

Effect of yoga on health related physical fitness

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Abstract

Background & Objective: In recent years the practice of yoga has gained recognition as a form of physical fitness and exercise, and has been said to improve strength and flexibility. A major cause of many chronic diseases and life style disorders was found to be improper lifestyle and stress leading to obesity and diabetes. The practice of yoga can enhance health and overall fitness, regulate all the body functions in a balanced manner and is helpful in providing sustainable health. The aim of the present study was to investigate the effect of yoga on Cardio Respiratory endurance, Body Composition, Flexibility and Muscular strength of females between the age group 18-25 years. Hence the present study was taken forward to find out the effect of intervention of yoga on health related physical fitness components.

Materials and Methods: Thirty female participants age ranging from 18 to 25 years of Pravara Institute of Medical Science, Loni were selected as the subject of the study. The changes in Cardio respiratory endurance, Body composition (Body Mass Index), Flexibility and Muscular strength were estimated before and after four weeks of yoga. The data obtained was analyzed using paired 't' test. $p < 0.0001$ was the level of significance.

Result: There was a significant improvement in the Cardio respiratory endurance ($p=0.0001$), Body Mass Index ($p=0.0001$), Flexibility ($p=0.0001$), and Muscular strength ($p=0.0001$) after undergoing four weeks of yoga when compared to that before yoga.

Conclusion: Yoga as it combines both physical and psychological aspects of the body through a series of low impact exercises, it was concluded that four weeks of Yoga training through Asanas was found to be effective in bringing about significant improvement in respect to Cardio respiratory endurance, Body Composition, Flexibility and Muscular strength.

Keywords: yoga, cardio respiratory endurance, body composition, flexibility and muscular strength

Introduction

Yoga is an ancient discipline designed to bring balance and health to the physical, mental, emotional, and spiritual dimensions of the individual. Yoga is often depicted metaphorically as a tree and comprises eight aspects, or "limbs:" yama (universal ethics), niyama (individual ethics), asana (physical postures), pranayama (breath control), pratyahara (control of the senses), dharana (concentration), dyana (meditation), and samadhi (bliss) [1]. From a conceptual point of view, the eight limbs of Patanjali yoga clearly signify a hierarchical (although it need not be sequential) pattern of developing consciousness from gross to a subtle level in a systematic manner. Yama, Niyama-Behavioral level Asana, Pranayama-Physical level Pratyahara, Dharana- Mental level Dyana, Samadhi - Spiritual level. So, the concept of yoga has been fabricated with the idea of achieving peace rather than health alone unlike exercise [2]. The word "yoga" comes from a Sanskrit root "yuj" which means union, or yoke, to join, and to direct and concentrate one's attention [3]. A 3,000 year old tradition, yoga, is now regarded in the Western world as a holistic approach to health and is classified by the National Institutes of Health as a form of Complementary and Alternative Medicine (CAM) [4]. Regular practice of yoga promotes strength, endurance, flexibility and facilitates characteristics of friendliness, compassion, and greater self-control, while cultivating a sense of calmness and well-being [5]. Yoga therapy is the two fold therapeutic system that

prevents and cures various diseases through practice of yoga. Yoga concentrates on purification of body and mind, through this integrated holistic approach one can overcome almost all kinds of afflictions in life. It is a kind of low-impact physical exercise, and is used for therapeutic purposes [6].

Physical fitness refers to a physiologic state of well-being that allows one to meet the demands of daily living or that provides the basis for sport performance or both. Health-related physical fitness involves the components of physical fitness related to health status, including cardiovascular fitness, musculoskeletal fitness, body composition and metabolism [7]. Physical fitness can be thought of as an integrated measure of most, if not all the body functions (skeletal muscular, cardio respiratory, and hematocirculatory, psycho neurological and endocrine-metabolic) involved in the performance of daily physical activity and/or physical exercise. Hence, when physical fitness is tested, the functional status of all these systems is actually being checked. Physical inactivity is a modifiable risk factor for cardiovascular disease and a widening variety of other chronic diseases, including diabetes mellitus, cancer (colon and breast), obesity, hypertension, bone and joint diseases (osteoporosis and osteoarthritis), and depression [8]. While yoga is not a cure for cancer, nor a definitive way of preventing it, yoga increases physical, emotional and spiritual wellness and brings about a certain peace, of which many cancer patients desire [9]. Yoga, breathing exercises, and meditation can reduce stress, promote

healing, and enhance quality of life for patients with cancer^[10, 11]. This is the reason why physical fitness is nowadays considered one of the most important health markers, as well as a predictor of morbidity and mortality for cardiovascular disease (CVD) and for all causes^[12].

Cardio respiratory fitness, also called cardiovascular fitness or maximal aerobic power, is the overall capacity of the cardiovascular and respiratory systems and the ability to carry out prolonged strenuous exercise. The maximal oxygen consumption (VO₂max) attained during a graded maximal exercise to voluntary exhaustion has long since been considered by the World Health Organization as the single best indicator of cardio respiratory fitness^[13]. With regard to the cardio respiratory system, the inverted yogasans postures and pranayama are unique among the yoga practices in terms of their effect on cardio respiratory system^[14]. In healthy population aged 20-35 years, yoga and omkar meditation practices led to better cardiac parameters in terms of orthostatic tolerance, heart rate, and blood pressure compared to exercise^[15]. Practices like Sethu Bandha Sarvangasana, Viparita Dandasana and Supta Virasana which have backward-bending components are good relievers of angina in Ischemic heart disease^[16].

Body composition is the relative proportions of protein, fat, water, and mineral components in the body. It varies among individuals as a result of differences in body density and degree of obesity^[17]. Obesity and excessive body weight is associated with various diseases particularly cardiovascular diseases, type-2 diabetes mellitus, hypertension, hyperlipidemia, osteoarthritis, certain types of cancer etc. in reality, a major cause of all these diseases was found to be improper lifestyle and stress^[18]. Yoga exercises do not consume much energy and many of them accompany isometric contractions. These contractions do not increase energy consumption much comparing with rest time^[19].

The ability of an individual to move smoothly depends on his Flexibility, an attribute that enhances both safety and optimal physical activity. Flexibility is ability to move a single joint or series of joints through an unrestricted painful range of motion (ROM). It is dependent upon the extensibility of muscle which allows muscle that cross a joint to relax, lengthen and yield to a stretch force.²⁰ Flexibility is an important element of physical fitness hence stretching of skeletal muscle to improve flexibility is practiced by both competitive and recreational sports people^[21] Flexibility allows people to avoid injuries because their muscles are stretched and they have full range of motion in their muscle^[22] Adequate range of motion is essential for performing everyday tasks, supports good posture and muscle relaxation and can help improve performance and reduce injury^[23].

Muscular fitness is the capacity to carry out work against a resistance. Muscular strength is the maximal force that can be generated by a specific muscle or muscle group. Since the maximum force that can be generated depends on several factors (for example, the size and number of muscles involved,

the proportion of muscle fibers called into action, the coordination of the muscle groups, etc. there is no single test for measuring muscle strength. The main health-related muscular fitness components are maximal strength (isometric and dynamic), explosive strength, endurance strength and isokinetic strength^[24].

The practice of yoga can enhance health and overall fitness, regulate all the body functions in a balanced manner and is helpful in providing sustainable health. Once learned, yoga can be practiced at any time on an individual basis, thus reducing common barriers to physical activity such as time conflicts and poor weather.

Methodology

The study received ethical approval from the Institutional Ethical Committee PIMS/CPT/ICE/2016/16278. The present study was conducted to assess the effect of yoga in female participants in the age group of 18-25 years. All the participants were screened according to inclusion and exclusion criteria, where in the inclusion criteria was between age group 18 to 25 years and who were able to understand the instructions. Exclusion criteria had participants with unstable mind, mental disorders and epilepsy, recent fracture or with neuromuscular problems, infections of the musculoskeletal system, severe spinal injuries and recent head injuries. Participants were briefed about the study, the intervention and an informed written consent was obtained from the participants. Demographic data (name, age) was noted and assessment was done by performing the following:

- Testing for Cardiovascular fitness was done by using the YMCA 3-minute Bench Step Test wherein we can record how quickly our heart rate recovers following a short bout of exercise.
- Body composition was estimated by calculating body mass index (Body Mass Index= Weight in kg/Height in meter²).
- Flexibility assessment was done by using the Trunk Forward Flexion Sit & Reach Test wherein we measured the hamstring, hip and lower back flexibility.
- Muscular strength was assessed by using Hand grip Test.

Further the participants were made aware about the various Asanas and their beneficial effects after which the yoga intervention was given for four weeks. The intervention included the following asanas: Bhujangasana, Paschimottanasana, Makarasana, Dhanurasana, Naukasana, Setubandhasana, Chakrasana, Adho Mukha Svanasana, Ardha Mandalasana, Pavanmuktasana, Tadasana and Yogamudrasana.

The intervention was conducted one hour for six days (per week) in duration of four weeks. The time duration for every session was approximately 60 minutes with sufficient rest intervals. By the end of 4weeks post assessment was done by performing YMCA 3-minute bench step test, trunk forward flexion sit and reach test, handgrip test and Body Mass Index calculation.

Data analysis & results

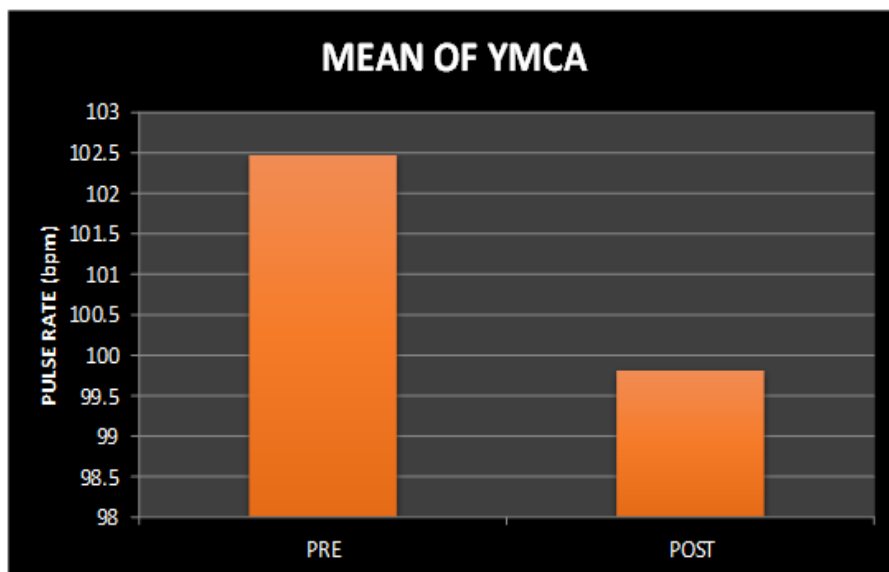


Fig 1: Comparison of pre and post values of YMCA 3-minute Step Test for cardio respiratory endurance, where t value is 7.76 and p value is <0.0001 which is extremely statistically significant.

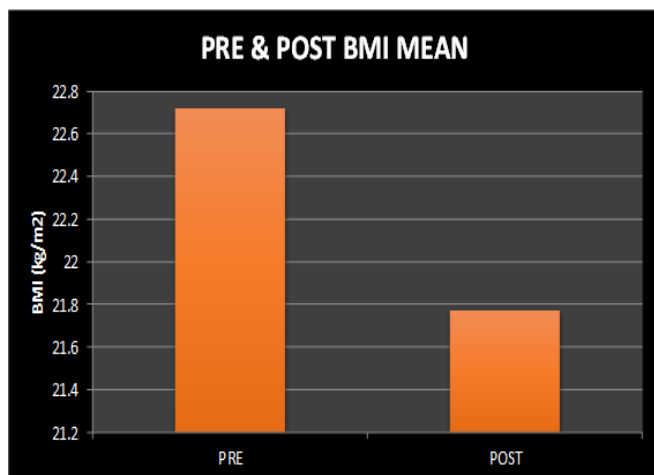


Fig 2: Comparison of pre and post Body Mass Index values of Body composition where t value is 11.59 and p value is <0.0001 which is extremely statistically significant.

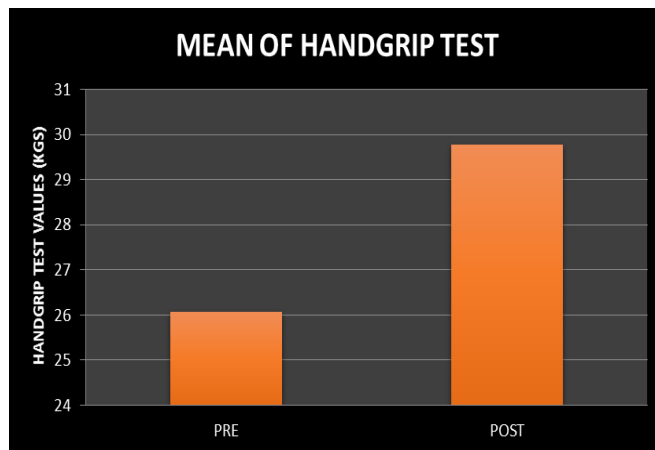


Fig 4: Comparison of pre and post average values of combined (right & left hand) muscular strength where t value is 16.55 and p value is 0.0001 which is extremely statistically significant.

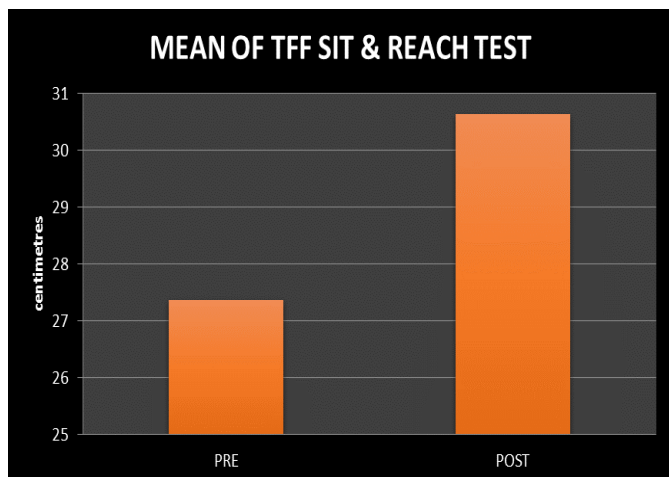


Fig 3: Comparison of pre and post values of TFF Sit & Reach Test for flexibility where t value is 15.23 and p value is <0.0001 which is extremely statistically significant.

Discussion

The present study aims at investigating the positive effects of four weeks of Yoga on cardio respiratory endurance, body composition, flexibility and muscular strength in females under 18-25 years of age group. The findings revealed that general yoga practice had an impact on some of the parameters measured in this research and helped them improve. Data indicated significant increase in cardio respiratory endurance (p = 0.0001), body composition (p= 0.0001), flexibility (p = 0.0001) and muscular strength (p= 0.0001). Similar study was done by K Jayachandran who investigated the effect of yoga on Cardio Respiratory system and Body Composition of school going children ranging from 14 to 16 years of age which suggests that Yoga in long duration affects hypothalamus and brings about decrease in the systolic and diastolic BP through its influence on vasomotor centre, which leads to reduction in sympathetic tone and peripheral resistance. The relaxation and exercise components of yoga have a major role to play in the treatment and prevention of high blood pressure (hypertension) and

body composition. There are many poses in Yoga that can improve the health of the heart by improving blood circulation. They also help in the removal of toxic waste from the body and regulate the hormones to keep us healthy.²⁵ Another study was performed by Helena Khosravi which determined the impact of general program of yoga on the muscle fitness, body composition and metabolic risk factors in middle age women with overweight where Muscle endurance and flexibility, fat percentage, body mass index, blood glucose and lipids levels were obtained, before and after 8 weeks of yoga practice. Data indicated significant increase in muscle endurance ($p = 0.012$) and flexibility ($p = 0.049$) occurred in yoga group. Significantly decrease in Body Mass Index and body fat percentage was observed ($p \leq 0.0001$)^[26].

The increase in flexibility can most likely be attributed to the repetitive stretching and force resistance movements of yoga asana therefore increasing blood circulation to muscles and connective tissue; holding the poses for a period of >30 s with controlled breathing techniques have been recognized as some of the most important elements of yoga practice, these two areas combined focus the mind and body to the active muscles responsible for stabilizing the body in yoga poses^[27].

Surprisingly, doing yoga it is possible to burn fat, lower body fat percentage, boost the metabolism and give all other benefits to improve health. Fat burning postures explains that the backward bending postures elevate the heart rate. Twisting postures stimulate the adrenal glands and flush out toxins^[28]. Moreover, it is clearly shown that stretching exercises increase muscular strength up to at most 20% of muscular maximal strength, whereas the yoga program in the present research consisted of exercises, some of which used body weight as the resistance force; Exercises such as leg stretching while lying; Navkasana (Full Boat Pose) hence, it was expected that the Asana in yoga, would rejuvenate muscular endurance and strength especially in abdominal muscles. Thus, yoga exercises could very well improve participant's fitness.

Conclusion

Yoga as it combines both physical and psychological aspects of the body through a series of low impact exercises, it was concluded that four weeks of Yoga training through Asanas was found to be effective in bringing about significant improvement in respect to Cardio respiratory endurance, Body Composition, flexibility and muscular strength.

Scope for Future Studies

More parameters could be taken in to consideration. More detailed study can be done using one more group added as a control group or other intervention can be given to find out comparative effects of yoga.

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