

EFFECT OF SHORT-TERM PRANAYAMA AND MEDITATION ON CARDIOVASCULAR FUNCTIONS IN HEALTHY INDIVIDUALS

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Abstract

Asana, pranayama, and meditation are three main techniques of yoga practiced in India over thousands of years to realize functional harmony between the body and mind. Recent studies on long-term yogic practices have shown improvements in cardiovascular functions. The present study was conducted to work out if a short-term practice of pranayama and meditation had improvements in cardiovascular functions in healthy individuals with regard to age, gender, and body mass index (BMI). This interventional study was conducted within the Department of physiology of Kolkata Medical College, Kolkata. Fifty healthy subjects (24 males and 26 females) of 20–60 years age group, fulfilling the inclusion and exclusion criteria underwent two hours daily yoga program for 15 days taught by a licensed yoga teacher. Pre and post yoga cardiovascular functions were assessed by recording pulse, systolic sign, diastolic sign, and mean sign. The parameters were analyzed by Student's t test. There was significant reduction in resting pulse, systolic sign, diastolic sign, and mean vital sign after practicing pranayama and meditation for 15 days. The response was similar in both the genders, the age groups, 40 yrs and both the groups with BMI, 25 kg/m². This study showed beneficial effects of short term (15 days) regular pranayama and meditation practice on cardiovascular functions no matter age, gender, and BMI in normal healthy individuals.

Keywords: Mean vital sign, meditation, pulse, short term pranayama.

INTRODUCTION

Yoga is an ancient philosophical and religious tradition thought to possess originated in India in 5000 BC. It has been incorporated into modern medicine during the few decades thanks to increasing incidence of diseases of recent civilization like obesity, hypertension, coronary artery diseases, and DM, which are rooted in faulty lifestyle and psychological stress. Yoga is that the simplest lifestyle modification, which aims to realize the unity of mind, body and spirit through asanas (exercise), pranayama (breathing), and meditation.[1] Breath could also be a dynamic bridge between the body and mind.[2] Hence, life experiences can distort breathing pattern. Pranayama is that the art of prolongation and control of breath helps in bringing conscious awareness to breathing and thus the reshaping of breathing habits and patterns .[2] Meditation could also be a yogic process of providing deep rest to the system by allowing the mind to calm down to its basal states. It's often looked upon as a relaxation technique to be used for treating stress and stress-related illnesses. [3] Differing kinds of pranayama produce different physiological cardiovascular responses in normal young individuals. During right nostril pranayama and alternate nostril pranayama, the center rate increased,[4] whereas during left nostril pranayama, there was a decrease[5] or no change in pulse.[6] Four weeks of Nadisuddhi pranayama has shown significant decrease in pulse, diastolic sign, systolic sign in conjunction with significant increase in pulse pressure.[7] During 'OM' meditation, there was an enormous

reduction in pulse as compared to the control period during which non-targeted thinking was encouraged.[8,9] of those studies reported the results of individual pranayama or meditation practice for minimum of 4 weeks to 6 months. Some studies also included the results of asanas. This study was administered to know the physiological effects of short term (15 days) combined practice of pranayama and meditation in influencing cardiovascular status in healthy individuals of 20–60 years.

PATIENTS AND METGODS

The present study was conducted within the Department of Physiology. Ethical clearance for the study protocol was obtained from the Institute ethical committee. Fifty healthy subjects aged group 20–60 years were selected randomly from a gaggle of participants visiting the yoga center that had not yet started practicing yoga but were keen on learning. The same subjects were chosen as both studies also as control group so on attenuate the confounding factors and make the study more reproducible.

Subjects who were trained in yoga before, subjects with history of respiratory, cardiovascular and renal diseases, and diabetes were excluded from the study. Subjects who smoke and consume alcohol or any drugs were also excluded from the study. The themes were selected after taking a thorough clinical history. Consent was obtained from all the members. Physical characteristics like age, height, weight, and body mass index (BMI) were obtained. BMI was calculated as weight (kg) / height (m) ². Pulse (PR) and sign (BP) were recorded before practice of pranayama and meditation.

The subjects were asked to relax physically and mentally for half-hour in supine position during a silent room. Within an equivalent position, the guts beat rate and thus the sign were recorded. The guts beat rate in beats per minute was recorded within the proper radial artery by placatory method for whole one minute. The systemic vital sign in millimeter of mercury (Hg) was recorded with a sphygmomanometer (Diamond), within the proper upper limb by auscultator method. Similarly, three readings of each subject's pulse and systemic sign were taken at an interval of quarter-hour each and average of the three values calculated. The mean arterial (blood) pressure (MAP=DBP+1/3PP) was also calculated. All the parameters were recorded between 5 and 6 pm so on avoid circadian variations.

All the themes were under uniform dietary habits and received same yoga training for a period of 15 days for 2 hours daily between 6 and eight pm. the themes were instructed to not change their lifestyle or perform the opposite physical exercises during yoga training.

The yoga practice schedule consisted of:

Prayer - 10 minutes.

Pranayama - 45 minutes.

Short break - 5 minutes.

Lecture or film on fundamentals in nutrition, stress management, meditation and yogic attitude in lifestyle - 30 minutes.

Meditation - 20 minutes.

Prayer - 10 minutes.

The different kinds of Pranayama [3] practiced were

Vibhagiya Pranayama (sectional breathing)

Adama (Kanista) Vibhagiya Pranayama (diaphragmatic/abdominal breathing)

Madhyama Vibhagiya Pranayama (Thoracic/intercostal breathing)
Aadya (Jesta) Vibhagiya Pranayama (upper lobar/clavicular breathing)
Poorna mudra Pranayama (Full yogic breathing)
Nadishuddi Pranayama (Alternate nostril breathing)
Kapalabathi Kriya (cleansing breath)
Bahya Pranayama (the external breathing)
Cooling Pranayamas
Sitali Pranayama
Sitkari Pranayama

The session was concluded by meditation [3] and prayer.

After 15 days, another time the cardiovascular status was assessed clinically in terms of PR and BP, as done before the start of pranayama and meditation training.

Results were presented as Mean SD. Student's t test was used to find the importance of study parameters by using SPSS 15.0 version. P value but 0.05 was considered statistically significant.

RESULTS

The age of the themes ranged from 20–60 yrs, the mean age being 38.60 ± 8.89 years. There are 6 subjects within the age group of 21–30 years, 23 subjects within the age group of 31–40 years, 17 subjects between 41–50 years, and 4 subjects between 51–60 years.

Out of the 50 subjects, 24 subjects were males and 26 were females. On analysis of the physical characteristics of the 50 subjects, the mean age (years) was 38.60 ± 8.89 , the mean height (cm) was 159.38 ± 9.97 , the mean weight (kg) was 64.21 ± 9.24 and thus the mean BMI (kg/m²) was 25.31 ± 3.29 . Both the genders were age matched with significant variation tall ($P < 0.001$), weight ($P=0.003$), and BMI ($P=0.025$).

The mean resting pulse (beats/min), mean resting systolic, diastolic and mean vital sign (mm Hg) were reduced significantly after 15 days of yoga practice.

The results were also compared between two age groups- age ≤ 40 years (13 males, 16 females) and age > 40 years (11 males, 10 females) and it had been found that in both the age groups, there was an enormous reduction in resting cardiovascular parameters after the yoga practice in both genders. as compared between two groups of BMI- BMI 25kg/m^2 , there was significant reduction in resting cardiovascular parameters after the yoga practice. The effect of 15 days pranayama and meditation practice on resting mean PR [Table 1], systolic sign [Table 2], diastolic sign [Table 3], and mean vital sign [Table 4] are represented in respective tables.

Table 1: Effect of yoga on pulse rate (beats/min)

Group	No. of subjects	Before yoga	After yoga	t value	Significance
Total	50	78.06±9.47	74.38±8.72	8.057	$P < 0.001^{**}$
Males	24	76.71±9.82	73.54±9.32	$t=6.699$	$P < 0.001^{**}$
Females	26	79.31±9.14	75.15±8.25	5.466	$P < 0.001^{**}$
<40 yrs of age	29	78.25±10.57	74.63±9.95	9.603	$P < 0.001^{**}$
>40 yrs of age	21	77.83±8.22	74.08±7.25	4.152	$P < 0.001^{**}$
BMI<25 kg/m ²	25	77.60±10.87	73.60±8.88	4.792	$P < 0.001^{**}$
BMI>25 kg/m ²	25	78.52±8.03	75.16±8.68	8.786	$P < 0.001^{**}$

$P < 0.001^{**}$ = statistically highly significant

Table 2: Effect of yoga on systolic blood pressure (mm of Hg)

Group	No. of subjects	Before yoga	After yoga	t value	Significance
Total	50	126.80±12.30	123.00±12.27	7.717	<i>P</i> < 0.001**
Males	24	128.67±12.04	124.83±11.40	5.550	<i>P</i> < 0.001**
Females	26	125.07±12.52	121.31±13.01	5.285	<i>P</i> < 0.001**
<40 yrs of age	29	124.52±13.86	120.89±13.09	5.744	<i>P</i> < 0.001**
>40 yrs of age	21	129.48±9.80	125.48±10.99	5.094	<i>P</i> < 0.001**
BMI<25 kg/m ²	25	125.52±11.46	122.16±10.72	4.738	<i>P</i> < 0.001**
BMI>25 kg/m ²	25	128.08±13.19	123.84±13.82	6.179	<i>P</i> < 0.001**

P < 0.001** = statistically highly significant

Table 3: Effect of yoga on diastolic blood pressure (mm of Hg)

Group	No. of subjects	Before yoga	After yoga	t value	Significance
Total	50	79.76±9.69	76.68±9.78	6.257	<i>P</i> < 0.001**
Males	24	80.17±11.02	78.17±9.99	3.391	<i>P</i> < 0.001**
Females	26	79.38±8.48	75.31±9.56	5.573	<i>P</i> < 0.001**
<40 yrs of age	29	77.26±10.67	74.37±9.35	4.111	<i>P</i> < 0.001**
>40 yrs of age	21	82.69±8.49	79.39±9.77	4.750	<i>P</i> < 0.001**
BMI<25 kg/m ²	25	77.12±9.22	74.48±9.26	4.125	<i>P</i> < 0.001**
BMI>25 kg/m ²	25	82.40±9.59	78.88±9.96	4.688	<i>P</i> < 0.001**

P < 0.001** = statistically highly significant

Table 4: Effect of yoga on mean arterial blood pressure (mm of Hg)

Group	No. of subjects	Before yoga	After yoga	t value	Significance
Total	50	95.40±9.72	92.07±9.75	7.465	<i>P</i> < 0.001**
Males	24	96.31±10.41	93.66±9.49	4.736	<i>P</i> < 0.001**
Females	26	94.55±9.17	90.61±9.93	5.886	<i>P</i> < 0.001**
<40 yrs of age	29	92.99±10.55	89.84±9.73	5.056	<i>P</i> < 0.001**
>40 yrs of age	21	98.23±7.96	94.69±9.29	5.457	<i>P</i> < 0.001**
BMI<25 kg/m ²	25	93.24±9.07	90.32±8.94	4.765	<i>P</i> < 0.001**
BMI>25 kg/m ²	25	97.55±10.05	93.83±10.37	5.749	<i>P</i> < 0.001**

P < 0.001** = statistically highly significant

DISCUSSION

The significant decrease in resting pulse, systolic and diastolic vital sign after the yoga practice within the present study is in accordance with the findings of other studies on physiological effects of yoga practice in healthy individuals. [10] Similar reduction in resting PR and vital sign after yoga practice was also reported in hypertensive patients, [11, and 12] in asthmatic patients [13] and in diabetic patients. [14]

In the present study a highly significant reduction in PR, SBP, and DBP are often attributed to modulation of autonomic activity with parasympathetic predominance and comparatively reduced sympathetic tone. This autonomic modulation in yoga is mediated through modification of breathing patterns which triggers various central and autonomic mechanisms also as mechanical and hemodynamic adjustments causing both tonic and phasic changes in cardiovascular functioning.[15]

As a way, pranayama can assume rather complex sorts of breathing. But the essence of the practice is slow and deep breathing. Slow breathing induces a generalized decrease within the excitatory pathways regulating respiratory and cardiovascular systems. As respiratory and cardiovascular systems have similar control mechanisms, alteration in one system will modify the functioning of the opposite. [16] During slow and deep breathing lung inflates to the utmost. This stimulates pulmonary stretch receptors which cause withdrawal of sympathetic tone in

striated muscle blood vessels resulting in widespread vasodilatation and reduce in peripheral resistance and thus decrease diastolic vital sign.[7] While practicing pranayama one concentrates on the act of breathing which removes attention from worries and “de-stresses” him. This unstressed state of mind evokes relaxed responses during which parasympathetic nerve activity overrides sympathetic activity. [17]

Meditation by modifying the state of hysteria reduces stress-induced sympathetic over activity thereby decreasing arterial tone and peripheral resistance leading to lowering of diastolic vital sign and pulse.[18] Regular practice of yoga has showed improvement in bar reflex sensitivity and reduce within the sympathetic tone thereby restoring vital sign to normal level in patients of hyperpiesia.[11,12]

In the present study, the responses to fifteen days of normal combined practice of pranayama and meditation were also assessed with reference to age and gender. It revealed that both males and females responded similarly to the yoga practice.

When compared age wise, it revealed similar response to fifteen days of pranayama and meditation practice in both age bracket ≤ 40 years and age bracket >40 years. Within the present study, cardiovascular response within the age bracket >40 years is analogous with the previous study. [10]

Although a big decline in resting pulse, SBP, DBP, and mean arterial BP after the yoga practice within the present study is in accordance with the findings of other studies on physiological effects of yoga practice in healthy individuals, this study has some differences. This study involved regular combined practice of pranayama and meditation for 15 days, whereas other studies reported the consequences of individual pranayama or meditation practice for minimum of 4 weeks to six months. Some studies also included the consequences of asanas.

Most of the studies conducted thus far have generalized their results regardless of age and gender of the themes. Only a few studies are conducted on subjects above 40 years during which age bracket, cardiovascular diseases are more prevalent. Within the present study, an effort was made to refill these lacunae.

Although this study observed the clear short term (15 days) effects of pranayama and meditation practice, it remains to be assessed whether these changes persist after resuming normal respiration and whether future practice will cause stable modifications of cardiovascular control.

Thus during a nutshell, with this study, it's proved definitely, that regular practice of pranayama and meditation for minimum of 15 days is useful in improving the cardiovascular functions even in healthy individuals regardless of age, gender, and BMI.

Finally, these results and their explanations would justify the incorporation of yoga as a part of our lifestyle in promoting health and thereby preventing age related cardiovascular diseases.

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