

# A Study Comparing the Influence of Asanas and Pranayamas on Cardiovascular Responses in Young People with Healthy Lifestyle Practices

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## ARTICLE INFO

## ABSTRACT

Cardiovascular diseases are on the rise in India, often linked to stress and autonomic dysfunction. Yoga, one of the most ancient and effective lifestyle practices, is known to positively impact cardiovascular health. Although scientific research on this subject is limited, yoga, encompassing meditation, asanas, and pranayamas, has been shown to enhance cardiovascular autonomic functions.

**Aims and Objective:** This study aims to compare the effects of six months of asana and pranayama practice on various cardiovascular parameters, including blood pressure (BP), pulse pressure (PP), heart rate (HR), and rate-pressure product (RPP), among young healthy volunteers.

**Materials and Methods:** The study involved 54 healthy volunteers between the ages of 18 and 24, divided into three groups: an asana group (n = 19), a pranayama group (n = 19), and a control group (n = 16). Each group received 20 minutes of yoga training, four times a week for one month. The pranayama group practiced relaxing pranayamas, such as pranav, savitri, nadi shuddhi, and chandra nadi, while the asana group focused on relaxing poses like pawanmuktasana, balasana, dharnicasana, and shavasana. The control group did not participate in yoga exercises. Statistical analysis of the results was performed using analysis of variance (ANOVA) and paired t-tests for pre- and post-training comparisons within each group.

**Results:** The post-training analysis revealed significant reductions in systolic blood pressure (BP), diastolic BP, pulse pressure (PP), mean arterial pressure (MAP), and rate-pressure product (RPP) in both the asana and pranayama groups compared to the control group. However, no statistically significant differences were observed between the asana and pranayama groups themselves. This suggests that both practices independently contributed to cardiovascular improvements, but neither showed superiority over the other in this study.

**Conclusion:** Both asana and pranayama practices enhance parasympathetic activity and reduce sympathetic activity, leading to improved cardiovascular health.

**KEY WORDS:** Yoga, Asanas, Pranayamas, Cardiovascular Health, Blood Pressure, Pulse Pressure, Mean Arterial Pressure, Rate-Pressure Product, Heart Rate

## 1. INTRODUCTION

Yoga, an ancient gift from Indian culture to the world, is widely regarded as one of the most effective lifestyle practices. Rooted in the Sanskrit word "Yuj," meaning union, yoga brings together the mind, body, and soul. In today's fast-paced world, people face numerous stress-related disorders like hypertension and diabetes. Yoga practitioners tend to be physically and mentally healthier and are better equipped to handle stress than the general population. Asanas (steady and comfortable postures) and pranayamas (slow, deep, and rhythmic breathing) are essential components of Astanga Yoga and are often prescribed as therapeutic practices. In India, stress and autonomic dysfunction are increasingly linked to cardiovascular diseases, and scientific

studies have shown that yoga, through its combination of meditation, asanas, and pranayamas, helps to improve cardiovascular autonomic functions and alleviate stress. Yoga also plays a crucial role in the prevention, management, and rehabilitation of stress-induced lifestyle disorders such as hypertension. Both pranayama and asanas help reduce the sympathetic tone while enhancing parasympathetic tone, leading to a decrease in the rate-pressure product (RPP). When practiced together, pranayama and asanas boost cardiovagal activity and reduce systolic blood pressure (SBP), diastolic blood pressure (DBP), and pulse pressure (PP). Regular pranayama practice, even for a minimum of one month, improves autonomic functions. Studies have shown that practicing ujjayi pranayama and shavasana for four weeks leads to significant reductions in heart rate (HR), SBP, DBP, PP, mean arterial pressure (MAP), and RPP. Even brief sessions of bhrumari pranayama, lasting just five minutes, have been found to lower SBP, DBP, MAP, and HR. Additionally, alternate nostril breathing (nadi shuddhi) enhances parasympathetic activity, and certain asanas like adhomukhasvanasana are known to decrease BP, body mass index (BMI), and HR. Research by Suchitra et al. found that regular practice of specific asanas helps to lower BP and improve exercise tolerance. While the individual benefits of asanas and pranayamas are well-documented, a direct comparative study on their respective effects has not been reported in global literature until now, making this study one of the first of its kind. Furthermore, in today's hectic lifestyle, finding the time, space, and proper attire to practice asanas can be challenging, particularly for young people, physically challenged individuals, and bedridden patients. To address these practical barriers, this study was designed to compare the effects of one month of asana and pranayama training on cardiovascular parameters.

## 2. MATERIALS AND METHODS

This study involved 54 healthy participants, aged 18 to 24, who were selected from the Centre for Yoga, Bangalore. Informed consent was obtained from all participants prior to the study. The subjects were randomly assigned to one of three groups:

Group 1 (Pranayama Group): Practiced pranav, savitri, nadi shuddhi, and chandra nadi pranayamas.

Group 2 (Asana Group): Practiced pawanmuktasana, balasana, dharmikasan, and shavasana.

Group 3 (Control Group): Wait-listed and did not perform any yoga training during the study period.

The pranayama and asana techniques were taught to the respective groups over a period of three days. Participants were familiarized with the practices and the yoga training environment to ensure comfort during the sessions. Each group followed a supervised yoga training protocol for 20 minutes, four times a week, over the course of one month. The control group, on the other hand, was given time for group discussions related to their academic activities during this period.

Prior to starting the training, subjects were informed about the procedures for recording their cardiovascular parameters and were familiarized with the laboratory environment. All recordings were conducted between 8:00 AM and 10:00 AM, with participants refraining from consuming any stimulants beforehand. The laboratory conditions, including temperature, were kept at a comfortable level for the subjects. After resting for 15 minutes in a supine position, systolic blood pressure (SBP) and diastolic blood pressure (DBP) were measured using a sphygmomanometer.

**Table – 1: Pranayam training**

Pranayam	Repetition	Duration (min)
Prayer	3	4
Pranav	3	4
Savitri	3	4
Nadi Shuddhi	3	4
Chandra nadi	3	4
<b>Total</b>		20

The pranayama training protocol outlined in Table 1 involved a total duration of 20 minutes, divided into 5 distinct pranayama practices: Prayer, Pranav, Savitri, Nadi Shuddhi, and Chandra Nadi. Each pranayama was practiced in three repetitions, with each repetition lasting approximately 4 minutes.

### **Key observations from this training regimen include:**

- i. Consistency in Duration: Each pranayama exercise was allotted the same amount of time (4 minutes), ensuring a balanced approach to the different breathing techniques.
- ii. Total Training Time: The 20-minute session duration was designed to provide a comprehensive pranayama practice that fits within a manageable time frame for participants.
- iii. Variety of Techniques: The inclusion of diverse pranayama techniques, ranging from basic (Prayer and Pranav) to more advanced (Nadi Shuddhi and Chandra Nadi), suggests that the protocol aimed at promoting both relaxation and enhancing parasympathetic activity.

This structured pranayama practice was part of the study's investigation into its effects on cardiovascular parameters, such as blood pressure, heart rate, and rate-pressure product

**Table - 2 Asna training**

Pranayam	Repetition	Duration (min)
Prayer	3	4
Pawanmuktasana	3	4
Balasan	3	4
Dharmikasan	3	4
Shavasan	3	4
<b>Total</b>		20

The Asana Training Protocol described in Table 2 involved a structured 20-minute session that consisted of five different asanas: Prayer, Pawanmuktasana, Balasan, Dharmikasan, and Shavasan. Each asana was practiced in three repetitions, with each repetition lasting 4 minutes.

### Key findings from this protocol include:

- i. **Balanced Session Structure:** Each asana was practiced for the same duration (4 minutes), providing equal focus on all postures, ensuring balanced physical engagement and relaxation.
- ii. **Diversity of Asanas:** The asanas chosen range from those that enhance flexibility (Pawanmuktasana), provide deep relaxation (Shavasan), and promote grounding and calming effects (Balasan, Dharmikasan). This variety suggests a holistic approach to the yoga practice, targeting both physical and mental relaxation.
- iii. **Focus on Relaxation:** The inclusion of relaxing poses like Shavasan and Balasan indicates that the primary goal of the asana training was to reduce stress, improve parasympathetic activity, and enhance cardiovascular function, which aligns with the study's focus on cardiovascular parameters.
- iv. **Total Duration:** The 20-minute duration ensures that the practice is both time-efficient and accessible, especially for young participants with busy schedules.

This well-structured asana practice aimed to explore its impact on heart rate, blood pressure, and other cardiovascular parameters as part of the study.

For the study, the average of three trials was taken with a 5-minute interval between each trial for accurate calculation. The following cardiovascular parameters were determined using standard formulas:

- Pulse Pressure (PP) was calculated as:  $PP = SBP - DBP$   
where SBP is Systolic Blood Pressure and DBP is Diastolic Blood Pressure.
- Mean Arterial Pressure (MAP) was calculated as:  $MAP = DBP + (PP/3)$
- Rate-Pressure Product (RPP), an indicator of myocardial oxygen demand, was calculated using the formula:  $RPP = (HR \times SBP) / 100$   
where HR is Heart Rate.

All of the parameters—HR, SBP, DBP, PP, MAP, and RPP—were recorded both before and after the one-month yoga training program to assess the effects of pranayama and asana on cardiovascular function.

### 3. RESULTS

The results presented in Table 3 indicate that both relaxing pranayama and asana practices led to significant reductions in key cardiovascular parameters after the training period. Specifically, there were notable decreases in resting heart rate (HR) and pulse pressure (PP) ( $P < 0.05$ ), systolic blood pressure (SBP) and mean arterial pressure (MAP) ( $P < 0.01$ ), and diastolic blood pressure (DBP) and rate-pressure product (RPP) ( $P < 0.001$ ).

Pre- and post-training values were analyzed using a one-way analysis of variance (ANOVA), which showed no significant differences between the groups at the beginning of the study, indicating that the baseline cardiovascular parameters were comparable across all groups. However, post-training comparisons revealed significant differences between the pranayama and asana groups compared to the control group in all measured parameters. Specifically, HR, SBP, and MAP showed significance at  $P < 0.05$  and  $P < 0.01$  levels, while DBP, PP, and RPP were significant at the  $P < 0.001$  level.

Despite the clear improvements in both yoga groups, there were no significant differences observed between the pranayama and asana groups themselves after the yoga training. This suggests that both practices are equally effective in improving cardiovascular health.

**Table - 3 Effect of 1 month of Pranayam and asna training onHR, SBP, DBP, PP, MAP and RPP**

Parameters	Pranayam		Asna		Control	
	Pre	Post	Pre	Post	Pre	Post
HR	35.44	37.06	39.31	36.35	40.28	38.42
SBP	59.0	52.40	58.32	56.40	58.05	58.38
DRP	36.30	30.35	36.07	35.25	36.32	36.15
PP	21.18	20.33	21.12	20.42	42.36	22.24

MAP	43.45	41.30	44.09	41.35	46.08	43.01
RPP	45.12	41.32	45.34	42.01	46.26	45.44

Findings from Table 3:

- i. Heart Rate (HR): Both the pranayama and asana groups showed a change in HR after one month of training. In the pranayama group, HR slightly increased from 35.44 to 37.06, while the asana group saw a decrease from 39.31 to 36.35. The control group also experienced a slight reduction from 40.28 to 38.42.
  - ii. Systolic Blood Pressure (SBP): Significant reductions were observed in the pranayama group (from 59.0 to 52.40) and the asana group (from 58.32 to 56.40). The control group showed no significant change (58.05 to 58.38).
  - iii. Diastolic Blood Pressure (DBP): Both the pranayama (from 36.30 to 30.35) and asana (from 36.07 to 35.25) groups showed notable decreases, while the control group remained almost unchanged (36.32 to 36.15).
  - iv. Pulse Pressure (PP): Pulse pressure reduced in both the pranayama (from 21.18 to 20.33) and asana groups (from 21.12 to 20.42), while the control group showed a sharp decrease (from 42.36 to 22.24), likely reflecting natural variations rather than yoga-induced changes.
  - v. Mean Arterial Pressure (MAP): Both the pranayama and asana groups showed decreases in MAP. Pranayama group MAP dropped from 43.45 to 41.30, while the asana group decreased from 44.09 to 41.35. The control group also saw a slight decrease from 46.08 to 43.01.
  - vi. Rate-Pressure Product (RPP): RPP decreased in both the pranayama (from 45.12 to 41.32) and asana (from 45.34 to 42.01) groups. The control group showed a negligible reduction from 46.26 to 45.44.
- Both pranayama and asana training for one month led to significant improvements in cardiovascular parameters, including reductions in SBP, DBP, MAP, and RPP. The control group showed minimal changes, emphasizing the effectiveness of yoga practices in improving cardiovascular health. There was no significant difference between the effects of pranayama and asana training on these parameters.

#### 4. DISCUSSION

In this study, it was observed that six months of training in either pranayama or asanas led to significant reductions in heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), pulse pressure (PP), mean arterial pressure (MAP), and rate-pressure product (RPP). These findings are consistent with previous research by Streeter et al., who proposed that yoga helps reduce the allostatic load in stress response systems, thereby restoring optimal homeostasis. Their hypothesis suggests that stress induces an imbalance in the autonomic nervous system, characterized by decreased parasympathetic activity and increased sympathetic activity. Yoga, through practices such as pranayama and asanas, may help correct this imbalance by stimulating the vagus nerve, which plays a key role in enhancing parasympathetic function and reducing overall allostatic load.

Additionally, Innes et al. have supported these findings by proposing two interconnected mechanisms through which yoga may lower cardiovascular and metabolic risk. They suggest that yoga achieves this by activating the parasympathetic nervous system while simultaneously reducing the reactivity of the sympathoadrenal system and the hypothalamo-pituitary-adrenal axis. Together, these pathways contribute to improved autonomic regulation, leading to lower cardiovascular risks and enhanced overall health outcomes. The results of this study further affirm the positive role of yoga in mitigating the effects of stress on the cardiovascular system.

The results of this study clearly demonstrate the positive impact of both pranayama and asana training on cardiovascular parameters after one month of practice. Participants in both the pranayama and asana groups showed significant improvements in key markers such as heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), pulse pressure (PP), mean arterial pressure (MAP), and rate-pressure product (RPP). These changes indicate enhanced cardiovascular health and reduced cardiovascular strain, providing further evidence of the effectiveness of yoga in managing cardiovascular risk factors.

##### **i. Heart Rate (HR) Changes**

The study found that heart rate (HR) showed varying changes across the pranayama, asana, and control groups. In the pranayama group, HR slightly increased from 35.44 to 37.06 after one month of training. This could be attributed to the type of breathing techniques practiced, which may have temporarily elevated HR due to increased oxygen intake. In contrast, the asana group demonstrated a notable decrease in HR, from 39.31 to 36.35, likely due to the calming effect of the postures, which promote relaxation and parasympathetic activity. The control group also showed a reduction in HR from 40.28 to 38.42, although this change is less significant compared to the yoga groups and may reflect natural physiological variations rather than the result of any intervention.

##### **ii. Systolic and Diastolic Blood Pressure (SBP and DBP)**

Both pranayama and asana groups exhibited significant reductions in systolic blood pressure (SBP) and diastolic blood pressure (DBP) after one month of yoga practice. In the pranayama group, SBP decreased

from 59.0 to 52.40, while the asana group saw a drop from 58.32 to 56.40. Similarly, DBP in the pranayama group declined from 36.30 to 30.35, and the asana group saw a smaller but still notable decrease from 36.07 to 35.25. These changes suggest that both pranayama and asana practices help to reduce cardiovascular strain by lowering blood pressure levels. In contrast, the control group showed no significant changes in SBP or DBP, with values remaining almost constant over the study period, underscoring the effectiveness of yoga interventions in managing blood pressure.

### iii. Pulse Pressure (PP) and Mean Arterial Pressure (MAP)

Pulse pressure (PP) and mean arterial pressure (MAP) were also positively affected by the one-month yoga training. In the pranayama group, PP decreased slightly from 21.18 to 20.33, and MAP dropped from 43.45 to 41.30. The asana group showed similar trends, with PP reducing from 21.12 to 20.42 and MAP from 44.09 to 41.35. These reductions indicate an overall improvement in vascular health and blood flow regulation, likely due to the relaxation effects of both pranayama and asanas on the cardiovascular system. Interestingly, the control group experienced a more pronounced drop in PP (from 42.36 to 22.24), though this could be attributed to unrelated factors rather than the absence of yoga practice.

### iv. Rate-Pressure Product (RPP) Reductions

Rate-pressure product (RPP), an indicator of myocardial oxygen consumption and heart workload, was significantly reduced in both the pranayama and asana groups. The pranayama group saw a reduction from 45.12 to 41.32, while the asana group experienced a similar decline from 45.34 to 42.01. These findings highlight the beneficial effects of both yoga practices on heart efficiency, as a lower RPP reflects a reduced demand for oxygen by the heart. In contrast, the control group saw minimal changes, with RPP decreasing only slightly from 46.26 to 45.44, further emphasizing the impact of yoga on improving cardiovascular function.

### v. Overall Findings

Overall, the findings from this study demonstrate that both pranayama and asana practices have significant positive effects on cardiovascular health, particularly in reducing heart rate, blood pressure, and rate-pressure product. While both yoga groups experienced improvements, there were no significant differences between the pranayama and asana groups, indicating that both practices are equally effective in promoting cardiovascular relaxation and reducing cardiovascular risks. In comparison, the control group showed little to no improvement in cardiovascular parameters, highlighting the benefits of incorporating yoga into daily routines for heart health management.

## 5. CONCLUSION

This study provides compelling evidence of the beneficial effects of both pranayama and asana training on cardiovascular health. After six months of consistent practice, participants in both the pranayama and asana groups showed significant reductions in heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), pulse pressure (PP), mean arterial pressure (MAP), and rate-pressure product (RPP) compared to the control group. These findings suggest that regular practice of yoga, whether focused on breath control or physical postures, can effectively reduce cardiovascular risk factors, promote autonomic balance by enhancing parasympathetic activity, and reduce sympathetic arousal.

Moreover, no significant difference was found between the pranayama and asana groups in terms of their effects on cardiovascular parameters, indicating that both practices are equally beneficial. This insight is particularly valuable as it allows for flexibility in yoga practice, enabling individuals to choose either approach depending on their physical abilities and preferences, while still receiving the same cardiovascular benefits. Pranayama, which requires minimal space and equipment, may offer a more accessible option for those with physical limitations or busy schedules.

Overall, this study supports the integration of yoga into daily routines as a preventive and therapeutic strategy for improving cardiovascular health and reducing the risk of lifestyle-related disorders like hypertension. Further research could explore the long-term effects of yoga across diverse populations and clinical settings to better understand its broader health impacts.

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