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EFFECTS OF A SIX WEEK PRANAYAMA INTERVENTION ON BLOOD PRESSURE AMONG YOUNG ADULTS IN HARYANA UNIVERSITY STUDENTS

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Abstract
Pranayama, a yogic breathing technique, has been widely studied for its potential to improve cardiovascular health through autonomic modulation. This study evaluated the effect of a six-week structured Pranayama intervention on systolic (SBP) and diastolic blood pressure (DBP) among young, normotensive college students. A total of 100 participants aged 18–25 years from Chaudhary Bansi Lal University, Haryana, were randomly divided into experimental (n = 50) and control (n = 50) groups. The experimental group practiced daily 40-minute Pranayama sessions including Anulom Vilom and Bhramari for six weeks, while the control group continued routine activities. SBP and DBP were measured pre- and post-intervention using a digital sphygmomanometer under standardized conditions. Results showed a significant reduction in SBP (≈9.4 mmHg) and DBP (≈6.6 mmHg) in the experimental group compared to the control group ($p < 0.05$). One-way ANOVA and Tukey's post-hoc tests confirmed significant intergroup differences, and bar charts supported the visual trend. These findings suggest that short-term, structured Pranayama practice can favorably influence cardiovascular parameters even in healthy young adults, highlighting its potential as a simple, low-cost, non-pharmacological strategy for blood pressure regulation and cardiovascular health promotion.

Keywords
Pranayama, Blood pressure, Systolic blood pressure, Diastolic blood pressure, Yoga, Autonomic nervous system, Cardiovascular health, Non-pharmacological intervention, Stress reduction, Preventive health.

1. INTRODUCTION

Pranayama, a cornerstone of yogic practice, involves voluntary regulation of breathing through controlled inhalation, exhalation, and breath-holding techniques. Traditionally considered a method for achieving physical and mental harmony, modern scientific evidence highlights its role in cardiovascular health. Controlled breathing influences autonomic function by enhancing parasympathetic activity and reducing sympathetic drive, thereby lowering heart rate and arterial blood pressure. It also improves baroreflex sensitivity, reduces peripheral vascular resistance, and enhances endothelial relaxation, collectively supporting blood pressure regulation [1, 2].

A wide range of experimental and clinical studies have investigated the impact of Pranayama on cardiovascular function and blood pressure. McElroy et al. (2012) demonstrated that practicing 15 minutes of daily Pranayama significantly reduced both systolic and diastolic blood pressure in adults [3]. Similarly, Mariha and Handayani (2018) applied Pranayama as a nursing intervention for hypertensive families and reported notable BP reductions [4]. In hypertensive populations, slow breathing techniques such as Nadi Shodhan and Nadi Shuddhi have produced clinically meaningful reductions in SBP and DBP, as documented by Sharma et al. (2017) [5]. Immediate effects have also been observed; Bhavanani et al. (2011, 2012) reported that single sessions of Sukha, Chandra Nadi, and other slow Pranayama practices can rapidly lower cardiovascular parameters in both hypertensive and normotensive participants [2, 6].

Short-term and population-specific studies further support the versatility of yogic breathing. Shree et al. (2019) found that brief Pranayama interventions improved sleep quality, lowered heart rate, and reduced blood pressure in young adults [7]. Bargal et al. (2022) observed that left nostril breathing decreased blood pressure and improved cardiorespiratory function in healthy individuals [8]. Suryawanshi et al. (2016) similarly reported improvements in cardio-respiratory function after Nadishuddhi Pranayama training [9]. In clinical populations, Mohan et al. (2018) demonstrated that Pranayama elicited favorable hemodynamic responses in post-coronary artery bypass graft patients, while Udenia et al. (2021) noted its adjunctive benefits for intraocular pressure, indirectly reflecting autonomic and vascular modulation [10, 11].

Systematic reviews and narrative analyses consolidate these findings, indicating that slow, deep breathing consistently lowers blood pressure through autonomic rebalancing and vascular effects [12, 13]. Collectively, this literature highlights Pranayama as a low-cost, non-pharmacological strategy for cardiovascular health promotion, effective in both preventive and therapeutic contexts. Building on this evidence, the present study was designed to evaluate the effect of a six-week Pranayama intervention on systolic and diastolic blood pressure in young, normotensive college students, providing further insights into the preventive potential of structured breathing practices.

2. METHODOLOGY

2.1 Research Design

The study followed a true experimental pre-test–post-test control group design to examine the effects of a six-week Pranayama intervention on systolic and diastolic blood pressure. Participants were divided into two groups:

- **Experimental group:** Received the intervention.
- **Control group:** Continued routine activities without intervention.

Blood pressure measurements were taken at baseline (pre-test) and after six weeks (post-test) to evaluate the effect of the intervention.

2.2 Participants and Sampling

A total of 100 college students (50 males and 50 females) from institutions affiliated with Chaudhary Bansi Lal University, Bhiwani (Haryana) voluntarily participated in the study. Participants were randomly allocated into two equal groups of 50 each:

- **Experimental Group (n = 50):** Underwent six weeks of Pranayama training.

- **Control Group (n = 50):** Did not receive any intervention and continued their routine activities.

Participants were 18–25 years old, in good health, and free from chronic cardiovascular or respiratory conditions. Individuals on medication, therapy, or specialized physical training were excluded.

All participants provided written informed consent, and ethical standards including voluntary participation, confidentiality, and the right to withdraw were upheld throughout the study.

2.3 Variable and Measurement

The independent variable was the six-week structured Pranayama program.

The **dependent variables** were:

- **Systolic Blood Pressure (SBP)** – measured in mmHg
- **Diastolic Blood Pressure (DBP)** – measured in mmHg

All measurements were conducted using a digital sphygmomanometer with participants seated in a relaxed state. Readings were taken under standardized conditions to ensure accuracy.

The data collection environment and measurement procedure are illustrated in Figures 2.1 and 2.2.

2.4 Intervention Protocol

The Pranayama training was conducted six days per week (Monday to Saturday) for six weeks, with each session lasting approximately 40 minutes:

1. **Opening Prayer and Om Chanting (5 minutes)**
2. **Core Pranayama Practices (30 minutes):**
    - *Anulom Vilom* (Alternate Nostril Breathing)
    - *Bhramari* (Humming Bee Breath)
3. **Closing with Shanti Mantra (5 minutes)**

All sessions were conducted in a quiet, ventilated environment under expert supervision. Participants were instructed to avoid meals for at least one hour prior to practice and to maintain regular attendance, which was recorded daily.

2.5 Data Collection Procedure

Data were collected before and after the six-week intervention.

- Blood pressure was measured in a seated position using a digital sphygmomanometer after the participant had rested for 5 minutes.
- Each measurement was taken under the same standardized conditions during both pre-test and post-test sessions.

Figure 1: Classroom environment for blood pressure assessments. Participants seated in the testing room during supervised pre- and post-assessment sessions.

Figure 2: Blood pressure measurement procedure during the study. The researcher measuring

a participant's blood pressure using a sphygmomanometer.

2.6 Statistical Analysis

All data were analyzed using SPSS software. Descriptive statistics (mean and standard deviation) were computed for systolic and diastolic blood pressure. One-way ANOVA tested differences among the four conditions (Control Pre, Experimental Pre, Control Post, Experimental Post). When ANOVA indicated significance, Tukey's HSD post-hoc test identified pairwise differences. Pearson correlation examined relationships among measurements. A p-value < 0.05 was considered statistically significant.

3. RESULTS

Blood Pressure Analysis

This study evaluated the impact of a **six-week Pranayama intervention** on **systolic and diastolic blood pressure** in adults using four groups: **Control (Pre), Experimental (Pre), Control (Post),** and **Experimental (Post)**. A combination of **descriptive statistics, one-way ANOVA, Tukey's**

post-hoc comparisons, and **Pearson correlation** was applied to examine changes and intergroup relationships. Graphical representations were also included to visually support statistical outcomes.

3.1 Systolic Blood Pressure (SBP)

The baseline systolic pressure was almost identical between the control and experimental groups (106.9 mmHg vs. 106.2 mmHg), confirming physiological equivalence prior to the intervention. After six weeks, the **control group showed a slight increase** to 113.3 mmHg, while the **experimental group demonstrated a decrease** to 103.9 mmHg, suggesting a favorable effect of Pranayama.

One-way ANOVA revealed a **significant effect of group on SBP** $F(3,196)=5.87, p=0.0007$ $F(3,196) = 5.87$, $p = 0.0007$ $F(3,196)=5.87, p=0.0007$, confirming that at least one group mean differed significantly. Tukey's post-hoc analysis indicated that **baseline comparisons were not significant**, the **control group showed no change over time**, and the **post-intervention comparison between Control Post and Experimental Post** revealed a **significant reduction in SBP** ($p < 0.05$). These findings confirm that **Pranayama effectively lowers systolic blood pressure**, while no intervention leads to either stability or a slight increase.

Table 1: Descriptive statistics of systolic blood pressure (mmHg)

Group	Mean (mmHg)	Std. Dev.	N
Control (Pre)	106.90	14.09	50
Experimental (Pre)	106.20	15.46	50
Control (Post)	113.30	10.72	50
Experimental (Post)	103.90	12.15	50

Table 2: One-way ANOVA summary for systolic blood pressure

Source	Sum of Squares	df	Mean Square	F	p-value
Between Groups	3145.5	3	1048.5	5.87	0.0007
Within Groups	35010.0	196	178.6	–	–
Total	38155.5	199	–	–	–

Table 3: Tukey's multiple comparisons for systolic blood pressure

Comparison	Mean Diff.	Significant?	95% CI of Diff
Control (Pre) vs Experimental (Pre)	+3.60	No	-3.36 to 10.56
Control (Pre) vs Control (Post)	-6.40	No	-13.36 to 0.56
Control (Post) vs Experimental (Post)	+9.40	**Yes**	2.44 to 16.36

The corresponding bar chart (**Figure 3**) reflects this trend visually. **Control (Pre) and Experimental (Pre)** appear equivalent, the **control group shows a mild increase** without intervention, and the **experimental group exhibits a meaningful reduction**, marked by a significant difference (*) compared to the control. This visual confirmation aligns with the statistical results, illustrating that **Pranayama leads to a favorable decrease in systolic blood pressure**.

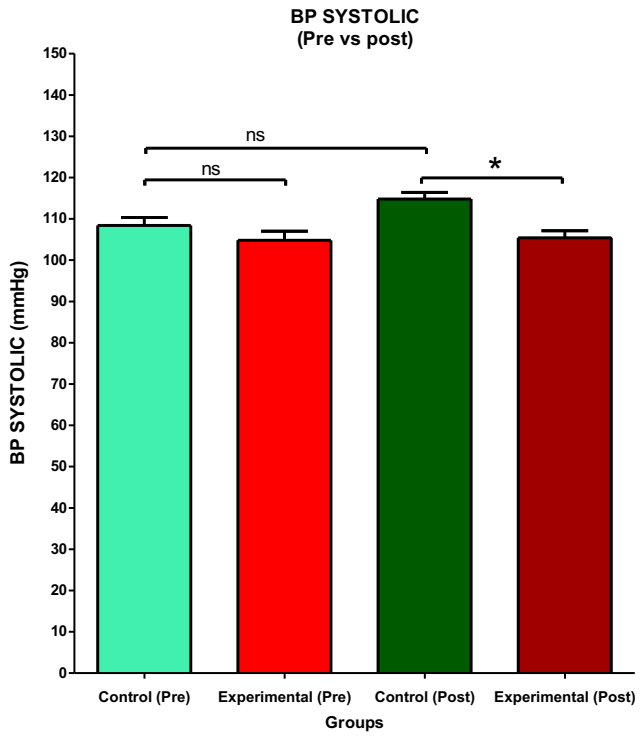


Figure 3: Group-wise mean systolic blood pressure (mmHg) across four conditions *(Light cyan = Control Pre; Red = Experimental Pre; Dark green = Control Post; Maroon = Experimental Post; * indicates $p < 0.05$)*

3.2 Diastolic Blood Pressure (DBP)

At baseline, diastolic pressure in the experimental group (66.6 mmHg) was slightly lower than in the control group (70.9 mmHg), though both were within a comparable physiological range. After six weeks, the **control group's DBP rose** to 75.5 mmHg, while the **experimental group's DBP decreased** to 68.9 mmHg, indicating a **beneficial effect of Pranayama on diastolic pressure**.

The one-way ANOVA revealed a **highly significant effect of group on DBP** $F(3,196)=7.71, p<0.0001F(3,196) = 7.71, p < 0.0001F(3,196)=7.71, p<0.0001$. Tukey's post-hoc test showed that **baseline differences were non-significant**, the **control group showed no significant change**, and the **comparison of Control Post and Experimental Post** confirmed a **significant reduction in DBP** ($p < 0.05$), reinforcing the **therapeutic impact of Pranayama**.

Table 4: Descriptive statistics of diastolic blood pressure (mmHg)

Group	Mean (mmHg)	Std. Dev.	N
Control (Pre)	70.90	10.36	50
Experimental (Pre)	66.60	9.89	50
Control (Post)	75.50	6.88	50
Experimental (Post)	68.90	8.87	50

Table 5: One-way ANOVA summary for diastolic blood pressure

Source	Sum of Squares	df	Mean Square	F	p-value
Group	2146.38	3	715.46	7.71	<0.0001

Residual	18198.50	196	92.85	–	–
Total	20344.88	199	–	–	–

Table 6: Tukey's multiple comparisons for diastolic blood pressure

Comparison	**Mean Diff.**	**Significant?**	**95% CI of Diff**
Control (Pre) vs Experimental (Pre)	+4.30	No	-0.72 to 9.32
Control (Pre) vs Control (Post)	-4.60	No	-9.62 to 0.42
Control (Post) vs Experimental (Post)	+6.60	**Yes**	1.58 to 11.62

Pearson correlation analysis showed mostly weak relationships, but a **significant positive correlation between Control (Pre) and Experimental (Post)** ($r = 0.308$, $p = 0.030$) was observed, suggesting that individuals with higher baseline DBP in the control group tended to demonstrate lower DBP values after intervention in the experimental group, reflecting a **potential converging therapeutic trend**.

Table 7: Pearson correlation coefficients for diastolic blood pressure

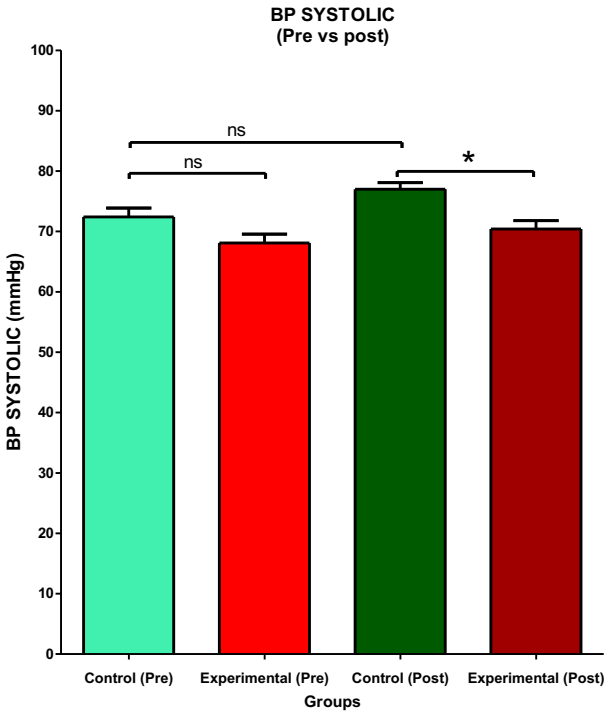
	Control (Pre)	**Experimental (Pre)**	**Control (Post)**	**Experimental (Post)**
Control (Pre)	1.000	0.460	0.015	0.308
Experimental (Pre)	0.460	1.000	0.211	0.267
Control (Post)	0.015	0.211	1.000	0.016
Experimental (Post)	0.308	0.267	0.016	1.000

Table 8: P-values corresponding to correlation coefficients

	Control (Pre)	**Experimental (Pre)**	**Control (Post)**	**Experimental (Post)**
Control (Pre)	–	0.0008	0.915	0.030
Experimental (Pre)	0.0008	–	0.142	0.061
Control (Post)	0.915	0.142	–	0.911
Experimental (Post)	0.030	0.061	0.911	–

The bar chart in **Figure 4** visually supports these findings. The **baseline bars for control and experimental groups are close**, indicating equivalence, while the **post-intervention comparison shows a marked reduction in DBP** for the experimental group. The asterisk (*) marks the **significant difference** between Control Post and Experimental Post. These results confirm that **Pranayama can effectively reduce diastolic pressure** over a six-week period.

Figure 4: Group-wise mean diastolic blood pressure (mmHg) across four conditions



*(Light cyan = Control Pre; Red = Experimental Pre; Dark green = Control Post; Maroon = Experimental Post; * indicates $p < 0.05$)*

4. DISCUSSION

The six-week Pranayama intervention in young, normotensive college students led to a reduction of approximately 9.4 mmHg in systolic blood pressure (SBP) and 6.6 mmHg in diastolic blood pressure (DBP), while the control group exhibited no significant changes (**Tables 1 and 4**). One-way ANOVA revealed a significant group effect on both SBP and DBP, with post-hoc analysis showing that the Control Post vs. Experimental Post comparison was significant (**Tables 2, 3, 5, and 6**). These results, further visualized in **Figures 3** and **4**, confirm that structured slow breathing practices can induce favorable cardiovascular adaptations in healthy young adults.

Our findings are consistent with previous literature demonstrating the blood pressure–lowering potential of Pranayama and yogic breathing techniques. Mittal et al. (2025) reported that six weeks of Nadi Shodhan Pranayama produced significant SBP and DBP reductions along with improved heart rate variability, indicating enhanced parasympathetic tone [5]. Katriya, et al. 2024 similarly observed a ~9.6 mmHg drop in SBP and ~6.5 mmHg drop in DBP after three weeks of Anulom Vilom, closely mirroring our results [14]. Agrawal et al. (2020) also documented ~4 mmHg reductions in both SBP and DBP in healthy adults following four weeks of Pranayama [15], and our results align with the 4–12 week interventions in young adults reported by Jain 2016 and Dinesh et al. (2014) [16, 17].

When compared to hypertensive populations, our observed reductions fall within the moderate range but remain clinically meaningful for prevention. Shetty et al. (2017) reported that Sheetali

and Sheetkari Pranayama lowered SBP by ~16 mmHg in hypertensive subjects, demonstrating the amplified effect in clinical groups [18]. Sharma et al. (2017) found that one month of Nadi Shuddhi practice reduced both SBP and DBP in stage I–II hypertensives [19], and Satyanand et al. (2014) observed enhanced parasympathetic tone and BP reductions after three months of Anulom Vilom and Bhramari [20]. Short-term responses have also been noted; Bhavanani et al. (2011) and Sathe, et al. (2020) demonstrated that even a few minutes of Sukha or Bhramari Pranayama can acutely reduce SBP and DBP in hypertensive patients [21, 22].

Further support for the broad applicability of Pranayama comes from Mohan et al. (2018), who showed positive effects in post-CABG patients, and Lindasari et al. (2020), who demonstrated similar BP reductions in elderly hypertensives [11, 23]. Ankad et al. (2011) also reported significant SBP and DBP improvements with short-term Sheetali/Sheetkari and Pranayama-meditation protocols, and Vasundhara et al. (2022) confirmed similar benefits in pregnant participants with Pranava Pranayama [24].

The mechanisms underlying these reductions are closely tied to autonomic and vascular modulation. Slow, deep breathing enhances parasympathetic (vagal) activity, suppresses sympathetic drive, and improves baroreflex sensitivity, collectively reducing arterial pressure. Our results align with studies demonstrating that slow breathing and Pranayama increase vagal tone and reduce BP variability [25]. Bhastrika and Sukha Pranayama have been shown to lower SBP and DBP within minutes, an effect abolished by parasympathetic blockade, confirming vagal and baroreceptor-mediated pathways [2, 26]. Additionally, slow breathing lowers catecholamines and cortisol, reducing stress-induced vasoconstriction and promoting endothelial relaxation, which explains the favorable changes in SBP and DBP [27]. Together, these mechanisms plausibly account for the significant blood pressure reductions observed in our study after six weeks of Pranayama.

CONCLUSION

The six-week Pranayama intervention effectively reduced both systolic and diastolic blood pressure in young, normotensive adults, demonstrating its potential as a simple, low-cost, non-pharmacological approach for cardiovascular health promotion and blood pressure management. Regular integration of structured breathing practices can serve as a preventive strategy for maintaining optimal cardiovascular function.

Statement and declaration

Author Contributions: Conceptualization, Anita Kumari and Manoj Kumar Tak; methodology, Anita Kumari; formal analysis, Anita Kumari; investigation, Anita Kumari; data curation, Anita Kumari; writing-original draft preparation, Anita Kumari; writing-review and editing, Manoj Kumar Tak; visualization, Anita Kumari; supervision, Manoj Kumar Tak; project administration, Anita Kumari. All authors have read and agreed to the published version of the manuscript. All drafts were written manually, and all studies were compiled manually. However, the final draft was polished with the help of ChatGPT-4. Every line was carefully reviewed to ensure accuracy, clarity, and correctness of meaning.

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Ethical Approval: The study involved non-invasive procedures and voluntary participation; no separate ethical approval was required (NIL). However, all participants were fully informed about the study procedures, and written informed consent was obtained from each participant prior to participation.

Conflict of Interest: The authors declare no conflict of interest.

REFERENCES

1. Nivethitha, L., A. Mooventhan, and N. Manjunath, *Effects of various Prānāyāma on cardiovascular and autonomic variables.* Ancient science of life, 2016. **36**(2): p. 72-77.
2. Bhavanani, A.B., Z. Sanjay, and Madanmohan, *Immediate effect of sukha pranayama on cardiovascular variables in patients of hypertension.* International journal of yoga therapy, 2011. **21**(1): p. 73-76.
3. McElroy, J.A., et al., *Take a deep breath: a pilot study demonstrating a significant reduction in blood pressure with 15 minute daily Pranayama breathing.* Annals of Behavioral Science and Medical Education, 2012. **2**(18): p. 15-18.
4. Mariha, T. and T.W. Handayani, *Pranayama breathing exercise as a nursing intervention to reduce blood pressure in families with hypertension.* UI Proc. Health Med., 2018. **3**: p. 62-65.
5. Mittal, G., et al., *An Exploratory Randomised Trial to Assess the Effect of Nadi Shodhan Pranayama as an Adjunct Versus Standard Non-pharmacological Management in Hypertensives.* Annals of Neurosciences, 2025: p. 09727531251318810.
6. Bhavanani, A.B. and Z. Sanjay, *Immediate effect of chandra nadi pranayama (left unilateral forced nostril breathing) on cardiovascular parameters in hypertensive patients.* International journal of yoga, 2012. **5**(2): p. 108-111.
7. Shree, C.M., K. Prashanth, and B. Girija, *Effect of short term pranayama on perceived stress, sleep quality, heart rate, and blood pressure.* International Journal of physiology, 2019. **7**(2): p. 111-115.
8. Bargal, S., et al., *Evaluation of the effect of left nostril breathing on cardiorespiratory parameters and reaction time in young healthy individuals.* Cureus, 2022. **14**(2).
9. Suryawanshi, P.R., et al., *CLINICAL STUDY ON EFFECT OF NADISHUDDHI PRANAYAMA ON IMPROVING CARDIO-RESPIRATORY FUNCTIONS.* 2016.
10. Udenia, H., et al., *Yogic pranayama and diaphragmatic breathing: adjunct therapy for intraocular pressure in patients with primary open-angle glaucoma: a randomized controlled trial.* Journal of Glaucoma, 2021. **30**(2): p. 115-123.
11. Mohan, E., et al., *Acute hemodynamic response to pranayama in postcoronary artery bypass graft patients.* Journal of the Practice of Cardiovascular Sciences, 2018. **4**(3): p. 206-210.

12. Jayawardena, R., et al., *Exploring the therapeutic benefits of pranayama (yogic breathing): a systematic review.* International journal of yoga, 2020. **13**(2): p. 99-110.
13. Saoji, A.A., B. Raghavendra, and N.K. Manjunath, *Effects of yogic breath regulation: A narrative review of scientific evidence.* Journal of Ayurveda and integrative medicine, 2019. **10**(1): p. 50-58.
14. Katriya, S.J., et al., *Immediate effect of Anulom-Vilom Pranayama on cardiovascular parameters in medical students.* National Journal of Physiology, Pharmacy & Pharmacology, 2024. **14**(10).
15. Agrawal, P., A. Sinha, and R. Garg, *EFFECT OF 4 WEEKS OF PRANAYAMA TRAINING AND 6 MIN WALK TEST ON BLOOD PRESSURE IN HEALTHY SUBJECTS.* International Journal of Scientific Research, 2020. **9**(8).
16. Jain, S., *Effect of six week training of alternate nostril breathing on cardiac output and systemic peripheral resistance in prehypertensive obese young adults.* Indian Journal of Public Health Research & Development, 2016. **7**(1): p. 1-4.
17. Dinesh, T., R. Venkatesan, and S. Venkidusamy, *Effect of 12 weeks of pranayama training on basal physiological parameters in young, healthy volunteers.* Panacea Journal of Medical Science, 2014. **4**(1): p. 28-30.
18. Shetty, P., et al., *Effects of Sheetali and Sheetkari pranayamas on blood pressure and autonomic function in hypertensive patients.* Integrative Medicine: A Clinician's Journal, 2017. **16**(5): p. 32.
19. Sarmah, P., D. Suar, and P. Patnaik, *Gratitude Vs. Yoga Intervention to Increase Happiness Among Women.* Psychological Studies, 2024. **69**(3): p. 274-285.
20. Satyanand, V., et al., *Studying the role of yogic Pranayama in the management of Blood pressure.* Int J Biomed Adv Res, 2014. **5**(12): p. 609-11.
21. Vasundhara, V.R., et al., *Immediate effect of Sukha Pranayama: A slow and deep breathing technique on maternal and fetal cardiovascular parameters.* Yoga Mimamsa, 2018. **50**(2): p. 49-52.
22. Sathe, S., et al., *To find out immediate effect of bhramari pranayama on blood pressure, heart rate and oxygen saturation in hypertensive patients.* Int J Curr Res Rev, 2020. **12**(19): p. 193.
23. Lindasari, N., E. Suhariyanti, and S. Margowati. *Yoga Pranayama Dhiirga Swasam with Sukhasana Position on reducing blood pressure in the elderly*. in *1st Borobudur International Symposium on Humanities, Economics and Social Sciences (BIS-HESS 2019)*. 2020. Atlantis Press.
24. Ankad, R.B., et al., *Effect of short-term pranayama and meditation on cardiovascular functions in healthy individuals.* Heart views, 2011. **12**(2): p. 58-62.
25. Sürücü, C.E., et al., *The effects of six-week slow, controlled breathing exercises on heart rate variability in physically active, healthy individuals.* Pedagogy of Physical Culture and Sports, 2021. **25**(1): p. 4-9.

26. Pramanik, T., B. Pudasaini, and R. Prajapati, *Immediate effect of a slow pace breathing exercise Bhramari pranayama on blood pressure and heart rate.* Nepal Med Coll J, 2010. **12**(3): p. 154-157.
27. Delaney, J.P., *The Effects of Stress and Relaxation on Heart Rate Variability in Health and Disease*. 2002: The University of Liverpool (United Kingdom).