

## Effects of yoga on functional capacity and well being

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### ABSTRACT

Yoga has proven beneficial effects on various health domains including musculoskeletal conditions, cardiopulmonary conditions through the practice of asana and pranayamas as well as on mental health, as it is known to enhance the body–and mind coordination. There is paucity of data on the effect of yoga on functional capacity in literature using 6 min walk test. The present study aims to look at the effect of yoga on 6-min walked distance, rating of perceived exertion (RPE), recovery time following the walk and state of well being. This is a hospital-based longitudinal study where 30 physiotherapy students of the age group 18 – 22 years of either sex were enrolled. Subjects having musculoskeletal problems, cardio respiratory disease and those who were not willing to volunteer were excluded They received Yoga intervention in form of Yogic practices which included a combination of asanas, pranayamas and omkar chanting for 1 h for 30 sessions. A baseline 6-min walk test was conducted on subjects and the 6-min walked distance, rating of perceived exertion (RPE) on modified Borg's scale were recorded. The baseline state of well-being was noted using the Warwick- Edinburgh mental well-being scale and similar recording was done post intervention after 30 sessions. Of the 30 subjects, there were no drop outs as these were committed college students. Of them, 24 were females and 6 were males with a mean age of 21.5 years SD 2.38. Statistically significant improvements were observed in 6-min walk distance ( $P$  value = 0.000), RPE ( $P$  value < 0.000), recovery time ( $P$  value < 0.000) and sense of well being score ( $P$  value < 0.000). Yoga practices are beneficial in improving the functional capacity in young healthy adults. Yoga can very well be incorporated in medical practice for increasing the patient's functional capacity, for those who have limitations in performing aerobic training due to various health reasons. The improved state of well being motivates the patients to adhere to yogic practices.

**Key words:** Functional capacity; well being; yogic practices.

### INTRODUCTION

Yoga in Sanskrit means “Union” and spiritual meaning of yoga is union of mind with divine intelligence of the Universe.<sup>[1]</sup> It is an ancient Indian Philosophy based on diverse breathing, stretching and meditation. The physical part of yoga consists of several stretching and strength building postures which are known to improve strength and flexibility and also have effects on metabolic, physiological and psychological aspects of human being.<sup>[2]</sup> Various interventions utilizing Yoga as a modality have

proven beneficial effects on body weight, blood glucose, and total cholesterol in patients with diabetes and coronary artery diseases.<sup>[3-5]</sup> and also showed improvements in pulmonary function tests.<sup>[1]</sup> The utility of yoga as a complementary therapy to conventional medical care is under-recognized by the health care community,<sup>[1]</sup> and the present study is an attempt to evaluate the effects of yoga on functional capacity and state of well being in normal healthy volunteers. If beneficial effects are observed, similar intervention can be planned in diseased individuals utilizing 6-min walk test as an outcome measure.

### AIMS AND OBJECTIVES

1. To evaluate the effects of Yogic practices (Asana, Pranayamas, and Omkar chanting) on functional capacity as evaluated by assessing 6 min walked distance and RPE on modified Borg's scale.
2. To evaluate the effects of Yogic practices on state of well being by using the Warwick- Edinburgh mental well-being scale.

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## MATERIALS AND METHODS

This is an institution-based longitudinal study ethically cleared from local IRB.

### Study sample

Thirty physiotherapy students of the age group 18–22 years of either sex were recruited. Subjects having musculoskeletal problems, cardio respiratory disease and those who were not willing to volunteer were excluded. This motivated group of students were responsible for completion of study without any drop outs.

### Intervention

The subjects were involved in Yogic practices during the morning hours between 9 and 10 am as a curriculum class on yoga, consisting of yogic asana for 30 min, pranayamas for 15 min, omkar chanting for 10 min and last 5 min of Shavasana/relaxation, for 1 h daily, for a total of 30 sessions spread over 6 weeks (5 days a week) [Table 1].

The subjects were instructed to perform these asanas in a relaxed state of mind, without undue force, in a smooth, coordinated, rhythmic controlled manner, being fully conscious of the physical movements with well-coordinated breathing pattern. Pranayama consisted of both slow and fast pace breathing manoeuvres without practising breath holding (Kumbhaka). While performing omkar chanting in a soft voice, they were instructed to concentrate on the prefrontal area in between the two eyebrows.

### Parameters evaluated

After recruitment of the volunteers and obtaining a consent for participation, they were subjected to baseline 6-min walk test wherein their walked distance was noted in meters after 6 min, Rating of perceived exertion (RPE) was noted on modified Borg's scale on a score of 0-10, the recovery time was noted in minutes as to when their vital parameters came back to baseline after the walk and state of well-being was evaluated using a questionnaire to answer questions about optimism, relaxed feeling, feelings toward self and peers, level of confidence etc using the 14-questions Warwick- Edinburgh mental well-being scale as base line data. It is a five-point scale ranging from minimum 1 to maximum 5 score and the total score of subjective well being was calculated. The above parameters were collected again after 30 yogic sessions. The statistical analysis was carried out using paired student's *t-test* after ascertaining the normality of the data using NCSS software.

## RESULTS

Of the thirty cases enrolled, 24 were females, 6 were males. Mean age of subjects was 21.5 SD 2.3 years. None of the subjects were involved in any type of yoga or other work-out training sessions. Mean 6-min walk test distance improved significantly from 361.66 m to 397.66 m [Table 2] and mean perceived exertion score declined significantly from 4.06 to 2.06 [Table 3] showing overall improvement in physical activities. The recovery time was shortened from a mean of 5.33 min to 2.53 min [Table 4] suggesting a definite improvement in their cardio-respiratory fitness levels. Total Sense of well being score recorded showed significant improvement from 54.8 to 59.7 [Table 5] after yogic training correlating with enhanced mood, feeling of optimism, relaxation, clear thinking, feeling of cheerfulness and improved confidence.

## DISCUSSION

Yoga is an ancient discipline of body, mind and spirit that has been westernized and practiced for its health benefits as a compliment to more conventional medical therapy. Yogic practices in normal subjects lead to improvement in cardio-respiratory performance,<sup>[6]</sup> lipid and carbohydrate metabolism<sup>[7]</sup> and psycho logic well being,<sup>[8]</sup> through body-and-breath-control, including relaxation techniques.<sup>[1]</sup> Regular yogic practices have

**Table 1: Yoga practices used in the study**

1. Yoga prayer
2. Yogasanas: (30 min)
  - a. Sitting aadharasanas
    - Swastikasana
    - Vajrasana
    - Padmasana
    - Yoga mudra
    - Supta vajarsana
    - Matsayasana
    - Parvatasana
    - Paschimotanasana
    - Majaasana
    - Tripad majarasana
  - b. Supine
    - Pawanmuktasana
    - Dwipadasana
    - Viprit karani mudra
    - Sarwngasana
    - Halasana
  - c. Prone
    - Bhujangasana
    - Salabhasana
    - Naukasana
    - Dhanurasana
3. Pranayama (15 min)
  - Anulome vilome
  - Ujjayi
  - Bhramari
  - Kapal bharti
4. Onkar chaning (15 min)
5. Conclusion: (5 min) Shavasana

**Table 2: Hanges in 6-min walk distance**

Variable	Count	Mean	Standard deviation	Standard error	95% LCL of mean	95% UCL of mean
Pre	30	361.67	41.03	7.49	346.35	376.99
Post	30	397.67	34.50	6.30	384.78	410.55
Difference	30	-36	16.52	3.02	-42.17	-29.83

P value=0.000(highly significant); Power of study=1.00; Correlation coefficient=0.6294

**Table 3: Hanges in rate of percieved excursion**

Count	Mean	Standard deviation	Standard error	95% LCL of mean
30	4.07	1.34	0.24	3.57
30	2.07	0.78	0.14	1.77
30	2	1.46	0.26	1.45

P value=0.000(highly significant); Power of study=1.00; Correlation coefficient=0.127

**Table 4: Hanges in recovery time**

Variable	Count	Mean	Standard deviation	Standard error	95% LCL of mean	95% UCL of mean
Pre	30	5.3	1.29	0.23	4.84	5.81
Post	30	2.5	0.86	0.15	2.21	2.85
Difference	30	2.8	0.99	0.18	2.42	3.17

P value=0.000(highly significant); Power of study=1.00; Correlation coefficient=0.6394

**Table 5: Hanges in sense of wellbeing score**

Variable	Count	Mean	Standard deviation	Standard error	95% LCL of mean	95% UCL of mean
Pre	30	54.8	4.85	0.88	52.98	56.61
Post	30	59.7	4.39	0.80	58.05	61.34
Difference	30	-4.9	3.43	0.63	-6.18	-3.62

P value=0.000(highly significant); Power of study=1.00; Correlation coefficient=0.7278; T for confidence limits=2.0452

shown profound improvement in thermoregulatory and psychological functions such as mental performance, improvement of memory and creation of a sense of well being.<sup>[8]</sup> These effects of yogic practices appear to be mediated through an interaction between the autonomic nervous system and endocrine system, wherein pineal secretion of melatonin may play an important role and also conditions autonomic functions mediated through limbic system and higher centres of central nervous system.<sup>[9]</sup>

Six-min walk test is an inexpensive, relatively quick, safe and a well tolerated method of assessing the functional exercise capacity in healthy subjects and in patients with moderate-to-severe heart or lung disease, easy to administer, better tolerated and more reflective of activities of daily living than the other walk tests.<sup>[10]</sup> It evaluates the global and integrated responses of all the systems involved during exercise, including the pulmonary, cardiovascular, systemic and peripheral circulation, neuromuscular units and muscle metabolism. Improvement in the walked distance in the present study is due to beneficial effects of yoga on musculoskeletal and cardio-respiratory systems. The asanas help by improving muscle strength, flexibility, power, endurance, static and dynamic stability and coordination which in turn improve physical performance and increase walking pace and stride length. Intense stretching and muscle conditioning during yoga postures also improve oxidative capacity of skeletal muscles, decrease glycogen utilization

via oxidative enzymes and or increased number of mitochondria.<sup>[11]</sup>

Six-min walked distance significantly correlates with peak VO<sub>2</sub> and there is a definite improvement cardio-pulmonary function leading to improved walked distance. Yoga helps to improve the cardiovascular efficiency and homeostatic control of the body.<sup>[9]</sup> Through body-and-breath control, including relaxation techniques, Yoga clearly has additional benefits for cardiopulmonary endurance in healthy people which manifest clinically as improved lung capacity, increased oxygen delivery, decreased VO<sub>2</sub> and respiratory rate, and decreased resting heart rate, resulting in overall improved exercise capacity.<sup>[1]</sup>

Pranayama, an important component of intervention, leads to improvement in walking distance and decreased perceived exertion as practice of pranayamas improves the ventilatory function of the lungs by using fullest capacity of lungs, reducing the oxygen debt, improving the gaseous exchange and preventing exhaustion.<sup>[11]</sup> Slow increase in the lung capacity associated with well practiced yoga breathing recruits the normally unventilated lungs and helps to match ventilation to perfusion better, thereby increasing oxygen delivery to muscles. The slow breathing rates associated with yogic breathing also substantially reduce chemo reflex response to hypoxia, probably through the improved oxygen delivery to tissues and possibly the result of acquired "tolerance" to hypoxia that is produced by change in the

chemo reflex threshold<sup>[11]</sup> and lessen sense of perceived exertion. Ray US (2001) also demonstrated improved aerobic capacity and decreased perceived exertion after maximal exercise after practice of Hatha yogic exercise.<sup>[12]</sup>

The practice of pranayamas modulates the cardiac autonomic status and improves cardio-respiratory functions suggesting an enhanced parasympathetic and blunted sympathetic activity, leading to early return of vitals to baseline.<sup>[12]</sup>

Warwick-Edinburgh mental well-being scale (WEMWBS) is a measure of mental well-being focusing entirely on positive aspects of mental health. It is a robust tool for monitoring mental well-being at a population level.<sup>[13]</sup> The improvement in the sense of well being can be explained on the basis of various interrelated factors. First, in yogic postures, where muscles are relaxed, energy is conserved and sympathetic over activity is reduced, with a relaxed mind and improved parasympathetic functioning, thereby leading to effect on cardio respiratory system, relaxed vasomotor center, reduced heart rate and blood pressure, ultimately lead to sense of feeling good. Omkar chanting is also known to cause alterations in the autonomic balance, respiratory performance and well being, which could be attributed to the improved scores of well being.<sup>[9]</sup> These observations suggest that yogic practices can be used as psycho physiologic stimuli to increase endogenous secretion of melatonin,<sup>[9]</sup> which, in turn, might be responsible for improved sense of well being. Similar improvements were observed in the mental functions after Yogic practices.<sup>[8]</sup>

Schell (1994) demonstrated significant difference in the personality inventory in the yoga group showing markedly higher scores in life satisfaction, ability to cope up with stress and lower scores in aggressiveness and emotional complaints.<sup>[14]</sup> Ray US (2001) concluded that there was improvement in various psychological parameters like reduction in anxiety and depression and better mental function after yogic practices which are quite consistent with the present study results.<sup>[9]</sup> Sharma R (2008) suggested that a short yoga based lifestyle modification and stress management educational program leads to a remarkable improvement in the subjective well being scores.<sup>[15]</sup>

## CONCLUSION

Yoga practices are known to facilitate secretion of melatonin from the pineal gland, which may be acting as a psycho sensitive hormone. It has been beneficial in improving the functional capacity and well-being in normal healthy subjects. Such yogic practices can very well be incorporated for increasing the patient's functional

aerobic capacity, particularly those who have limitations in performing weight-bearing aerobic training due to various musculoskeletal problems. The improved state of well being would motivate the patients to adhere to such practices.

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