



# EFFECT OF 6 WEEKS YOGASANA PRACTICES ON FLEXIBILITY AND MUSCULAR ENDURANCE OF SCHOOL GOING CHILDREN

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## Abstract

**Purpose:** The purpose of the study was to find out the effect of 6 weeks of yogasana practices on flexibility and muscular endurance of school going children. **Material and Methods:** For this study 20 school going children selected from various school of Varanasi city was selected randomly as the subject. The age of subjects was ranged between 12 to 16 years. For this study, the pre test & post test randomized group design was used and involving total 20 school going children, who were grounded randomly into two group i.e., experimental and control group each group consist 10 children. Flexibility of the subjects was measured by using Sit and Reach test and the score were recorded in inch. Muscular Endurance was measured by Burpee Jump and the numbers of correctly executed squat thrust in one minute was recorded as a score of subjects. The experiment group was taken 6 weeks Yogasana practices with our daily life activity and control group was performed our daily activity without any specific training program. The data which was obtained from subjects of flexibility and muscular endurance was analyzed statistically by the analysis of covariance (ANCOVA) technique. The obtained "F" ratio was tested at .05 level of significance. **Statistical Procedure:** The data which was obtained from subjects of flexibility and muscular endurance was analyzed statistically by the analysis of covariance (ANCOVA) technique. The obtained "F" ratio was tested at .05 level of significance. **Results & Conclusion:** The results of the study showed that there is significant effect of 6 weeks of Yogasana practices on flexibility and muscular endurance of school going children. The study concludes that increasing the flexibility and muscular endurance positively contributes due to Yogasana practices.

**Keywords:** Flexibility, Muscular endurance & Yogasana.

## Introduction

Health is not just freedom of disease. For good health the joints, tissues, muscles, cells, nerves, glands and each system of the body must all be in a state of perfect balance and harmony. Health is the perfect equilibrium of the body and mind, intellect and soul. Health is like the flowing water of a river, always fresh and pure, in a constant state of flux. Humans are a combination of the senses of perception, the organs of action, the mind, the intelligence, the inner consciousness, and the conscience. (B.K.S.Iyengar, 2001, p. 15) Human beings are made up of three components: body, mind and soul. Corresponding to these are three needs that must be satisfied for a contented life; the physical need is health; the psychological need is knowledge; and the spiritual need is inner peace. When all three are present there is harmony. (Silva Mira & Shyam Mehta, 1990, p. 8) Health is a balanced state of bodily elements and of all anatomical and physiological systems, where each part of the body functions at full potential. All complex systems of body must work smoothly and without interruption, but in ordinary life they do not. Mental, moral and emotional aspects too must be sound. Spiritually completes full health and puts human affairs in the

perspective of the universal. Striving toward this goal is the main aim of yoga. (Silva Mira & Shyam Mehta, 1990, p. 12)

Yogasans help to ensure an even distribution of bio-energy, or life force, which brings the mind to a state of calm. Human who practices yoga, face life not as a victim, but as a master, in control of his or her life situations, circumstances and environment. Asanas balance the respiratory, circulatory, nervous, hormonal, digestive, excretory and reproductive systems perfectly. The equilibrium in the body then brings mental peace and enhances intellectual clarity. (B.K.S.Iyengar, 2001, p. 15) Yoga is one of the six orthodox systems of Indian philosophy. It was collated, co-ordinated and systematized by Patanjali in his classical work, the Yoga sutras which consists of 185 terse aphorisms. In Indian thought everything is permeated by the supreme universal spirit (Paramatma or god) of which the individual human spirit (jivatma) is a part. The system of yoga is so called because it teaches the means by which the jivatma can be united to or be in communion with the Paramatma and so secure liberation (moksa). (B. K. S. Iyengar, Yehudi Menuhin, 1976, p. 19)

In the sixth chapter of the Bhagavad Gita, which is the most important authority on Yoga Philosophy, Sri Krishna explains to Arjuna the meaning of Yoga as a deliverance from contact with pain and sorrow. It is said; (B. K. S. Iyengar, Yehudi Menuhin, 1976)

*“Anasritah karma-phalam karyam karma karoti yah sa sannyasi ca yogi ca na niragnir na cakriyah”*

When his mind, intellect and self (ahamkara) are under control, freed from restless desire, so that they rest in the spirit within, a man becomes a Yukta-one in communion with god. A lamp does not flicker in a place where no winds blow; so it is with a yogi who control his mind, intellect and self being absorbed in the spirit within him. When the restlessness of the mind, intellect and self is stilled through the practice of yoga, the yogi by the grace of the spirit within himself finds fulfillment. (B. K. S. Iyengar, Yehudi Menuhin, 1976, p. 19) The primary aim of yoga is to restore the mind to simplicity, peace and poise, to free it from confusion and distress. This simplicity this sense of order and calm, comes from the practice of asanas and pranayama. Yoga asanas integrate the body, the mind, the intelligence and finally, the self. (B.K.S.Iyengar, 2001, p. 12) In the yoga sutras of Patanjali there is a concise definition of Yogasanas; “Sthiram sukham asanam”, meaning ‘that position which is comfortable and steady. Asanas are practiced to develop the ability to sit comfortably in one position for an extended period of time, an ability necessary for meditation. Raja yoga equates yogasana to the stable sitting position. (Saraswati, 1996, p. 09) Yogasanas have often been thought of as a form of exercise. They are not exercise, but techniques which place the physical body in positions that cultivate awareness, relaxation, concentration and meditation. Part of this process is the development of good physical health by stretching, massaging and stimulating the pranic channels and internal organs. (Saraswati, 1996, p. 12)

Physical activity has been defined as any bodily movement produced by skeletal muscles that results in energy expenditure. Similarly, Exercise is a type of physical activity that is planned, structured, repetitive and is purposely aimed at improving physical fitness. Physical fitness is a set of attributes that people have or achieve and includes components of health related and athletic related skills. (Lori Thein Brody, Carrie M. Hall, 2011, p. 101)

Flexibility refers to a musculotendinous units ability to elongate with application of a stretching force. The amount of flexibility of area structure is related to its stiffness, suppleness, or pliability. Prolonged loss of flexibility can reduce range of motion. (Houglum, Therapeutic Exercise for Musculoskeletal Injuries , 2016, p. 126) Flexibility is the total range of motion at a joint that occurs pain free in each of the planes of motion. In most cases, less flexibility is better than too much; however, in certain activities, excessive flexibility is a necessity. (Marcia K. Anderson, Gail P. Parr, Susan J. Hall, 2009, p. 101) Muscle endurance is the ability of a muscle or a muscle group to perform repeated contractions against a less than maximal load. A muscles endurance or ability to prolong activity, depends on the status of the energy systems available and the quantity of forces resisted. (Houglum, Therapeutic Exercise for Musculoskeletal Injuries , 2016, p. 193)

## Material and Methods

### Study participants

For this study 20 school going children selected from various school of Varanasi city was selected randomly as the subject. The age of subjects was ranged between 12 to 16 years. For this study, the pre test & post test randomized group design was used and involving total 20 school going children, who were grounded randomly into two group i.e., experimental and control group each group consist 10 children.

Control Group	O		O
Yogasana Practice Group	O	T	O

### Functional tests

Flexibility of the subjects was measured by using Sit and Reach test and the score were recorded in inch. (Kansal, 1996, p. 195) Muscular Endurance was measured by Burpee Jump and the numbers of correctly executed squat thrust in one minute was recorded as a score of subjects. (Ashok, 2008, p. 240)

### Training Protocol

The experiment group was taken 6 weeks Yogasana practices with our daily life activity and control group was performed our daily activity without any specific training program. In this training, Suryanamaskar, Virabhadrasana, Shavasana, Halasana, Vrksasana, Matsyasana, Virabhadrasana, Bhujangasana, Dhanurasana, Makarasana, Gomukhasana, Ardhamatsendrasana, Utthita Trikonasana, Paschimotanasana, Padmasana, Tadasana and Garudasana performed by subjects with the help of experts.

### Statistical Procedure

The data which was obtained from subjects of flexibility and muscular endurance was analyzed statistically by the analysis of covariance (ANCOVA) technique. The obtained "F" ratio was tested at .05 level of significance.

## Results

**Table 1: Descriptive statistics analysis of Control and Experimental group in relation to flexibility**

		N	Mean	Std. Deviation	Std. Error
Pre Test	Control	10	10.30	2.00	0.63
	Experimental	10	10.40	1.57	0.49
	Total	20	10.35	1.75	0.39
Post Test	Control	10	10.70	1.94	0.61
	Experimental	10	12.60	1.83	0.58
	Total	20	11.65	2.08	0.46

Table 1 showed that the mean and standard deviations of Flexibility of control and experimental group. The observed mean and standard deviation of Pre test of flexibility of control group 10.30 & 2.00 and experimental group 10.40 & 1.57. The observed mean and standard deviation of Post test of Flexibility of control group 10.70 & 1.94 and experimental group 12.60 & 1.83 are respectively. (Chan, Data Presentation, 2003)

The data are further analyzed with the help of analysis of variance (ANOVA) to find out of significance difference between statistical means of pre test and post test of Control group and experimental group in relation to Flexibility. (Wayne W. Daniel, Chad L. Cross , 2013, p. 306)

**Table 2: Analysis of Variance of Comparison of means of Control and Experimental group in relation to flexibility**

		Sum of Squares	df	Mean Square	F	Sig.
Pre Test	Between Groups	.050	1	.050	.015	.903
	Within Groups	58.500	18	3.250		
	Total	58.550	19			
Post Test	Between Groups	18.050	1	18.050	5.037	.038
	Within Groups	64.500	18	3.583		
	Total	82.550	19			

Table 2 shows that, the pre test obtained 'F' value of 0.015 is found to be insignificant at .05 level of significance in relation to flexibility, which is clearly indicated that there are no significant difference between groups and explain the random assignment of subjects to control and experimental group is quite successful. In relation to post test, significant difference is found between control and experimental group pertaining to flexibility, since obtained 'F' value of 5.037 is found significant at .05 level of significance. (Chan, Quantitative Data-Parametric & Non-Parametric Tests, 2003)

**Table 3: Adjusted Post test means of Control and Experimental group in relation to Flexibility**

Group	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Control	10.746 <sup>a</sup>	.303	10.107	11.384
Experimental	12.554 <sup>a</sup>	.303	11.916	13.193

From the table 3, it is revealed that the adjusted post test mean of flexibility of control group is 10.746 with the standard error of 0.303 and adjusted post test mean of experimental group 12.554 with the standard error of 0.303. The data are analyzed and the results pertaining to Analysis of Covariance (ANCOVA) between control and experimental group of school going children in relation to flexibility for pre test-post test respectively. (Verma, 2011, p. 172)

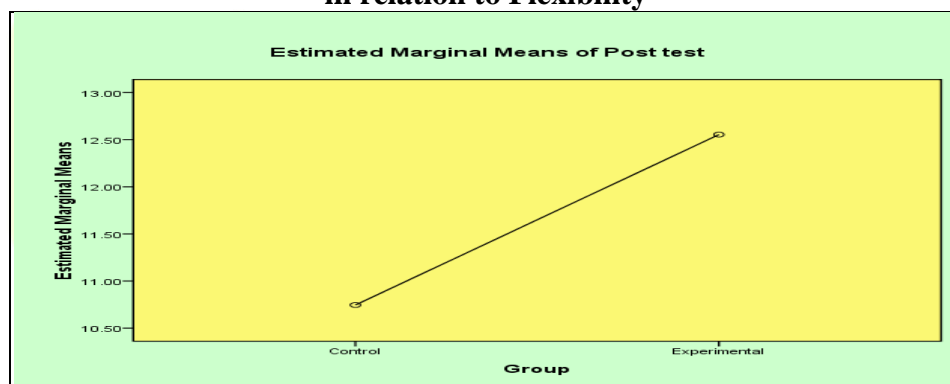
**Table 4: Analysis of Covariance of comparison of adjusted post test means of control and experimental group in relation to Flexibility**

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>a</sup>
Contrast	16.340	1	16.340	17.838	.001	.512	17.838	.978
Error	15.573	17	.916					

Table 4 revealed that the obtained 'F' value of 17.838 is found significant at .05 level of significance in relation to flexibility. This result indicates that the Yogasana treatment is given to subjects has increase flexibility of school going children. (field, 2009, p. 405)

The partial Eta Squared value (0.512) indicated that 51.2% effects of Yogasana training on flexibility. (Glenn Gamst, Lawrence S. Meyers, A. J. Guarino, 2008, p. 454)

**Figure 1: The Graphical representation of adjusted post test mean plot of Control and Experimental group in relation to Flexibility**



**Table 5: Descriptive statistics analysis of Control and Experimental group in relation to Muscular endurance**

		N	Mean	Std. Deviation	Std. Error
Pre Test	Control	10	19.10	2.80	.88
	Experimental	10	18.30	2.98	.94
	Total	20	18.70	2.84	.63
Post Test	Control	10	19.30	2.45	.77
	Experimental	10	22.00	2.49	.78
	Total	20	20.65	2.77	.62

Table 5 showed that the mean and standard deviations of Muscular endurance of control and experimental group. The observed mean and standard deviation of Pre test of muscular endurance of control group 19.10 & 2.80 and experimental group 18.30 & 2.84. The observed mean and standard deviation of Post test of muscular endurance of control group 19.30 & 2.45 and experimental group 22.00 & 2.49 are respectively. (Chan, Data Presentation, 2003)

The data are further analyzed with the help of analysis of variance (ANOVA) to find out of significance difference between statistical means of pre test and post test of Control group and experimental group in relation to muscular endurance. (Wayne W. Daniel, Chad L. Cross, 2013, p. 306)

**Table 6: Analysis of Variance of Comparison of means of Control and Experimental group in relation to Muscular endurance**

		Sum of Squares	df	Mean Square	F	Sig.
Pre Test	Between Groups	3.200	1	3.200	.381	.545
	Within Groups	151.000	18	8.389		
	Total	154.200	19			
Post Test	Between Groups	36.450	1	36.450	5.959	.025
	Within Groups	110.100	18	6.117		
	Total	146.550	19			

Table 6 shows that, the pre test obtained 'F' value of 0.381 is found to be insignificant at .05 level of significance in relation to muscular endurance, which is clearly indicated that there are no significant difference between groups and explain the random assignment of subjects to control and experimental group is quite successful. In relation to post test, significant difference is found between control and experimental group pertaining to muscular endurance, since obtained 'F' value of 5.959 is found significant at .05 level of significance. (Chan, Quantitative Data- Parametric & Non-Parametric Tests, 2003)

**Table 7: Adjusted Post test means of Control and Experimental group in relation to Muscular endurance**

Group	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Control	18.975 <sup>a</sup>	.249	18.450	19.499
Experimental	22.325 <sup>a</sup>	.249	21.801	22.850

From the table 7, it is revealed that the adjusted post test mean of muscular endurance of control group is 18.975 with the standard error of 0.249 and adjusted post test mean of experimental group 22.325 with the standard error of 0.249. The data are analyzed and the results pertaining to Analysis of Covariance (ANCOVA) between control and experimental group of school going children in relation to muscular endurance for pre test-post test respectively. (Verma, 2011, p. 172)

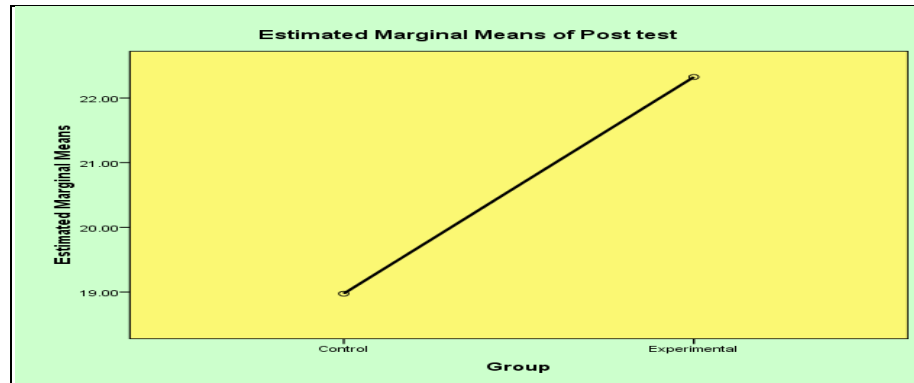
**Table 8: Analysis of Covariance of comparison of adjusted post test means of control and experimental group in relation to Muscular endurance**

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>a</sup>
Contrast	54.950	1	54.950	89.856	.000	.841	89.856	1.000
Error	10.396	17	.612					

Table 8 revealed that the obtained 'F' value of 89.856 is found significant at .05 level of significance in relation to muscular endurance. This result indicates that the Yogasana treatment is given to subjects has increase muscular endurance of school going children. (field, 2009, p. 405)

The partial Eta Squared value (0.841) indicated that 84.1% effects of Yogasana training on muscular endurance.

**Figure 2: The Graphical representation of adjusted post test mean plot of Control and Experimental group in relation to Muscular endurance**



## Discussion

The results of the study showed that there is significant effect of 6 weeks of Yogasana practices on flexibility and muscular endurance of school going children. Flexibility is a measure of joint range of motion without injury and is an important health related component of fitness. Having adequate flexibility has many health and performance benefits. (Ratamess, 2012, p. 168) Flexibility reflects an absolute gross range of motion of a joint, including capsule and soft tissue surrounding that joint or a group of joints. (David Joyce, Daniel Lewindon, 2014, p. 61) Due to Yogasana exercise flexibility is maximized, the Muscle tendon units that cross a joint have adequate extensibility to deform and yield to a stretch force. (Carolyn Kisner, Lynn Allen Colby, John Borstad, 2018, p. 83) The result of this finding is supported by the study conducted by Anil Kumar (2016) where they found that there was significant effect of Yogaasana on flexibility.

Muscular endurance is the ability of an isolated muscle group to perform repeated contractions over a period of time. (Carolyn Kisner, Lynn Allen Colby, John Borstad, 2018, p. 247) Muscular endurance depends on oxidative capacity and yogasana training increases the muscles metabolic capacity. Muscular endurance is often limited by a local accumulation of lactate, with glycolysis inhibition and failure to regenerate ATP in the working muscle. During Prolonged Yogasana exercise depletion of intramuscular glycogen reserves may contribute to impaired muscular endurance. (Lori Thein Brody, Carrie M. Hall, 2011, p. 77) Muscular endurance is far more functional than muscular strength for completion of activities of daily living. Muscular strength increases, muscular endurance also tends to increase. Therefore, the clinician can focus easily on increasing both muscular strength and muscular endurance through similar Yogasana exercise program. (Higgins, 2011, pp. 130-131) The result of this finding is supported by the study conducted by Tumpa Kirtania, Subhashis Biswas and Ashok Goon (2022) where they found that there was significant effect of Yogaasana on Muscular Endurance.

## Conclusion

The study concludes that increasing the flexibility and muscular endurance positively contributes due to Yogasana practices.

## Practical Applications

The results of the study provide insight into yogasana practices program for improvement of flexibility and muscular endurance of school going children. The flexibility is very essential motor fitness components of the human body while performing any types of physical activity. The muscular endurance is health related physical fitness components, which is very important for healthy living. This research paper provides better knowledge for improvement of flexibility and muscular endurance through Yogasana practice.

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