

## Effect of short term yoga on body weight, BMI, body fat percentage & blood pressure

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### Abstract

**Introduction and Objectives:** Obesity and hypertension contribute to increased morbidity and mortality in many diseases. Yoga therapy is a multifunctional exercise modality involving a lifestyle change with numerous benefits. Benefits of long term yoga in controlling obesity and hypertension are well documented. The objective of this study was to study the short-term impact of a brief lifestyle intervention based on yoga on body weight, BMI, body fat percentage & blood pressure.

**Materials and Methods:** The study was conducted at a non-residential one week long yoga camp and involved 51 males and 64 females aged between 18-60 years. Participants were expected to be on a homemade lacto-vegetarian diet and advised to restrict sugar, salt and fat intake. The protocol of Yogatherapy included warmup exercises, pranayams, backward, forward and side bending & twisting asanas followed by shavasana and meditation. The participants underwent 1.5 hours daily yoga program for seven days under supervision of certified yoga professionals. Pre and post camp parameters were assessed by recording body weight, height, body fat percentage, body fat mass, systolic blood pressure, diastolic blood pressure. Student T test was used for statistical analysis.

**Results:** There was decrease in mean body weight (by 1.25 & 1.37 kg), BMI (by 0.46 & 0.57), body fat mass (by 0.73 & 0.94 kg), body fat percentage (by 0.79 & 0.61%), systolic blood pressure (by 1 & 4.3 mmHg) & diastolic blood pressure (by 0.4 & 3.1 mmHg) in males & females respectively. All the observations were statistically significant except the changes in systolic & diastolic BP in males.

**Conclusion:** A seven day yoga intervention does cause some reduction in weight, body fat mass, body fat percentage, BMI, less so in systolic and diastolic blood pressures, but regular yoga for longer durations may be required for tangible, sustained reduction in these parameters to benefit the individual.

**Keywords:** Short term yoga, Obesity, Body fat percentage, Hypertension.

### Introduction

According to the World Health Organization, in 2016, 39% of adults aged 18 years and over (39% of men and 40% of women) were overweight and overall about 13% of the world's adult population (11% of men and 15% of women) were obese.<sup>1</sup> The 'worldwatch Institute' has estimated that although starvation continues to be a problem in many parts of world, the number of overweight people in the world is now as great as the number of underfed.<sup>2</sup> Obesity is not only an aesthetic issue and a predisposing factor but it also increases the morbidity & mortality in many diseases.<sup>3</sup> Mortality has a linear relation with body fat percentage of an individual.<sup>4</sup> BMI & BF% is associated with cardiovascular risk factors including blood pressure & serum lipid profile.<sup>5</sup> Hypertension is one of the most common disorders, affecting ≈26.4% of the adult population worldwide. It ranks as the leading chronic risk factor for mortality, accounting for 13.5% of all deaths. Moreover, it is now projected to grow to affect >1.5 billion people by 2025.<sup>6</sup>

Yoga treats the human beings as a whole, considering physical, mental, spiritual & social wellbeing, which is in sync with the WHO definition of health. Yoga therapy is a multifunctional exercise modality with numerous benefits. It reduces blood pressure (BP) through reducing stress, increasing parasympathetic activation, and altering baroreceptor sensitivity.<sup>7</sup> Researchers have demonstrated that yoga works in reducing hypertension by modulating the

physiological systems of the body, specifically its effect on the heart rate.<sup>8</sup> Long term management of obesity needs lifestyle change because in most of the cases it essentially is due to an imbalance between energy intake & output. Yoga has been suggested as a modality to counter obesity as it involves a life style change together with dietary modification, breathing exercises and meditation.

Now a days yoga has become a popular measure for management of obesity and people are flocking to yoga studios in the hope of managing obesity and hypertension. As yoga advises moderation in diet & exercise, the beneficial effects of yoga in weight management over long term are evident. However, in this fast paced era where everyone wants a quick-fix, very short duration camps are being organized with high claims of health benefits ranging from weight loss and blood pressure regulation to memory benefits and longevity.

Due to the limited number of studies focused on physical outcomes associated with short term yoga, the available scientific evidence is insufficient to state formal recommendation on the efficacy of short term yoga in controlling obesity and hypertension. The objective of this study was to study the short-term impact of a brief lifestyle intervention based on yoga on body weight, BMI, body fat percentage & blood pressure.

## Materials and Methods

The study was conducted at a non-residential one week long yoga camp organized by Manavseva Trust, Pune. The camp was advertised using handouts and local print media to invite enrolment at the camp. Participants for this study were recruited from adults attending the camp, between 18-60 years age group and consenting to participate in the study after the purpose, procedures and risks were explained to them. The key inclusion criteria were willingness and ability of the participants to attend this short term yoga therapy. The key exclusion criteria were physically challenged persons who were unable to perform the prescribed yogic exercises for the requisite duration and intensity. All the subjects with history of alcohol or tobacco consumption in any form during the study period were excluded. Subjects with known physiological or pathological conditions contributing to, or those on medications causing salt & water retention or wasting, were excluded from the study.

Total 125 healthy subjects fulfilling the inclusion and exclusion criteria were enrolled for the study out of which 115 (51 males and 64 females) attended all the yoga sessions and presented themselves for both the sets of measurements. All the participants had no previous experience of yoga. The participants underwent 1.5 hours daily yoga program for seven days under supervision of certified yoga professionals. Pre and post camp parameters were assessed by recording Body weight, height, Body fat percentage, body fat mass, Systolic blood pressure, diastolic blood pressure. All the measurements were recorded at the start of Yoga on first day, and after the conclusion of camp on the seventh day. The data taken on the last day and on the first day of the yoga camp were compared with a t-test for paired data using SPSS version 16.0.

## Yogatherapy

Yoga is an ancient art of living. It includes eight fold path including life style changes, breathing exercises (kriyas, pranayama), loosening exercises (sukshmvayayamas) and yoga postures (asanas). As a part of yogatherapy, all the participants of the yoga camp were asked to abstain from non-vegetarian food, tea, coffee, alcohol and tobacco in any form. They were informed about the benefits of homemade vegetarian food and advised to restrict sugar, salt and fat intake. They were expected to be on a lacto-vegetarian diet and to avoid fast foods and restaurant foods during the duration of yoga camp. However, this was a non-residential camp and the subjects were free to go home after yoga session every morning. The nature and composition of the diet was not recorded and actual caloric intake is likely to be variable among the participants.

The protocol of Yogatherapy included warmup exercises, pranayams, backward, forward and side bending & twisting asanas followed by shavasana and meditation. The trainers supervised the duration of each exercise and the approximate duration is as follows: warm up exercises & butterfly like movements of legs in sitting position for 10 min. Pranayama bhastrika, kapalbhati & anulom-vilom for 10 minutes. Asanas including padmasana, vajrasana,

mandukasana, vakrasana, gomukhasana, makarasana, bhujangasana, naukasana, dhanurasana, paschimotanasana, uttanpadasana, pavanmuktasana for 60 min & Omkar recitation, meditation, shavasana for 10 min.

## Instrument

Weight (Kg) and height (meters) were measured (using Omron digital body weight scale HN-286 and SECA 206 wall mounted metal tapes respectively). Body Mass Index (BMI) was calculated by Weight (Kg)/ height squared (m<sup>2</sup>). The instrument was standardized & examined for reproducibility. All anthropometric measures reflect the average of 3 measurements (measured by same person on same instrument to avoid inter-instrument and inter personal variation). Age was defined as the age in completed years at the time of interview.

The systemic arterial blood pressure in millimeter of mercury (Hg) was recorded with a sphygmomanometer (Diamond), in the right upper limb by auscultatory method. Body fat percentage was measured using Omron BF-362, a handheld body fat monitor, working on the principle of Bioelectric Impedance. All relevant parameters were entered in the recording unit and recording was done after overnight fasting. Also, none of the participants had excessive sweating or consumed excess fluid prior to recording. A manufacturer recommended method was used for recording, with participants standing erect, their legs slightly apart, arms held straight out at 90 degree to the body, both hands gripping the electrode.

## Statistical Analysis

All the data was entered in Microsoft Excel and cleaning and analysis was done using SPSS version 16. All the data passed the normality test and sample size gave more than 80% power. We applied student's paired t test for statistical analysis. All tests were two-sided, and the probability (P) level of less than 0.05 was considered as significant and less than 0.01 is highly significant.

## Result

It was observed that there was decrease in mean body weight (by 1.25 & 1.37 kg), BMI (by 0.46 & 0.57), body fat mass (by 0.73 & 0.94 kg), body fat percentage (by 0.79 & 0.61%), systolic blood pressure (by 1 & 4.3 mmHg) & diastolic blood pressure (by 0.4 & 3.1 mmHg) in males & females respectively. All the observations were statistically significant except the changes in systolic & diastolic BP in males.

**Table 1:** Pre and post Yoga values of variables in male and female participants

S. No.	Variable	Males				Females			
		Before	After	Mean diff	P value	Before	After	Mean diff	P value
1	Weight(Kg)	72.08	70.83	1.25	p< 0.01	69.32	67.95	1.37	p< 0.01
2	BMI(Kg/m <sup>2</sup> )	25.98	25.52	0.46	p< 0.01	29.38	28.81	0.57	p< 0.01
3	BFM(Kg)	22.04	21.31	0.73	p< 0.01	27.8	26.86	0.94	p< 0.01
4	BF%	30.43	29.64	0.79	p< 0.01	39.5	38.89	0.61	p< 0.01
5	SBP(mmHg)	140.35	139.35	1	p>0.05	135.7	131.4	4.3	p< 0.01
6	DBP(mmHg)	90.88	90.49	0.4	p>0.05	90.5	87.4	3.1	p< 0.01

## Discussion

This study assessed the effect of short term (7 days) yoga on body weight, BMI, body fat mass, body fat percentage & systolic and diastolic blood pressure. A reduction in all these parameters was recorded in males and females. Barring change in blood pressure in males, changes in other parameters were statistically significant.

Most of the researchers have studied effects of Yoga over long periods, reporting unequivocal health benefits for obesity and hypertension management. Gharote ML had observed significant decrease in body fat percentage after two months but no significant change earlier.<sup>9</sup> The same study found a significant reduction in body weight, BMI, body fat mass, body fat percentage after three months. This is in line with available studies which have recorded improvement in anthropometric variables after yoga intervention for variable durations. Most of the long duration studies have found progressive and sustained reduction in body weight, body fat mass, body fat percentage, BMI.<sup>10-12</sup> Some short term studies have also shown positive results of yoga therapy.<sup>13-16</sup> A study by Telles<sup>15</sup> involving six day yoga intervention in residential camp with diet based on Yoga text (low fat, high fiber, vegetarian diet) has also reported similar results, but our findings are important because it shows that non-residential yoga intervention with regular lactovegetarian diet is also helpful in obesity control. Another major difference was the duration of Yoga: Study by Telles had total five hours yoga in two sessions daily, while present study had a single 90 minute yoga session daily.

Although the systolic and diastolic blood pressure decreased in males and females both, it was not significant in males. More aesthetic importance of weight loss for females leading to better compliance to the regimen may be contributory. This is in contrast to study by Ankad RB<sup>14</sup> which found significant reduction in males and females both. The difference may be attributed to narrower age group, smaller study sample and longer duration of intervention in the latter. Other studies reported that yoga effectively reduced BP in normotensive, prehypertensive and hypertensive populations.<sup>7,8,10,14,16,17</sup> These studies suggest that yoga is an effective adjunct therapy which is nonpharmacologic, free of adverse effects and worthy of inclusion in clinical guidelines for treatment of hypertension. However our findings suggest it is not a capsule of modern medicine, which can have positive

effects on blood pressure instantly and long-term interventions are necessary.

The possible mechanisms working in yoga therapy in reduction of weight are the calorie burning in physical activity as a combination of isometric & isotonic exercises. Various asanas target different body areas, increasing the tone of the muscles groups which may not be in routine use, comparable with the resistance training.<sup>18</sup> The calorie-expenditure effects of increased physical activity can add up over the period. A calorie deficit of 3500 kCal equals a 0.45 Kg body fat loss, whether the deficit occurs rapidly or systematically over time.<sup>19</sup> Anxiety plays an important causative role in obesity by causing increased caloric intake. The hypothalamic-pituitary-adrenal axis dysregulation is thought to contribute to increased appetite, craving for high-sugar and high-fat foods with subsequent weight gain in stressed individuals.<sup>20</sup> Yoga is known to decrease anxiety and stress and helps in regulating food intake, contributing to weight loss and reduction in fat mass.<sup>21</sup> The dietary modifications suggested to the subjects may also have contributed to favorable caloric balance- both by altered diet composition and meal size as a result of increased awareness of the caloric intake. Besides the alteration in caloric balance, physical activity induced dehydration and alteration in body composition may be a factor contributing to weight loss in our short duration study.

We recognize that this study has several limitations. Measurements were done at the start and end of camp and causation and sustainability of the beneficial changes cannot be ascertained. Participants diet and caloric intake was not monitored and is likely to be variable. The observations suggest that a short-term, yoga-based lifestyle intervention may significantly reduce weight and body fat. Although significant benefits were observed, multitude of yogic asanas makes it difficult to pinpoint the most effective component of yoga. Effect of yoga and dietary modifications need to be investigated separately. Effect of even shorter intervention-weekend yoga should also be explored.

## Conclusion

A seven day yoga intervention does cause some reduction in weight, Body fat mass, Body fat Percentage, BMI, less so in systolic and diastolic blood pressures, but regular yoga for longer durations may be required for tangible, sustained reduction in these parameters to significantly benefit the individual.

**Conflict of Interest:** None.

## References

1. WHO factsheet Obesity and Overweight, Reviewed feb 2018 Accessed on 1<sup>st</sup> April 2018  
URL <http://www.who.int/mediacentre/factsheets/fs311/en/>
2. Gardner G, Halwell B. Overfed and underfed: the Global Epidemic of Malnutrition. World Watch Paper. 2000;150.
3. Barrett, SM Barman, Scott Boitano, HL Brooks. Ganong's review of medical Physiology. 25<sup>th</sup> Ed, McGraw Hill education (India) (Lange);2016. pp 486
4. Heitman BL, Erikson H, Ellsinger BH, Mikkelesen KL, Larson B. Mortality associated with body fat, fat free mass & body mass index among 60 year old Swedish men a 22 year follow up the study of men born in 1913. *Int J Obes Relat Metab Disord* 2000;24(1):33-7.
5. Nakanishi N, Nakamura K, Suzuki K, Matsuo Y, Tatara K. Association of body mass index & percentage body fat by bioelectrical impedance analysis with cardiovascular risk factors in Japanese male office workers. *Ind Health* 2000;38(3):273-9.
6. Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J. Global burden of hypertension: Analysis of worldwide data. *Lancet* 2005;365:217-23.
7. Tyagi A, Cohen M. Yoga and hypertension: a systematic review. *Altern Ther Health Med* 2014;20(2):32-59.
8. Okonta NR. Does yoga therapy reduce blood pressure in patients with hypertension?: an integrative review. *Holistic Nurs Pract* 2012;26(3):137-41.
9. Gharote ML. An evaluation of the effects of yogic treatment on obesity—A report. *Yoga Mimamsa*. 1977;19(1):13-37.
10. Chauhan A, Semwal DK, Mishra SP, Semwal RB. Yoga practice improves the body mass index and blood pressure: A randomized controlled trial. *Int J Yoga* 2017;10(2):103.
11. Rshikesan PB, Pailoor Subramanya RN. Yoga Practice for Reducing the Male Obesity and Weight Related Psychological Difficulties-A Randomized Controlled Trial. *J Clin Diagn Res JCDR* 2016;10(11):OC22.
12. Balaji PA, Varne SR, Ali SS. Physiological effects of yogic practices and transcendental meditation in health and disease. *North Am J Med Sci* 2012;4(10):442.
13. Bijlani RL, Vempati RP, Yadav RK, Ray RB, Gupta V, Sharma R, Mehta N, Mahapatra SC. A brief but comprehensive lifestyle education program based on yoga reduces risk factors for cardiovascular disease and diabetes mellitus. *J Altern Complement Med* 2005;11(2):267-74.
14. Ankad RB, Herur A, Patil S, Shashikala GV, Chinagudi S. Effect of short-term pranayama and meditation on cardiovascular functions in healthy individuals. *Heart views: J Gulf Heart Assoc* 2011;12(2):58.
15. Telles S, Naveen VK, Balkrishna A, Kumar S. Short term health impact of a yoga and diet change program on obesity. *Med Sci Monit* 2009;16(1):CR35-40.
16. Gokal R, Shillito L, Maharaj SR. Positive impact of yoga and pranayam on obesity, hypertension, blood sugar, and cholesterol: a pilot assessment. *J Altern Complement Med* 2007;13(10):1056-8.
17. Hagins M, Selfe T, Innes K. Effectiveness of yoga for hypertension: systematic review and meta-analysis. *Evid Based Complement Altern Med* 2013;2013.
18. Campbell WW, Crim MC, Young VR, Evans WJ. Increased energy requirements and changes in body composition with resistance training in older adults. *Am J Clin Nutr* 1994;60(2):167-75.
19. McArdle WD, Katch FI, Katch VL. Exercise physiology: nutrition, energy, and human performance. Lippincott Williams & Wilkins; 2010.p813
20. Nieuwenhuizen AG, Rutters F. The hypothalamic-pituitary-adrenal-axis in the regulation of energy balance. *Physiol Behav* 2008;94(2):169-77.
21. Sharma M. Yoga as an alternative and complementary approach for stress management: a systematic review. *J Evid-Based Complement Altern Med* 2014;19(1):59-67.

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