Comparative study on the effect of yogic relaxing asanas and pranayamas on cardiovascular response in healthy young volunteers

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ABSTRACT

Background: Cardiovascular morbidity is increasing recently in India. Stress and autonomic dysfunction are associated with cardiovascular morbidity. Yoga is the best lifestyle ever designed. Based on limited scientific research, yoga (meditation, asanas, and pranayamas including relaxation) therapy is known to improve cardiovascular autonomic functions. Aims and Objective: To study and compare the effect of 6 months of training in relaxing asanas and pranayamas on blood pressure (BP), pulse pressure (PP), heart rate (HR), and rate-pressure product (RPP) in young healthy volunteers. Materials and Methods: A total of 109 healthy volunteers aged 20-25 years were divided into 3 groups consisting of asan (n = 38), pranayam (n = 38), and control group (n = 33). The Yoga training was given 25 min/day for 6 days/week for 6 months. Pranayam group received relaxing pranayam (pranav, savitri, nadi shuddhi and chandra nadi), asan group received relaxing asan (pawanmuktasana, balasan, dharnicasan, and shavasan) and waiting list were kept as a control group. The results were statistically compared between groups by analysis of variance and intra-group pre-post comparisons by paired t-test. Results: Post training analysis showed significant decreases in systolic BP and diastolic BP as well as PP, mean arterial pressure and RPP in both asan and pranayam group as compared with control. There was, however, no significant difference between asan and pranayam group. Conclusion: Practising either relaxing asan or pranayam enhances parasympathetic activity and decreases sympathetic activity.

KEY WORDS: Pranayam; Asan; Blood Pressure

INTRODUCTION

Yoga is the best lifestyle ever designed by our ancient India culture, an eternal gift to the world, achieves the union of our mind, body and soul. The term “yoga” derived from the Sanskrit root “Yuj” which means union. Modern lifestyle is a challenge of stress and stress related disorders such as hypertension and diabetic mellitus. Yoga practitioners are physically and mentally healthier and have better capability to cope up the stress than the normal population. Among the eight-fold path of Astanga Yoga, asan (firm and comfortable postures) and pranayam (slow, deep, conscious, rhythmic breathing) are mainly practiced by many people and also it is given as yoga therapy. Stress and autonomic dysfunction associated with cardiovascular morbidity are seen as upward trend in India in recent years. Based on scientific research, yoga (meditation, asanas, and pranayamas including relaxation), therapy is known to improve cardiovascular autonomic functions and reduces stress. Yoga has a role in prevention, management, and rehabilitation in stress-induced lifestyle disorder like hypertension.[1-3]
Pranayam and asan reduce basal sympathetic tone and enhance basal parasympathetic tone while reducing rate-pressure product (RPP). A combined protocol of pranayam and asan improves cardiovascular activity and decreases systolic blood pressure (SBP), diastolic pressure (DBP), and pulse pressure (PP). Minimum of 3 months practice of pranayam improves autonomic functions. Practicing ujjayi pranayama and shavasana for 6 weeks decrease heart rate (HR), SBP, DBP, PP, mean arterial pressure (MAP), and RPP. 5 min of bhramari pranayama has been shown to decrease SBP, DBP, MAP, and HR. Alternate nostril breathing (naadishudhi) improves parasympathetic activity. Adhomukhasvanasana decreases BP, body mass index, and HR. Suchitra et al. found that a set of asan decreases BP and improves exercise tolerance. However comparative study on asan and pranayam has not been reported in world literature, thereby this study seems to be the first of its kind to be reported in literature. Moreover in our busy lifestyle, practicing asan requires time, space, and comfortable clothes. It is practically difficult to practice asan by old aged people, physically challenged, and bed-ridden patients. Thus, to overcome these practical difficulties, this study was planned to compare the effect of 6 months training in asan and pranayam on cardiovascular parameters.

**MATERIALS AND METHODS**

Before commencement of the study, approval from Institute Research Committee and Institute Human Ethical Committee approval was obtained.

A total number of 120 subjects aged between 20 and 25 years were selected through Centre for Yoga Therapy Education and Research in Sri Balaji Vidyapeeth, Puducherry, and an informed consent obtained from them. They were randomly divided into three Groups: Group 1 received pranayama (pranav, savitri, nadi shuddhi and chandra nadi), Group 2 received asan (pawanmuktasana, balasan, dharmikasan and shavasan), and Group 3 was wait listed as a control. Two subjects dropped out from Group 1, two from Group 2, and seven from Group 3. Pranayam and asan techniques were taught to the respective groups for 3 days, and they were familiarized with the techniques and made comfortable to the yoga training hall atmosphere. Yoga training protocol for each group is given in Tables 1 and 2. A total of 25 min training program was given to each group for 6 days a week for 6 months under our supervision. During this period, waiting list control group was given study time for group discussion on academic activities.

Subjects were explained about the method of recording and were familiarized with the laboratory environment. Recordings were obtained between 8 AM and 10 AM without any stimulants in pre-recording period. The laboratory temperature was maintained at comfortable level for the subject. After 15 min of rest in supine, SBP and DBP were obtained from the subjects using sphygmomanometer.

The average of 3 trials with 5 min interval were taken for our calculation. PP was determined by PP = SBP-DBP. MAP and RPP were determined using respective formulae, MAP = DBP + (PP/3); RRP = (HR x SBP)/100. All the above-mentioned parameters were recorded before and after 6 months of yoga training program.

**Statistical Analysis**

After obtaining the study data, it was statistically analyzed using SPSS version 16.0. All data passed normality testing by Kolmogorov-Smirnov test and hence further analysis was done between groups using one-way analysis of variance (ANOVA) and using Students paired *t*-test for intra-group pre-post comparisons.

**RESULTS**

The results are given in Table 3. Relaxing pranayam and asan resulted in significant decreases in resting HR and PP (*p* < 0.05), SBP and MAP (*p* < 0.01), and DBP and RPP (*p* < 0.001) after training. The means of pre and post training values of all groups were compared by oneway ANOVA. There were no significant differences between groups at pre training. Post training comparison showed significant differences in HR (*p* < 0.05), SBP and MAP (*p* < 0.01), DBP, PP and RPP (*p* < 0.001) for the means of both pranayam and asan to control group after training. However, there were no significant differences between pranayam and asan group after yoga training.

**DISCUSSION**

In this study, it was found that 6 months of either pranayam or asan training decreases HR, SBP, DBP, PP, MAP, and
RPP. Findings of this study are collaborated by reports from Streeter et al. who proposed that yoga may help to reduce allostatic load in stress response systems thus restoring optimal homeostasis.[18] They hypothesized that stress produces an imbalance of autonomic nervous system with decreased parasympathetic and increased sympathetic activity. They also suggested that yoga may help correct such parasympathetic under activity through stimulation of vagus nerves as well as a reduction in allostatic load. Innes et al. have also postulated two interconnected pathways through which yoga may reduce cardiovascular and metabolic risk. They suggested that this was through parasympathetic activation coupled with decreased reactivity of sympatho-adrenal system and hypothalamo-pituitary-adrenal axis.[19,20]

The de-stressing effect of pranayama may be reducing sympathetic arousal, resulting in lesser release of adrenaline, thus bringing about a fall in HR and SBP as reported in the previous study.[21] Slow deep breathing stimulates stretch receptors in the lungs that stimulate Hering-breuer inflation reflex. This causes a withdrawal of sympathetic tone that in turn leads to vasodilation and reduced DBP.[12] One of the more useful non-invasive methods of determining load on the heart is the RPP that is an indicator of myocardial oxygen consumption.[12,23] This was significantly reduced in both the asan and pranayama groups. The slow and conscious performance of the relaxing asanas in our subjects may be contributing to the cardiovascular changes evidenced this study. The benefits of asan may be attributed to intra-thoracic and intra-abdominal pressure changes that occur while performing these practices. The mechanisms for positive changes may also be an improvement of baroreflex sensitivity and attenuation of sympathetic and renin-angiotensin system activity following Yoga training.[8] It has been reported that yoga improves “heart friendly” status of lipid profile in peri and post-menopausal DM[24] and Damodaran et al.[19] suggested that yoga can play an important role in risk modification for cardiovascular diseases.

A series of studies at Puducherry, India,[24,25,31] have documented immediate effects of various pranayama in hypertension where yoga has been shown to be an effective adjunct therapy. These changes were attributed to a normalization of autonomic cardiovascular rhythms as a result of increased vagal modulation and/or decreased sympathetic activity and improved baroreflex sensitivity along with an augmentation of endogenous nitric oxide production. The prolonged exhalation phase of pranava pranayama was hypothesized to mimic Valsalva maneuver resulting in decreased venous return, cardiac output and SBP. Pranayam has been shown to decrease oxygen consumption as well as the basal metabolic rate. Hence, the set of pranayama techniques used in this study may be a useful adjuvant to medical therapy in patients of hypertension and aid in cardiac rehabilitation post-myocardial infarction. Pranayama is relatively easier to perform than asan and requires less space than asan that involves different body postures requiring greater space for performance.

The strength of this study is the strict adherence to the practice schedule and near perfect attendance by all subjects. The duration of the study as well as the frequency of the practice make it stand out when compared to most yoga studies where compliance is much lower. The study is limited to non-invasive measurements of HR and BP and doesn’t allow for ambulatory measurements that would be more accurate. As other more exhaustive autonomic tests were not done exact mechanisms of action of yoga training is more hypothetical and cannot be substantiated fully.

CONCLUSION

This study offers further evidence of the cardiovascular relaxation afforded by yoga. It also has studied the differential effects of asan and pranayam training and found that both have similar beneficial effects as compared to a wait-listed control group. This may be attributed to the enhancement of parasympathetic tone and reduction in sympathetic activity in the autonomic nervous system. Pranayama is relatively easier to perform and hence the findings of this study give us scope for further research in clinical and geriatric population as well as those who are physically challenged.
REFERENCES


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