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RESEARCH ARTICLE

Effect of 6 weeks pranava yoga training on cardiovascular parameters in prehypertensive young adults

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ABSTRACT

Background: Hypertension is the major problem in developing countries. Blood pressure is usually maintained in a range by various regulatory mechanism involving hormones, nervous system, and other local factors. Any rise in blood pressure above the normal range for a prolonged period is labeled as hypertension which is usually preceded by high normal blood pressure known as prehypertension. Various aerobic exercises and yoga may be beneficial in prehypertensive people. Of many yogic exercises, pranava yoga seems to be simplest. Pranava yoga involves chanting of word "Aum." **Aims and Objectives:** Aim of the study was to find out the effect of 6 weeks Pranava yoga training on cardiovascular parameters of prehypertensive young adults. **Materials and Methods:** Subjects were divided into two groups of 30 each. Group A (control group) comprised normotensive subjects and Group B comprised prehypertensive subjects. Cardiovascular parameters were recorded using impedance cardiovasograph and mercury sphygmomanometer. After training of pranava yoga, subjects of Group B practiced it for 15 min daily for 6 weeks. All parameters were recorded in both groups before and after 6 weeks pranava yoga practice. Statistical analysis was done by one-way ANOVA and Tukey *post-hoc* tests. **Results:** Results showed that in comparison to Group A, all cardiovascular parameters were significantly higher ($P < 0.05$) in Group B before training and but did not show a significant difference ($P > 0.05$) after 6 weeks training of pranava yoga. **Conclusion:** Results indicate a significant improvement in cardiovascular parameters in prehypertensive subjects after 6 weeks practice of pranava yoga.

KEY WORDS: Pranava Yoga; Prehypertension; Impedance Cardiovasograph

INTRODUCTION

Hypertension is major and fast developing problem in developing countries, and it is more common in people of high socioeconomic status. Stress, less physical activity, high intake of salt, fast food, and beverages make the young adults more prone to development of hypertension.[1,2] Primary hypertension does not develop all of sudden. It is a gradual process, preceded by prehypertension. Prehypertension is a condition of high normal blood pressure. Sympathetic overactivity has been found to be associated with the development of prehypertension followed by hypertension Stage 1 and 2. In prehypertension, systolic blood pressure (SBP) ranges between 120 and 139 mmHg and diastolic blood pressure (DBP) ranges between 80 and 89 mmHg. It is very common in young adults with family history of hypertension. If blood pressure is more than this range, then it is labeled as hypertension. Development of prehypertensive

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into hypertensive occurs if preventive measures are applied timely.[3,4]

Out of many etiologies for the development of hypertension, stress has been found a major culprit for it. Stress management might be helpful in the control of high blood pressure. Various techniques of yoga and meditation have been proved beneficial for stress management, and therefore, must be beneficial in the prevention of developing hypertension from the prehypertensive state. They may bring the person from prehypertensive state to normotensive state.[5-7] Yoga modulates autonomic activities by various mechanisms and action on hypothalamus limbic system, adrenal gland, and other organs of the body. Studies have shown evidence for the relationship between chronic stresses, alterations in hypothalamic-pituitary-adrenal axis activity, and hypertension.[8-10]

Studies have been conducted to find out the immediate cardiovascular effects of pranava yoga in hypertensive patients and revealed immediate decrease in blood pressure and heart rate (HR) after pranava yoga.[11,12]

Cardiac output (CO), peripheral resistance, and other cardiovascular parameters can be measured non-invasively with high accuracy using impedance cardiovasograph (Nivomon, L and T Medical's). It is a non-invasive vasography monitoring system. It measures the CO and blood flow index of the patient non-invasively. It computes various other cardiovascular parameters.[13,14]

Pranava yoga is one of simplest yogic exercises. It involves continuous chanting of word "Aum". It is relaxing in nature and relaxes the body very quickly. Vibrations produced during Aum chanting also bring about positive changes in the brain leading to relaxation.

Therefore, this study was conducted to find out the effect of 6 weeks pranava yoga training on cardiovascular parameters in prehypertensive young adults.

MATERIALS AND METHODS

This study was conducted in the Department of Physiology, Saraswathi Institute of Medical Sciences, Hapur. 60 asymptomatic healthy male subjects, aged 17-22 years, participated voluntarily in this study undertaken, to assess the effect of 6 weeks pranava yoga training on cardiovascular parameters in prehypertensive young adults. Experiment procedures were in accordance with the ethical committee on human experimentation. The study was carried out at ambient temperature with minimal external or internal sound disturbances in the room. Subjects reported to laboratory 3 h after light breakfast. They were explained in detail about the experimental procedure. Informed consent was taken from all subjects.

Based on resting blood pressure, subjects were divided into two groups. Group A (control group) comprised normotensive subjects (SBP <120 Hg, DBP <80 mm Hg) and Group B comprised prehypertensive subjects (SBP >120 mmHg; <139 mmHg; DBP >80 mmHg; <89 mmHg). Basal parameters of all subjects of both Group A and Group B were recorded after 10 min of rest. Cardiovascular parameters were recorded using impedance cardiovasograph (Nivomon) and mercury sphygmomanometer.

Then, pranava yoga training was given to all subjects of Group A and B. Subjects were instructed to chant the word "Aum" repeatedly for 15 min in a controlled manner with slow inhalation and exhalation of breath. After training, subjects of were asked to practice pranava yoga for 15 min daily for 6 weeks. After 6 weeks practice of pranava yoga, subjects again reported to the lab. All cardiovascular parameters were recorded again in resting condition after 10 min of rest.

Statistical Analysis

Statistical analysis was done by one-way ANOVA and Tukey *post-hoc* tests using the (window) SPSS Statistics 17.0 Version. Data were expressed as mean and standard deviation, and $P < 0.05$ was considered as significant.

RESULTS

Table 1 shows that all cardiovascular parameters SBP, DBP, HR, CO, cardiac index, stroke volume, stoke volume index, systemic peripheral resistance (SPR), and systemic resistance index were significantly higher ($P < 0.05$) in Group B before training in comparison to Group A.

There was no significant difference in cardiovascular parameters in Group A before and after training of pranava yoga for 6 weeks.

After 6 weeks training of pranava yoga, there was no significant difference in cardiovascular parameters in subjects of Group A and Group B ($P > 0.05$).

DISCUSSION

Pranava yoga has been found as a useful tool for hypertensive patients in various studies to reduce the blood pressure immediately. It has been hypothecated that pranava yoga, alike other yogic exercises, normalizes sympathetic nervous system and bring the sympathovagal balance toward higher parasympathetic activity. Our results also have shown a significant decrease in all cardiovascular

Table 1: Comparison of cardiovascular parameters in Group A (control) and Group B (prehypertensive) before and after 6 weeks pranava yoga training

Cardiovascular parameters	Group A (Control group) (*n*=30)		Group B (prehypertensive group) (*n*=30)	
	Before training	After training	Before training	After training
SBP (mmHg)	113.8 (4.2)	112.8 (2.1)#	133.42 (5.3) *	114.2 (4.1)^
DBP (mmHg)	73.2 (3.4)	71.7 (3.4)#	81.2 (3.5)*	72.1 (5.4)^
HR (per min)	71.2 (4.1)	69.8 (3.2)#	77.3 (5.3)*	70.1 (0.7)^
CO (L/min)	5.4 (0.2)	5.2 (0.3)#	5.7 (0.5)*	5.3 (0.4)^
SV (ml/beat)	73.3 (0.5)	71.4 (0.7)#	76.8 (4.8)*	72.4 (4.7)^
SPR (dyne.s/cm^5)	1357.8 (24.1)	1352.5 (25.2)#	1399 (26.6)*	1348.2 (18.6)^
CI (L/min/m^2)	3.3 (0.6)	3.2 (0.7)#	3.4 (0.4)*	3.1 (0.4)^
SI (ml/beat/m^2)	43.9 (0.6)	42.2 (0.2)#	46.5 (0.3)*	42.1 (0.1)^
SVRI (dyne.s/cm^5/m^2)	773.8 (16.3)	770.5 (14.5)#	790.7 (18.6)*	768.4 (15.4)^

#Comparison in Group A before and after training, #*P*>0.05 (non-significant), *Comparison between Group A and Group B before training *P<0.05 (significant), ^Comparison between Group A and Group B after training ^P>0.05 (non-significant), data presented are mean (SD). Analysis of data was done by one-way ANOVA and Tukey *post-hoc* tests. SBP: Systolic blood pressure, DBP: Diastolic blood pressure, HR: Heart rate, CO: Cardiac output, SV: Stroke volume, SPR: Systemic peripheral resistance, CI: Cardiac index, SI: Stroke volume index, SVRI: Systemic vascular resistance index

parameters in basal state in prehypertensive subjects after training of pranava yoga of 6 weeks duration. These results are in line but more elaborated than previous studies as the effect of pranava yoga training was recorded in resting condition without immediate influence of "Aum" chanting, opposed to previous studies where parameters were recorded immediately after pranava yoga. This study reveals the long-term and sustained effects of pranava yoga on cardiovascular parameters, which are more important for improvement from prehypertensive state to normotensive state. Blood pressure was significantly reduced in prehypertensive subjects to normotensive level after 6 weeks practice of pranava yoga with a significant reduction in HR and SPR. This indicates that pranava yoga decreases the sympathetic tone or increases the vagal tone.

Strength and Limitations of the Study

Direct measurement of the effect of pranava yoga training on cardiovascular parameters such as CO and SPR by impedance cardiovasograph is the key strength. The study is limited to healthy young adults and not involving patients suffering cardiac diseases such as post myocardial infarction cases.

CONCLUSION

Pranava yoga practice improves the cardiovascular functions and also normalizes the high normal blood pressure of prehypertensive; therefore, it may be a useful tool to keep the person healthy throughout the life if it is practiced regularly. As the beneficial effects of pranava yoga are encouraging and can be performed any time of the day. Therefore, the possible superiority of pranava yoga over other yogic exercises cannot be ruled out.

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