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Effect Of Diaphragmatic Breathing Exercise In Padmasana And Vajrasana Position And Jacobson Relaxation Technique In Young Adults With Pre- Hypertension And Anxiety On Cardio-Respiratory System And Psychology

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Abstract

Introduction:

Prehypertension is commonly observed in young adults with anxiety, often leading to increased blood pressure and respiratory rate.

Objective:

To evaluate the effectiveness of Vajrasana and Padmasana positions combined with diaphragmatic breathing and Jacobson relaxation in young adults with anxiety and prehypertension.

Method:

Sixty participants were divided into two groups (30 each). Group A practiced Vajrasana, and Group B practiced Padmasana, both with DBE and JRT for 15 minutes, 4 days a week over 8 weeks. BP, RR, and anxiety levels were recorded pre- and post-intervention.

Results:

Both groups showed significant improvement in RR (p=0.732) and anxiety (p=0.509), but Group A showed greater improvement in systolic (p=0.000) and diastolic BP (p=0.006).

Conclusion:

While both positions improved RR and anxiety, Vajrasana with DBE and JRT was more effective in reducing blood pressure, showing greater overall benefits.

Keywords: *Prehypertension, Anxiety, Vajrasana, Diaphragmatic breathing, Jacobson relaxation Techniqu*

INTRODUCTION

Anxiety contributes to the development and progression of hypertension and is considered a distinct risk factor. Poor hypertension management can further increase anxiety levels [1]. A positive correlation between anxiety and hypertension is supported by both theoretical and longitudinal studies [2]. Anxiety is closely linked to hypertension in daily life, and anti-anxiety medications may help manage blood pressure in hypertensive patients [3]. Anxiety, often triggered by stressors like exams or danger, differs from short-term stress by being more intense and long-lasting [4]. Research highlights the relationship between anxiety and problem orientation in college students, showing a strong connection between worry and impaired problem-solving [5].Prehypertension, defined as systolic BP of 120–139 mmHg and/or diastolic BP of 80–89 mmHg, is distinct from clinical hypertension (≥140/90 mmHg) [6]. Depression—commonly equated with sadness or mental illness—is increasing among youth, with several methods used for its prevention and treatment [7][8]. Stress, driven by lifestyle changes or infections, may lead to depression and chronic diseases if left unmanaged [9].Breathing exercises like diaphragmatic breathing help manage pulmonary diseases and stress, improving daily function and reducing dyspnea [10]. The diaphragm plays a central role in breathing [11], and stress-induced psychological symptoms include anxiety, depression, and chronic illness [12]. Deep diaphragmatic breathing (DDB), which

involves abdominal contraction during exhalation and diaphragm activation during inhalation, lowers breathing rate and improves gas exchange [13][14].Padmasana, a spiritually significant yoga pose, promotes disease reduction and self-realization [15]. Vajrasana, a kneeling posture, facilitates deep breathing, lowers BP, and supports focus and mind-body relaxation [16]. Jacobson's Progressive Muscle Relaxation reduces anxiety by interrupting stress responses [17], and applied relaxation is proven as effective as cognitive therapy for generalized anxiety disorder [17].RR was measured using a pulse oximeter, validated by Pupim et al. (2013) [18]. BP was assessed using a mercury sphygmomanometer, considered more accurate than digital devices [19]. Anxiety was measured using the Hamilton Anxiety Rating Scale (HAM-A), validated by Maier et al. (1988) [20] Pre-hypertension among students is increasing, with anxiety playing a key role in affecting cardio-respiratory and psychological health. This study compares two Asanas combined with Jacobson Relaxation to determine the more effective method for clinical and home-based practice

METHODOLOGY

A total of 60 college students aged between 18 and 25 years, all diagnosed with pre-hypertension, were selected through randomized sampling. The participants were divided into two groups: Group A (n=30) practiced Vajrasana, while Group B (n=30) practiced Padmasana. Anxiety levels were assessed using the Hamilton Anxiety Rating Scale (HAM-A).The inclusion criteria for participants were: age between 18 and 30 years (both male and female), a confirmed diagnosis of pre-hypertension (systolic BP 120–140 mmHg), a normal body mass index (BMI between 18–29 kg/m²), and a HAM-A anxiety score greater than 10. Participants were excluded if they had cardiovascular disease, hypertension (BP >140 mmHg), BMI above 29 kg/m², or were on antidepressants or other medications.The study followed a structured design where participants selected their preferred sitting position (either Vajrasana or Padmasana) and underwent an intervention lasting eight weeks, with sessions conducted four times per week. Each session included diaphragmatic breathing exercises and Jacobson relaxation technique.Data collection involved recording baseline measurements before the start of the intervention and follow-up measurements after three weeks of training. All data were collected using standardized tools to ensure consistency.

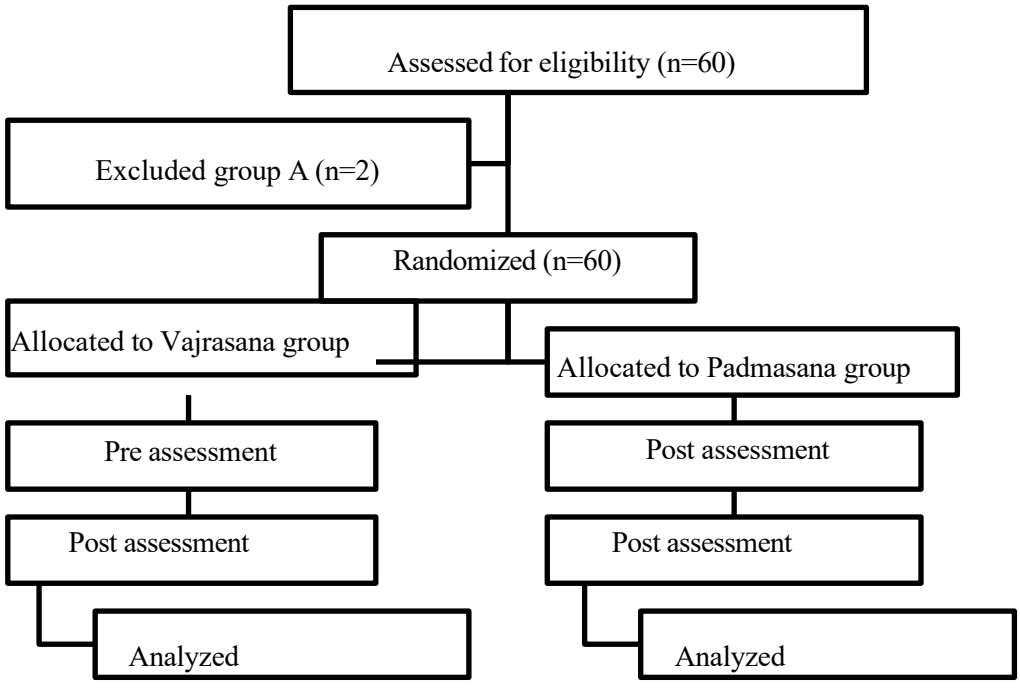


Figure: Training protocol/ Interventions

Training Protocol / Intervention – Group A

Group A participants practiced a combination of Vajrasana, diaphragmatic breathing, and Jacobson relaxation techniques. In the Vajrasana posture, participants knelt with their knees and ankles together, feet plantar-flexed, and buttocks resting on their heels. Their hands were placed on the thighs with forearms supinated. The spine was kept straight, the pelvis slightly tilted backward, and the head aligned with the gaze directed forward, keeping the chin parallel to the floor. This posture was maintained while practicing controlled diaphragmatic breathing and engaging in systematic muscle relaxation following the Jacobson technique.

Fig. 1 VAJRASANA sitting position with DBE

Fig.2 VAJRASANA sitting position with Jacobson relaxation technique

Group B

Training Protocol / Intervention – Group B

Group B participants practiced Padmasana in conjunction with diaphragmatic breathing and Jacobson relaxation techniques, following a protocol similar to Group A but using a different sitting posture. In Padmasana, participants sat with their legs extended and spine erect, then bent one leg to place the foot on the opposite thigh with the sole facing upward, followed by positioning the other leg in the same manner. Hands rested on the knees with palms facing upward. During diaphragmatic breathing, one hand was placed on the diaphragm and the other on the thigh, and participants took slow, deep breaths. For Jacobson relaxation, a tight fist was made during inhalation and relaxed during exhalation. All sessions were conducted under the supervision of certified trainers to ensure safety and proper technique.

Fig.3 PADMASANA sitting position with DBE

Fig.4 PADMASANA sitting position with Jacobson relaxation technique.

Outcome measures

The primary outcome measures were blood pressure, respiratory rate, and anxiety levels assessed using the Hamilton Anxiety Rating Scale. Blood pressure was measured using a sphygmomanometer and stethoscope, while respiratory rate was recorded using a pulse oximeter. Anxiety was evaluated with the Hamilton Anxiety Rating Scale to determine the psychological impact of the intervention

The 60 participants were screened in the study, including male and female. Then two groups were formed with 30 in each group. In group A 2 students were dropped out. All the baselines' characteristics were entered in the excel sheet for the descriptive analysis.

Data Analysis:

A total of 60 participants from Parul University, aged between 18 and 25 years, were assessed for age, height, weight, BMI, respiratory rate, blood pressure, and anxiety levels using the Hamilton Anxiety Rating Scale. The study procedures were clearly explained to all participants prior to their involvement. To evaluate the data, the Shapiro-Wilk test was used to assess normality, which indicated a non-normal distribution. Descriptive statistics, including mean and standard deviation, were calculated for all variables. The Wilcoxon Signed Rank Test was applied for intra-group comparisons, while the Mann-Whitney U Test was used for inter-group comparisons. Data analysis was performed using SPSS version 20.2.1.0.1, and Microsoft Word and Excel were used for preparing graphs and tables.

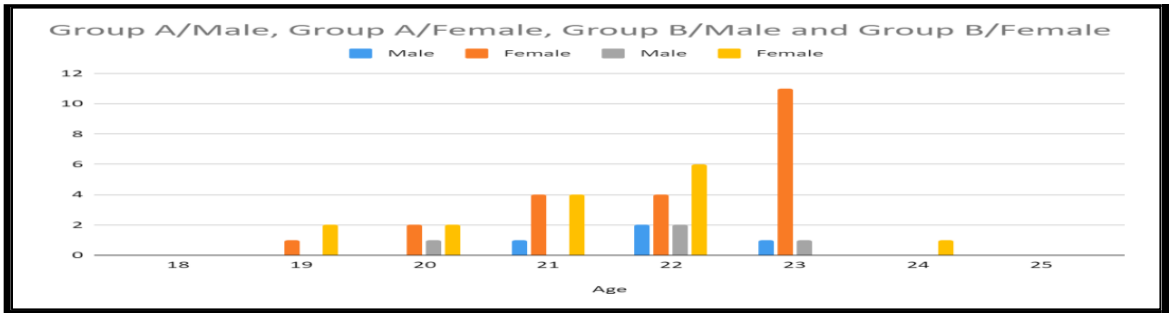
RESULTS:

Out of the initial 60 participants, 2 individuals from Group A dropped out, resulting in a final sample size of 58 subjects—28 in Group A and 30 in Group B. Baseline characteristics were recorded for descriptive analysis. Normality tests, including the Kolmogorov-Smirnov and Shapiro-Wilk tests, showed significant deviations ($p < 0.05$) from normal distribution in variables such as age, BMI, respiratory rate,

and blood pressure (both pre- and post-intervention) in both groups. The Hamilton Anxiety Rating Scale (HAM-A) scores demonstrated mixed results in terms of normality.

Table No. 1 Age Distribution of the Data of Male and Female

Age	Group A		Group B	
	Male	Female	Male	Female
18	0	0	0	0
19	0	1	0	2
20	0	2	1	2
21	1	4	0	4
22	2	4	2	6
23	1	11	1	0
24	0	0	0	1
25	0	0	0	0

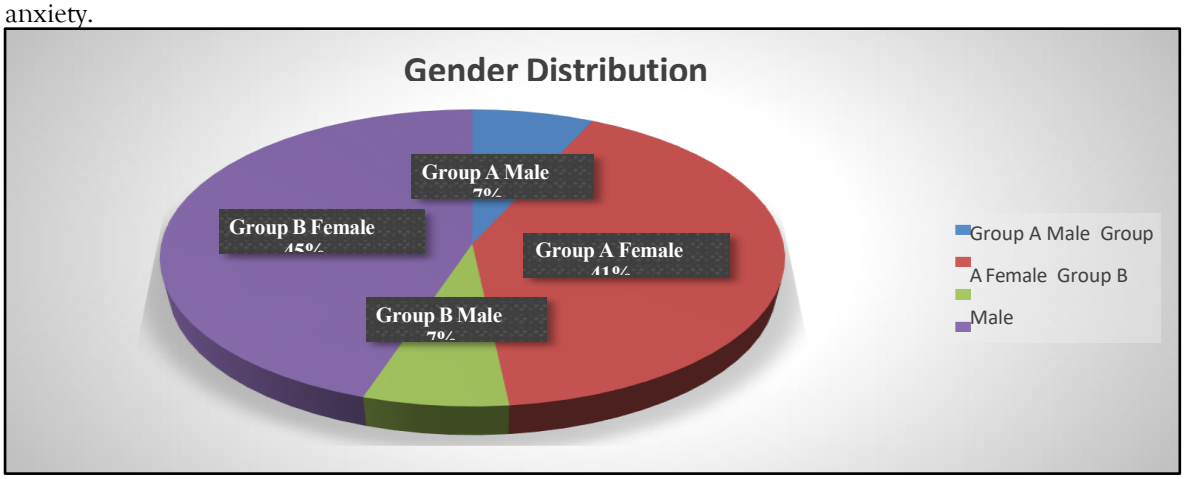


Group A participants (ages 18–25) included males who were mostly aged between 21 and 23, with one participant aged 24, while females ranged from 19 to 23 years, with the majority aged 22. In Group B, males were primarily clustered between 20 and 23 years, whereas females were evenly distributed across the age range of 19 to 22 years.

Table No.2 Gender Distribution of the Data

Group A		Group B	
Male	Female	Male	Female
4	24	4	26

The table shows that Group A had 28 participants (4 males, 24 females), and Group B had 30 participants (4 males, 26 females), indicating a female majority in both groups. Recognizing this distribution is important, as gender may affect responses to interventions for prehypertension and anxiety.



Graph No.1 Pie Chart- Gender Distribution of the Data

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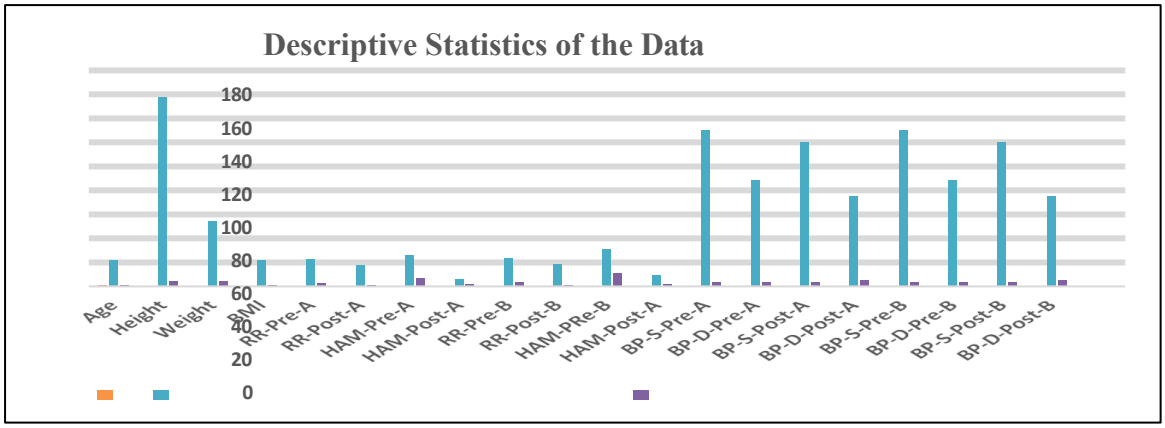
Table No. 3 Descriptive Statistics of the Data

Descriptive Statistics			
	N	Mean	Std. Deviation
Age	53	21.9811	1.30812
Height	28	158.0000	4.42217
Weight	28	54.4286	4.29839
BMI	28	21.7857	1.22798
RR-Pre-A	28	22.7500	2.50370
RR-post-A	28	17.9286	.85758
HAM-Pre-A	28	26.0714	7.26702
HAM-post-A	28	6.3214	1.82683
RR-Pre-B	30	24.0333	3.55725
RR-post-B	30	18.2333	1.33089
HAM-Pre-B	30	31.2000	11.22620
HAM-post-A	30	9.1667	1.80198
BP-S-Pre-A	28	130.1786	3.46467
BP-D-Pre-A	28	88.5714	3.56348
BP-S-Post-A	28	119.8214	3.96329
BP-D-Post-A	28	75.0000	5.09175
BP-S-Pre-B	28	130.1786	3.46467
BP-D-Pre-B	28	88.5714	3.56348
BP-S-Post-B	28	119.8214	3.96329
BP-D-Post-B	28	75.0000	5.09175

The table summarizes key statistics for 53 participants, with a mean age of 21.98 years (SD = 1.31). For 28 participants, average height, weight, and BMI were 158.00 cm, 54.43 kg, and 21.79 kg/m², respectively. Both groups showed decreased respiratory rates and anxiety scores post-intervention. Blood pressure values (systolic and diastolic) also improved consistently in both Group A and Group B.



Graph No. 2 Histogram-Descriptive statistics of the Data

Table No.4 Intragroup Analysis-Wilcoxon Signed Rank Test

		Test Statistic	Standard Error	Standardized Test Statistic	Asymptotic Sig.(2-sided test)
	Respiratory Rate Pre-Post	0.000	43.806	-4.634	0.000
	Hamilton	0.000	43.885	-4.626	0.000

Group-A	Anxiety Rating Scale-Pre-Post scores				
	Blood Pressure-Systole-Pre-Post	0.000	41.120	-4.596	0.000
	Blood Pressure-Diastole-Pre-Post	0.000	40.249	-4.696	0.000
Group-B	Respiratory Rate Pre-Post	0.000	48.540	-4.790	0.000
	Hamilton Anxiety Rating Scale-Pre-Post scores	0.000	48.609	-4.783	0.000
	Blood Pressure-Systole-Pre-Post	0.000	41.120	-4.596	0.000
	Blood Pressure-Diastole-Pre-Post	0.000	40.249	-4.696	0.000

The Wilcoxon Signed Rank Test showed significant reductions ($p < 0.05$) in respiratory rate, anxiety scores, systolic, and diastolic BP for both Group A and Group B from pre- to post-intervention.The results confirm the effectiveness of both interventions, showing notable improvements in respiratory function, anxiety, and blood pressure, with substantial effect sizes. Overall, the findings highlight their therapeutic value for managing prehypertension and anxiety in young adults.

Table No. 5 Intergroup Analysis- Kruskal Wallis Test (comparison between the groups)

Independent-Samples Kruskal-Wallis Test Summary	Test Statistic	Degree Of Freedom	Asymptotic Sig.(2-sided test)
Respiratory Rate	.732[a,b]	1	0.392
Hamilton Anxiety Rating Scale	.437[a,b]	1	0.509
Blood Pressure-Systole	13.389[a,b]	1	0.000
Blood Pressure- Diastole	7.571[a,b]	1	0.006

The Kruskal-Wallis Test revealed no significant differences between Group A and Group B in post-intervention respiratory rate ($p = 0.392$) and anxiety scores ($p = 0.509$), indicating similar improvements in these parameters across both groups. However, a significant difference was observed in systolic blood pressure ($p = 0.000$), favoring Group A. Additionally, diastolic blood pressure also showed a significant difference between the groups post-intervention ($p = 0.006$), with Group A demonstrating greater

reductions in both systolic and diastolic BP compared to Group B.

DISSCUSSION

This study involved 60 pre-hypertensive college students aged 18 to 25 years who also exhibited elevated anxiety levels. Participants were randomly assigned to two groups using an even-odd sampling method. Group A practiced the Vajrasana sitting posture, while Group B practiced Padmasana. Both groups performed diaphragmatic breathing exercises (DBE) and the Jacobson relaxation technique (JRT) as part of their intervention. Anxiety levels were measured using the Hamilton Anxiety Rating Scale (HAM-A) [20]. In Group A, participants showed a significant reduction in mean respiratory rate (RR) from pre- to post-intervention, confirmed by the Wilcoxon Signed Rank Test ($p < 0.05$). These findings are supported by Naragatti (2023), who reported that Vajrasana significantly enhances respiratory efficiency when combined with breathing exercises [21]. Similarly, systolic and diastolic blood pressure readings in Group A significantly decreased after the intervention, in line with previous findings on the cardiovascular benefits of Vajrasana [21]. Group A also showed a marked reduction in HAM-A scores, reinforcing the role of Vajrasana in both physiological and psychological improvements [16, 21].

In Group B, participants practiced Padmasana along with the same breathing and relaxation techniques. This group also experienced a statistically significant reduction in RR, supported by findings from Heni Sumastri et al. (2021) as well as Naragatti and Vadiraja (2023), who highlighted the positive effects of Padmasana on respiratory parameters [15, 23]. Blood pressure improved significantly following the intervention in Group B, consistent with existing literature suggesting the benefits of relaxation techniques in managing hypertension [1, 2, 6]. Furthermore, anxiety levels measured using the HAM-A scale decreased notably, reflecting the calming and therapeutic effects of Padmasana in combination with DBE and JRT [15, 17].Despite similar improvements in RR and anxiety levels across both groups, intergroup analysis revealed that Group A (Vajrasana) achieved significantly greater reductions in both systolic and diastolic blood pressure compared to Group B. This suggests Vajrasana may have a more profound influence on cardiovascular health, potentially due to its stimulation of the parasympathetic nervous system, which promotes relaxation and reduces physiological stress responses [7, 11, 21]. While Padmasana offers benefits such as enhanced musculoskeletal flexibility and improved posture [10], its cardiovascular effects appear to be less pronounced than those of Vajrasana. In conclusion, both postures contributed positively to respiratory and psychological outcomes, but Vajrasana was notably more effective in reducing blood pressure, making it the preferred posture for inividuals managing prehypertension and anxiety concurrently.

CONCLUSION

Vajrasana with diaphragmatic breathing and Jacobson's relaxation technique showed greater improvements in pre-hypertension and anxiety compared to Padmasana. While both positions improved respiratory rate (RR) and anxiety, Vajrasana was more effective in lowering blood pressure. In conclusion, both Vajrasana and Padmasana with breathing exercises and relaxation techniques are beneficial, but Vajrasana proved to be more effective for pre-hypertension and anxiety

limitation of study

A limitation of the study was its three-week duration, which prevented assessment of long-term effects. Additionally, participant selection was limited to those with pre-hypertension and anxiety, and factors influencing anxiety and blood pressure beyond those addressed were not considered.

future recommendation

The study can be extended to a larger population with exercise protocols implemented over a longer duration to assess long-term effects. Additionally, comparisons between male and female participants can be conducted to evaluate gender-specific responses to Vajrasana and Padmasana positions. Further research could also explore the impact of these interventions across different age groups to identify variations in outcomes based on age.

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