body, the physical part of man; the mind, the subtle part; and the element that relates the body with the mind in a special way, the breath.

Over the last 10 years, a growing number of research studies have shown that the practice of hatha yoga can improve strength and flexibility, and may help control such physiological variables as blood pressure, respiration and heart rate, and metabolic rate to improve overall exercise capacity<sup>[2]</sup>.

There have been many studies on yoga and its effects on physical function<sup>[3]</sup> but with the phenomenal and ever increasing

popularity of hatha yoga in the past few years, there is a surprising lack of research on this particular discipline and as a result the present study had been undertaken to examine the effects of selected asanas in hatha yoga on agility and flexibility level.

## METHODS

### *Subjects*

The subjects for the present were selected on the basis of random group design. Thirty (N=30) male students were selected as subject for the present study from D.A.V. Institute of Engineering and Technology, Jalandhar (Punjab), INDIA. All subjects ranged between the chronological age of 18-25 years. The selected subjects were further divided into two groups. Experimental treatment was then assigned to group "A" and group "B" acts as control. The subjects were subjected to the six week training programme of Swastikasana, Mayurasana, Matsyendrasana, Paschimottanasana and Gomukhasana. Hexagonal obstacle test was used to measure agility whereas Sit and reach test was used to measure flexibility.

### *HEXAGONAL OBSTACLE TEST*

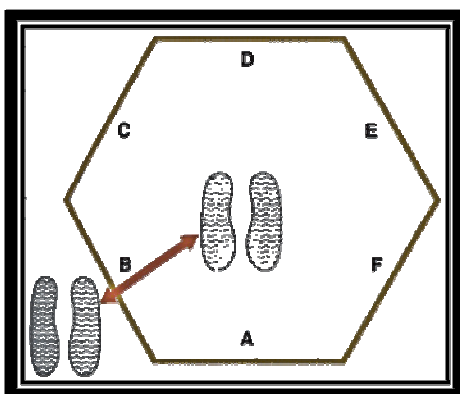
#### **Objective**

The objective of the Hexagonal Obstacle Test is to monitor the athlete's agility.

#### **Required resources**

To undertake this test you will require:

- a) 66 cm sided hexagon marked out on the floor
- b) Stop watch



### Test procedure

The Hexagonal Obstacle Test is conducted as follows:

- The athlete stands in the middle of the hexagon, facing line A
- At all times throughout the test the athlete is to face line A
- On the command GO the watch is started and the athlete jumps with both feet over line B and back to the middle, then over line C and back to the middle, then line D and so on
- When the athlete jumps over line A and back to the middle this counts as one circuit
- The athlete is to complete three circuits
- On completion of three circuits the watch is stopped and the time recorded
- The athlete rests and then repeats the test
- On completion of the second test determine the average of the two recorded times.

If you jump the wrong line or land on a line then the test is to be restarted.

### **SIT AND REACH TEST**

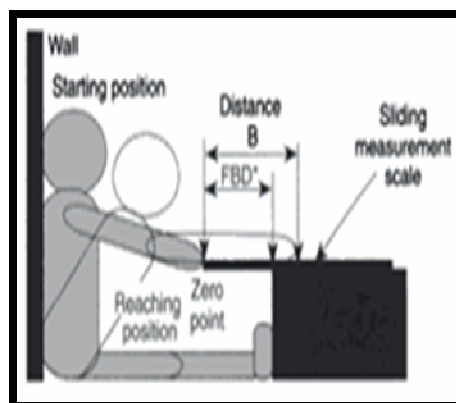
#### Objective

Sit and Reach Test measures the flexibility of the lower back and hamstrings.

### Required resources

To undertake this test you will require:

- a) Sit and Reach Box about 30cm (12 inches) high.
- b) A meter rule.



*Reprinted from Horger and Hopkins, 1992*

### Test procedure

The subject sits on floor with shoes off. Subject places bottom of feet (10 to 12 inches apart) against side of box (approximately 12" or 30 cm high) with knees straight. Tester places measuring stick on box parallel to subject's legs; 15" or 38 cm at edge of box closest to subject and end of measuring stick ("0") toward subject. Subject places hand over hand and reach as far as possible over measuring stick without bending knees. Best of three tries is recorded.

### **SIX WEEK OF YOGASANAS TRAINING PROGRAMME**

First stage in Hath yoga is Asana. The aim of asanas is to strengthen the body, clearing the impurities of nadis and to make the body fit for sitting comfortably in meditation for long hours. The present study had been undertaken to examine the effect of selected asanas in hatha yoga on agility and flexibility level. The experimental group received training in physical postures (asanas, 90 minutes). The



asanas which were practiced every day included:

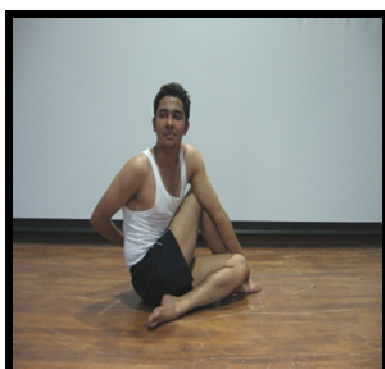
1. Swastikasana
2. Mayurasana
3. Matsyendrasana
4. Paschimottanasana and
5. Gomukhasana



SWASTIKASANA



MAYURASANA



MATSYENDRASANA



PASCHIMOTTANASANA



GOMUKHASANA

### ***STATISTICAL ANALYSES***

The difference in the mean of each group for selected variable was tested for the significance of difference by “t” test<sup>[4]</sup>. The level of significance was set at 0.05.

Hypothesis:

$$H_0: \mu_y = \mu_x$$

$$H_1: \mu_y \geq \mu_x$$

Level of significance:

.05

Inference:

Since calculated “t” is greater than tab t.05, Ho (null hypothesis) may be rejected at .05 level of significance. Thus it may be concluded that six week of yogasanas training programme have a significant effect on agility and flexibility level. As per the study the above remark can be given at 95% confidence.



## RESULTS AND DISCUSSION

The study was conducted to find out the effects of selected asanas in hatha yoga on agility and flexibility level. The statistical analysis of data collected on thirty (N=30) subjects. For each of the chosen variable, the results pertaining to significant difference, if any, between experimental and control groups were assessed by “t” test and are presented in tables (read Annex).

Table-3 shows that the mean of flexibility of pretest of experimental group and posttest of experimental group was 47.86 and 46.66 respectively, whereas the mean of pulse rate of pretest of control and posttest of control group was 50.20 and 46.8000. The “t” value in case of experimental group was 8.122 and for control group it was 0.414. Since cal.  $t (=8.122) > \text{tab } t_{.05} (14) (=2.145)$ ,  $H_0$  (null hypothesis) is rejected at .05 level of significance. Thus it may be concluded that six week of yogasanas training programme showed significant improvement in flexibility. As per the study the above remark can be given at 95% confidence. The graphical representation of responses has been exhibited in figure-1.

Table-3 shows that the mean of agility of pretest of experimental group and posttest of experimental group was 14.70 and 13.42 respectively, whereas the mean of agility of pretest of control and posttest of control group was 15.41 and 15.03. The “t” value in case of experimental group was -7.3 and for control group it was -5.389. Since cal.  $t (= -7.3) > \text{tab } t_{.05} (14) (=2.145)$ ,  $H_0$  (null hypothesis) is rejected at .05 level of significance. Thus it may be concluded that six week of yogasanas training programme showed significant improvement in agility. As per the study the above remark can be given at 95% confidence. The graphical representation of responses has been exhibited in figure-2.

From the results it is evident that the six week of yogasanas training programme showed significant improvement in agility and flexibility level. The findings is supported by the study conducted by Galantino ML, Bzdewka TM, Eissler-Russo JL, Holbrook ML, Mogck EP, Geigle P, Farrar FT. to evaluate a possible design for a 6-week modified hatha yoga protocol to study the effects on Twenty-two participants (M = 4; F = 17), between the ages of 30 and 65 with chronic low back pain showed improved balance and flexibility<sup>[5]</sup>. Likewise M.DiBenedetto, K.Innes, A.Taylor, P.Rodeheaver, J.Boxer, H.Wright, D.Kerrigan conducted the study titled “Effect of a Gentle Iyengar Yoga Program on Gait in the Elderly: An Exploratory Study” on Twenty-three healthy adults (age range, 62–83y) who were naive to yoga were recruited; 19 participants completed the program. An 8-week Iyengar Hatha yoga program specifically tailored to elderly persons and designed to improve lower-body strength and flexibility. Findings of this exploratory study suggest that yoga practice may improve hip extension, increase stride length, and decrease anterior pelvic tilt in healthy elders<sup>[6]</sup>. Study conducted by Tekur P, Singphow C, Nagendra HR, Raghuram N. to compare the effect of a short-term intensive residential yoga program with physical exercise (control) on pain and spinal flexibility in subjects with chronic low-back pain (CLBP). Spinal flexibility measures improved significantly in both groups but the yoga group had greater improvement as compared to controls on spinal flexion ( $p = 0.008$ ; effect size 0.146), spinal extension ( $p = 0.002$ ; effect size 0.251), right lateral flexion ( $p = 0.059$ ; effect size 0.006); and left lateral flexion ( $p = 0.006$ ; effect size 0.171)<sup>[7]</sup>.



## CONCLUSIONS

Findings of this exploratory study suggest that the treatment of six week yogasanas training programme showed significant improvement in agility and flexibility level.

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## ANNEX

**TABLE-1**  
**FLEXIBILITY OF EXPERIMENTAL**  
**GROUP**

	<b>Pre-Test</b>	<b>Post-Test</b>
Sample size	15	15
Arithmetic mean	47.8667	50.2000
95% CI for the mean	41.8370 to 53.8963	44.3798 to 56.0202
Variance	118.5524	110.4571
Standard deviation	10.8882	10.5099
Standard error of the mean	2.8113	2.7136

*Paired samples t-test*

Mean difference	2.3333
Standard deviation	1.1127
95% CI	1.7171 to 2.9495
<b>Test statistic t</b>	<b>8.122</b>
Degrees of Freedom (DF)	14
Two-tailed probability	P < 0.0001

**TABLE-2**  
**FLEXIBILITY OF CONTROL**  
**GROUP**

	<b>Pre-Test</b>	<b>Post-Test</b>
Sample size	15	15
Arithmetic mean	46.6667	46.8000
95% CI for the mean	41.5711 to 51.7623	42.0445 to 51.5555
Variance	84.6667	73.7429
Standard deviation	9.2014	8.5874
Standard error of the mean	2.3758	2.2172

*Paired samples t-test*

Mean difference	0.1333
Standard deviation	1.2459
95% CI	-0.5566 to 0.8233
<b>Test statistic t</b>	<b>0.414</b>
Degrees of Freedom (DF)	14
Two-tailed probability	P = 0.6848



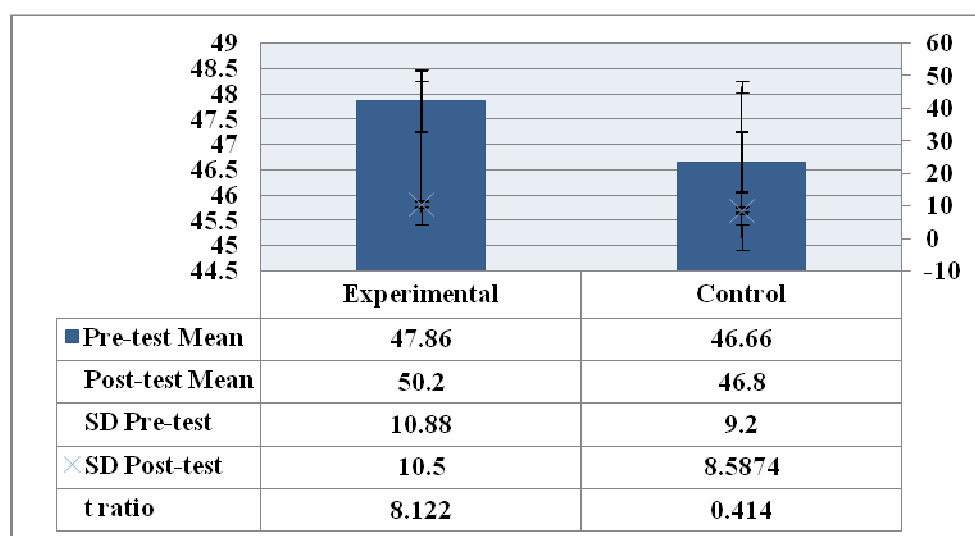
**TABLE-3**  
**MEAN, STANDARD DEVIATION (SD), STANDARD ERROR OF MEAN (SEM) OF**  
**FLEXIBILITY OF EXPERIMENTAL AND CONTROL GROUP**

Group	Number	Mean	S.D.	SEM	't' Value
Experiment (Pre-test)	15	47.86	10.88	2.81	<b>8.122</b>
Experimental (Post-test)	15	50.20	10.50	2.7136	
Control (Pre-test)	15	46.66	9.20	2.37	<b>0.414</b>
Control (Post-test)	15	46.8000	8.5874	2.2172	

\*Significant at 0.05 level of confidence.

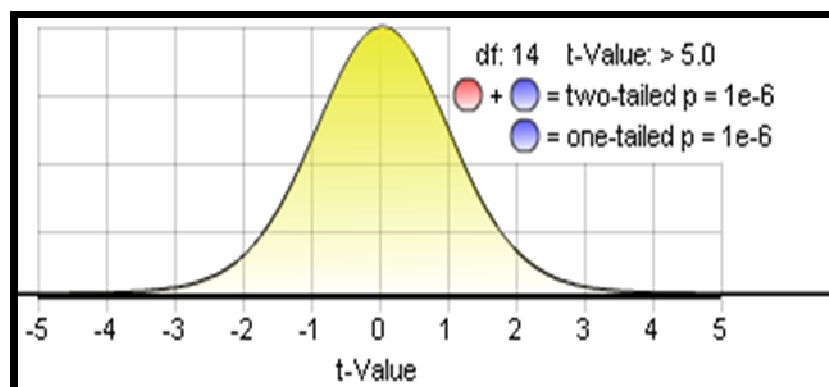
"t" .05 (14) = 2.145

**FIGURE-1**  
**MEAN, STANDARD DEVIATION (SD), STANDARD ERROR OF MEAN (SEM) OF**  
**FLEXIBILITY OF EXPERIMENTAL AND CONTROL GROUP**





**FIGURE-2**  
**P-VALUE, TWO TAILED AND ONE TAILED PROBABILITY VALUES OF A**  
**T-TEST OF EXPERIMENTAL GROUP OF**  
**AGILITY**



**FIGURE-2**  
**P-VALUE, TWO TAILED AND ONE TAILED PROBABILITY VALUES OF A**  
**T-TEST OF CONTROL GROUP OF**  
**FLEXIBILITY**

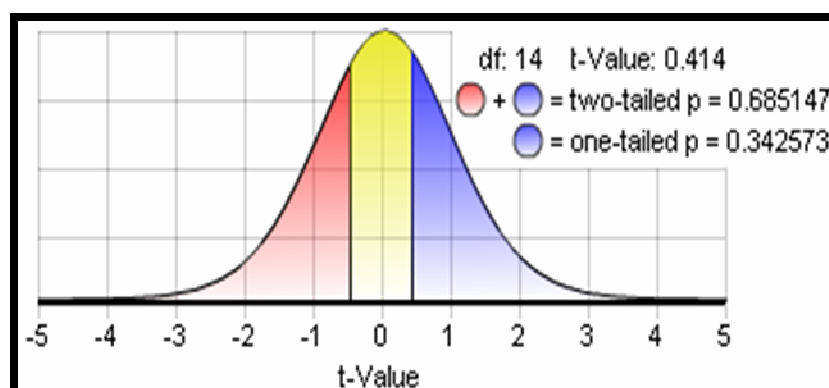




TABLE-4  
AGILITY OF EXPERIMENTAL  
GROUP

	Pre-Test	Post-Test
Sample size	15	15
Arithmetic mean	14.7067	13.4267
95% CI for the mean	13.6627 to 15.7506	12.4527 to 14.4007
Variance	3.5535	3.0935
Standard deviation	1.8851	1.7588
Standard error of the mean	0.4867	0.4541

*Paired samples t-test*

Mean difference	-1.2800
Standard deviation	0.6721
95% CI	-1.6522 to -0.9078
<b>Test statistic t</b>	<b>-7.376</b>
Degrees of Freedom (DF)	14
Two-tailed probability	P < 0.0001

TABLE-5  
AGILITY OF CONTROL  
GROUP

	Pre-Test	Post-Test
Sample size	15	15
Arithmetic mean	15.4133	15.0333
95% CI for the mean	14.3767 to 16.4500	13.9669 to 16.0997
Variance	3.5041	3.7081
Standard deviation	1.8719	1.9256
Standard error of the mean	0.4833	0.4972

*Paired samples t-test*

Mean difference	-0.3800
Standard deviation	0.2731
95% CI	-0.5312 to -0.2288
<b>Test statistic t</b>	<b>-5.389</b>
Degrees of Freedom (DF)	14
Two-tailed probability	P = 0.0001



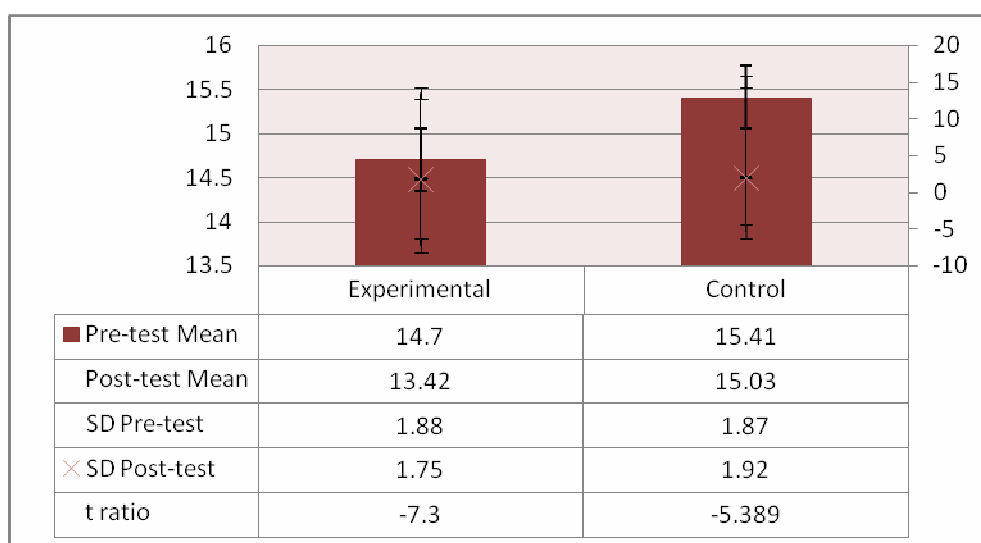
**TABLE-6**  
**MEAN, STANDARD DEVIATION (SD), STANDARD ERROR OF MEAN (SEM) OF**  
**AGILITY OF EXPERIMENTAL AND CONTROL GROUP**

Group	Number	Mean	S.D.	SEM	't' Value
Experiment (Pre-test)	15	14.70	1.88	0.48	<b>-7.3</b>
Experimental (Post-test)	15	13.42	1.75	0.45	
Control (Pre-test)	15	15.41	1.87	0.48	<b>-5.389</b>
Control (Post-test)	15	15.03	1.92	0.49	

\*Significant at 0.05 level of confidence.

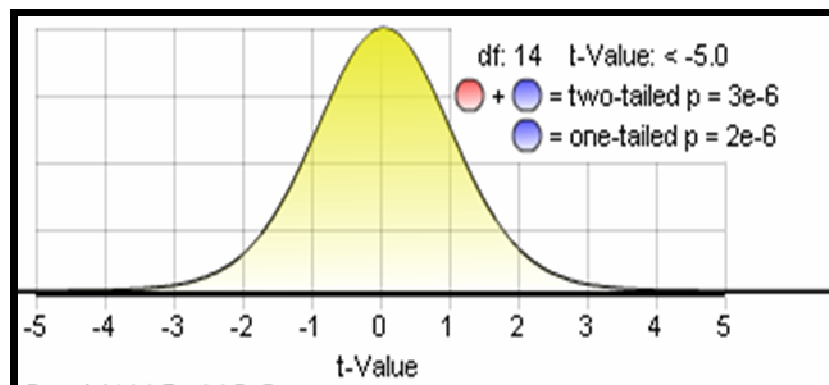
"t" .05 (14) = 2.145

**FIGURE-2**  
**MEAN, STANDARD DEVIATION (SD), STANDARD ERROR OF MEAN (SEM) OF**  
**AGILITY OF EXPERIMENTAL AND CONTROL GROUP**





**FIGURE-3**  
**P-VALUE, TWO TAILED AND ONE TAILED PROBABILITY VALUES OF A**  
**T-TEST OF EXPERIMENTAL GROUP OF**  
**AGILITY**



**FIGURE-3**  
**P-VALUE, TWO TAILED AND ONE TAILED PROBABILITY VALUES OF A**  
**T-TEST OF CONTROL GROUP OF**  
**AGILITY**

