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Immediate effect of yoga on blood pressure and heart rate following a single yoga session in young female

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Abstract

Background and AIMS: Yoga has been extensively studied now a day for its beneficial effect on human systems. In that one of the most important is cardiovascular system for that reason want to determine immediate effect of yoga on blood pressure and heart rate following single yoga session in young female.

Methods and Material: 55 participants with aged between 17-25 years selected for the study. The participants were relaxed physically and mentally for 15 minutes. Then the Blood pressure and Heart rate were recorded by sphygmomanometer and pulse oximeter, respectively. After that warm up session and yoga session was carried out. Yoga session included many asanas. After performing all the asanas again measurement of Blood pressure and Heart rate was done. After that 10 minutes relaxation was given and measurement of the Blood pressure and Heart rate were again done.

Results: One way repeated measure ANOVA was used to see the immediate effects of yoga on BP and HR following single yoga session in young female within the group. Bonferroni post hoc test, used to discover which specific means differed. Statistical analysis was performed using SPSS version 16. There were significant differences were found in SBP, DBP and HR at three time interval- Baseline, After Yoga and After Relaxation in young female with $p < 0.05$

Conclusion: There were reduction in SBP, DBP and HR following single yoga session in young female at three time interval – baseline, after yoga and after relaxation.

Keywords: Yoga, blood pressure, heart rate, asanas

Introduction

The word “Yoga” is derived from its Sanskrit origin “YUJ” which means “to bind”, “to join” or “to apply”. In the words of Maharshi Patanjali, “yoga is the restraint of the process of the mind”. Yoga has been extensively studied for the beneficial effects on human health [1, 2].

Yoga is the integration and harmony between thoughts, words, and deeds or integration between head, heart, and hands. Patanjali, writer of the classical yogic text, The Yogasutras, defines yoga as-“Complete control over the different patterns or modifications of consciousness.”

Yoga is a form of exercise that gives you everything: strength, endurance, balance, flexibility, and relaxation. Dr. Dean Ornish, the renowned American physician and bestselling author who has shown that a yogic lifestyle can reverse heart disease, says, “Yoga is a system of perfect tools for achieving union as well as healing” [3].

The practice of yoga has been shown to have preventive, curative as well as rehabilitative potential that can be explained on the basis of modulation of autonomic functions, stress reduction, improvement in physiological functions and enhanced quality of life [4, 5, 6]. It has become quite apparent that yoga is a relatively low-risk, high-yield approach to improving overall health and wellbeing [7].

There are eight stages of yoga:

- 1) Yama
- 2) Niyam
- 3) Asana
- 4) Pranayama
- 5) Pratyahara
- 6) Dharana

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- 7) Dhyana
- 8) Samadhi

In present study, different Asanas were taken

Asana means talking a posture by placing hands, feet and body trunk in a particular posture. They are innumerable, catering to various physical and mental needs of the person. The activity is done with the idea of purifying the individual's body and mind. Asana caters to the various needs of the musculoskeletal, digestive, circulatory, hormonal, glandular, nervous, and other system of the body.

By practicing Asana, the practitioner overcomes the physical disabilities, mental disturbances, and the gates of the spiritual practice open to him. The freshness and lightness has to be experienced in both body and the mind. The mind has to be alert, knowledgeable, and honest to pick up.

The asana can be performed in any place but they should be done with an empty stomach. Some of the common asanas are:

- Vrikshasana
- Shashankasana
- Parvatasana
- Bhujangasana
- Pavanamuktasana

There are many effects of Yoga. By doing yoga, pulse rate decreases, respiratory rate decreases, blood pressure decreases, cardiovascular efficiency increases, respiratory efficiency increases, gastrointestinal function normalizes, musculoskeletal flexibility and joint range of motion increase, posture improves, strength increase, endurance increases, energy level increases.

So, the purpose of the present study is to evaluate the cardiovascular health in young female. The cardiovascular health problems are now seen in early young group also as a result of increasing junk food consumption and other risk factors like sedentary lifestyle, less awareness of physical activities like yoga, aerobics and increased consumption of more oily foods and salt intake, also people do not have time to spare for physical work and continuously work by sitting in air conditioning room.

Many literature are available for its long term effect on cardiovascular system but scarcity regarding its immediate effect. That's why rationale of this study is to determine immediate effect of yoga on blood pressure and heart rate following single yoga session in young female.

Method

55 participants participated in this study based on the inclusion and exclusion criteria. All participants voluntarily agreed and signed informed consent form to extend full cooperation and be available for data collection as and when required. The purpose of the study and requirement and schedule of the testing procedure were explained to the participants.

Guidelines followed during yoga session

- Yoga session held in morning before breakfast
- Practice in a warm, quite, clean and airy place
- Mat was used

The procedure allowed the participants to relax physically and mentally for 15 minutes. The blood pressure was recorded by using Sphygmomanometer (Diamond Mercurial Blood Pressure Apparatus, Deluxe) in supine position in the right

upper limb by auscultatory method. Heart rate was recorded by using Pulseoximeter (MEDTECH Brand OG-01). After that warm up session was carried out for 15 minutes. In warm up session, participants performed self-stretching, jogging and marching on place, etc. After that Yoga session was carried out. In yoga session, five asanas were performed which were described below. After performing all the asanas again Blood pressure and Heart rate were measured. After that 10 minutes relaxation was given. In this relaxation period, savasana was carried out and again Blood pressure and Heart rate were measured.

Procedure for performing Asanas

➤ Vrikshasana

- First start the Tadasana position, stand straight on the ground and take a small gap between your feet. The weight is shifted to one leg, for example, starting with the left leg. The entire sole of the foot remains in contact with the floor. The right knee is bent and the right foot placed on the left inner thigh, or in half lotus position.
- In either foot placement, the hips should be open, with the right knee pointing towards the right, not forward. With the toes of the right foot pointing directly down, the left foot, center of the pelvis, shoulders and head are all vertically aligned. Hands are typically held above the head either pointed directly upwards and unclasped, or clasped together.
- The asana is typically held for 20 to 60 seconds to stretch the spine, returning to Tadasana while exhaling, then repeating standing on the opposite leg.

➤ Parvatasana

- Begin on hands and knees.
- Lift the knees and push the heels back toward the ground.
- Bring the head and shoulders in the direction of the knees.
- Keep the shoulders relaxed the whole time, allowing the body weight to be lifted from the hips.
- Stay for as long as is comfortable.

➤ Shashankasana

- Sit in Vajrasana the thunderbolt pose or the kneeling pose. Place your hands on the thighs and breathe in a relaxed manner.
- Raise both your hands above the head, palms facing forward. The arms should be in line with the shoulders.
- Slowly bend down and bring the hands forward, till the hands and forehead touched the ground. Exhale while you are bending forward.
- In the final position the forehead and hands rest on the ground. Rest in this position for as long as you are comfortable. In the final position slow rhythmic and relaxed breathing can be done.
- Exhale slowly and come back to the starting position (Kneeling pose).
- Repeat this process for 5 to 10 rounds depending on time and comfort.

➤ Bhujangasana

- From a prone position with palms and legs on the floor, the chest is lifted.

➤ Pavanamuktasana

- In the first stage, the yogi lies on their back stretching

their legs straight. The yogi bends their right knee and holds it with their hands, pressing it towards their abdomen. Breathing out, the yogi lifts up their head and touches their knee with their chin. Breathing in, the yogi stretches their legs straight.

- In the second stage, the yogi presses their abdomen with their left leg.
- In the third stage, the yogi presses their abdomen with both legs, placing their chin between their knees. From this position, the yogi swings their body back and forth 5 to 10 times, and then swings their body left to right and right to left 5 to 10 times.

Statistical analysis

All statistical analysis was performed using SPSS version 16. The one way repeated measure ANOVA was used to compare the means of Systolic BP, Diastolic BP and Heart rate at three time periods- Baseline, After Yoga and After Relaxation within the group. Results were considered to be significant at $p < 0.05$ and confidence interval was set at 95 %.

Demographic Data

Table 1: Demographic data of the young female (Mean± SD)

Variable	Mean± SD
Age (year)	18.03±0.26
Height (m)	150.58±8.68
Weight (kg)	43.2±8.06

Table 3: Repeated measure ANOVA of Systolic Blood Pressure, Diastolic Blood Pressure and Heart Rate within group

Source	Variable	Type III Sum of Squares	Df	Mean Square	F	Sig. $p < 0.05$
SBP	Sphericity Assumed	10286.19	2	5143.09	107.35	.000
DBP	Sphericity Assumed	3643.3	2	1821.65	37.11	.000
HR	Sphericity Assumed	3011.83	2	1505.91	23.08	.000

Table: 4.2.2 represents the *F*-ratio corresponding to Sphericity Assumed for SBP, DBP and HR. The *F*-ratio of SBP, DBP and HR are 107.35, 37.11 and 23.08, respectively and associated significance value for SBP, DBP and HR is .000

Table: 4.1.1 represents Demographic data of young female which included age (year), height(m)and weight(kg).Mean ±SD were analysed. Values are given in Table 4.1.1.

Descriptive statistics

Table 2: Descriptive Statistics of Systolic Blood Pressure, Diastolic Blood Pressure and Heart Rate

Variables	N	Mean	Std. Deviation
BS Systolic	55	126.9091	9.59798
AY Systolic	55	111.9091	7.72747
AR Systolic	55	108.8364	6.47149
BS Diastolic	55	87.6000	7.97357
AY Diastolic	55	80.0182	8.00576
AR Diastolic	55	76.3091	9.57209
BS Heart Rate	55	91.4909	11.49214
AY Heart Rate	55	86.9455	11.89836
AR Heart Rate	55	81.0545	12.54388

Table: 4.2.1 represents mean and SD of SBP, DBP and HR at three times interval Baseline, After Yoga and After Relaxation of young female within the group.

BS: Baseline

AY: After Yoga

AR: After Relaxation

SBP: Systolic Blood Pressure

DBP: Diastolic Blood Pressure

HR: Heart Rate

Table 4: Pairwise Comparisons of Systolic Blood Pressure, Diastolic Blood Pressure and Heart Rate

Variable	(I) Effect	(J) Effect	Mean Difference (I-J)	Std. Error	Sig. $p < 0.05$
SBP	BS	AY	15.00*	1.22	.000
		AR	18.07*	1.53	.000
	AY	BS	-15.00*	1.22	.000
		AR	3.07*	1.16	.033
	AR	BS	-18.07*	1.53	.000
		AY	-3.07*	1.16	.033
DBP	BS	AY	7.58*	1.12	.000
		AR	11.29*	1.58	.000
	AY	BS	-7.58*	1.12	.000
		AR	3.71*	1.27	.015
	AR	BS	-11.29*	1.58	.000
		AY	-3.71*	1.27	.015
HR	BS	AY	4.54*	1.55	.015
		AR	10.43*	1.56	.000
	AY	BS	-4.54*	1.55	.015
		AR	5.89*	1.51	.001
	AR	BS	-10.44*	1.56	.000
		AY	-5.89*	1.51	.001

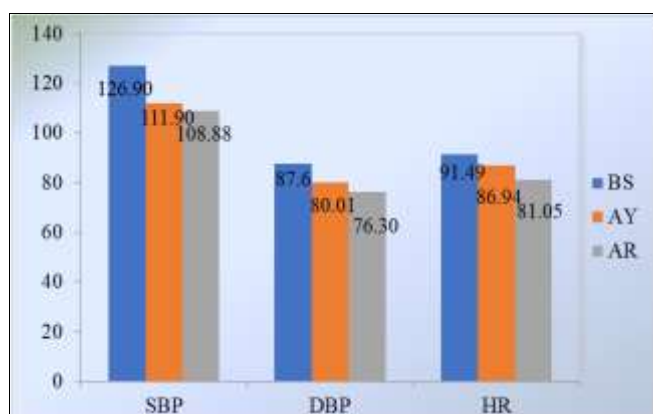
The results presented in table: 4.2.2informed that there is overall significant difference in means, but it does not show that where those differences occurred. For that, Bonferroni post hoc test is used.)

Table: 4.2.3 represents the results of the Bonferroni post hoc test, which allows to discover which specific means differed. In SBP, mean difference between baseline and after yoga was 15.00, between baseline and after relaxation was 18.07 and

between after yoga and after relaxation was 3.07 with $p < 0.05$. This shows that there is significant decrease in Systolic blood pressure when measure at 3 times interval- Baseline, After Yoga and After Relaxation.

In DBP, mean difference between baseline and after yoga was 7.58, between baseline and after relaxation was 11.29 and between after yoga and after relaxation was 3.71 with $p < 0.05$. This shows that there was significant decrease in Diastolic blood pressure when measure at 3 times interval- Baseline, After Yoga and After Relaxation.

In HR, mean difference between baseline and after yoga was 4.54, between baseline and after relaxation was 10.44 and between after yoga and after relaxation was 5.89 with $p < 0.05$. This shows that there was significant decrease in Heart Rate when measure at 3 times interval- Baseline, After Yoga and After Relaxation.



Graph 1: Mean comparisons of SBP, DBP and HR at BS, AY and AR within group

Graph represents that there is decrease in SBP, DBP and HR within group at three time interval – Baseline, after yoga and after relaxation. In SBP, the values of BS, AY and AR were 126.90, 111.90 and 108.88 respectively, which indicated that the SBP was decreased.

In DBP, the values of BS, AY and AR were 87.6, 80.01 and 76.30 respectively, which indicated that the DBP was decreased. In HR, the values of BS, AY and AR were 91.49, 86.94 and 81.05 respectively, which indicated that the HR was decreased. So, Graph concluded that in young female SBP, DBP and HR were decreased at three time interval – Baseline, after yoga and after relaxation.

Discussion

The present study was conducted to determine the immediate effect of yoga on Blood Pressure and Heart Rate following single yoga session in young female between the age of 17 to 25 at 3 times interval-Baseline, After Yoga and After Relaxation. The sample size was 55. Sphygmomanometer and pulse oximeter used for the measurement of Blood pressure and heart rate respectively.

The topic was selected to evaluate the cardiovascular health in young female. The cardiovascular health problems are now seen in early young group also as a result of increasing junk food consumption and other risk factors like sedentary lifestyle, less awareness of physical activities like yoga, aerobics and increased consumption of more oily foods and salt intake, also people do not have time to spare for physical work and continuously work by sitting in air conditioning room.

Bhavanani, B, A^[8] conducted the study on single session of integrated, “silver yoga” program which improves

cardiovascular parameters in senior citizens. The result of the study showed all parameters witnessed a reduction following the single session. This was statistically more significant ($p < 0.0001$) in HR (Heart Rate), RPP (Rate-Pressure Product) and DOP (Double Product) while it was also significance ($p < 0.01$) and ($p < 0.05$) in SP (Systolic Pressure) and PP (Pulse Pressure) respectively. The decrease in MP (Mean Pressure) just missed significance ($p = 0.054$) while it was not significant in DP (Diastolic Pressure) and concluded that there is a healthy reduction in HR, BP and derived cardiovascular indices following a single yoga session in geriatric subjects. The present study showed the immediate effect of yoga on Blood pressure and Heart rate following single yoga session in young female which showed that there was significant decrease in Systolic Blood Pressure, Diastolic Blood Pressure and Heart Rate.

Cohen L. Debbie^[9] conducted the pilot study and observed significant decreases in 24-hour ambulatory BP (ABP) readings after a 12-week period of yoga participation. Based on this they conducted a larger randomized trial, the Lifestyle Modification and Blood Pressure Study II (LIMBS II), to determine the effects of yoga and enhanced LSM, alone or together, on lowering BP in patients with prehypertension and stage 1 hypertension. The study concluded that the mean baseline BP was lower in the completers vs noncompleters (133/81 mm Hg vs 134/82 mm Hg, $p < .05$) and was significantly, but not clinically different. Baseline body mass index and weight were similar. The present study also concluded the significant result ($P < 0.05$) and showed that there were significant reduction in SBP, DBP and HR in young female at 3 times interval period-Baseline, After Yoga and After Relaxation. This showed the immediate effect which is contrast to this study.

Santha Joseph *et al.*^[10] focused on the effect of yoga on heart rate and blood pressure and its clinical significance. In this study the mean values of heart rate, systolic blood pressure and diastolic blood pressure are highly significantly reduce after 6 months of yoga practice. The result of this study is also similar to our study. Reduction in heart rate and blood pressure indicate a shift in the balancing components of autonomic nervous system towards the parasympathetic activity. This modulation of autonomic nervous system activity might have been brought about through the conditioning effect of yoga on autonomic functions and mediated through the limbic system and higher areas of central nervous system were reported by Anand BK *et al.*^[11] and Selvamurthy *et al.*^[12].

Bodhe, C, D^[13] conducted the study on Effect of short term pranayama on certain cardiovascular risk factors. The result of study showed a significant decrease in heart rate and systolic blood pressure were observed while diastolic blood pressure, blood total cholesterol and HDL cholesterol levels did not show any significant change after 10 week of pranayama and concluded that short term practice of pranayama shows a significant decrease in heart rate and systolic blood pressure in young healthy volunteers. This study mainly focused on the pranayama which was contrast to our study. The present study showed the effect of asanas on BP and HR.

Vijaya Lakshmi *et al.*^[14] concluded that regular practice of yoga increases the baroreflex sensitivity and decreases the sympathetic tone; thereby restoring blood pressure to normal level in patients of essential hypertension. Bhargava *et al.*^[15] reported that meditation by modifying the state of anxiety reduces stress – induced sympathetic over activity thereby

decreasing arterial tone and peripheral resistance, and resulting in decreased diastolic blood pressure and heart rate. This ensures better peripheral circulation.

Indla Devasena, *et al.* [16] reported that non-pharmacological methods like yoga, meditation, diet, weight reduction and life style modification should be encouraged to control the modifiable risk factors. The cardiovascular parameters alter with age, but these alterations are slower in persons ageing with regular yoga practice. It can thus be concluded that these results and their explanations would justify the incorporation of yoga as part of our life style in prevention of age-related cardiovascular complications.

The present study showed the immediate effect of yoga on Blood pressure and heart rate. Decreased in BP and HR is beneficial for improving the cardiovascular health. In present study, there were significant decrease was found in Blood Pressure and Heart Rate.

Conclusion

There was healthy reduction in Systolic blood pressure, Diastolic blood pressure and Heart rate at three time interval-Baseline, after yoga and after relaxation following single yoga session in young female.

Limitation

- Study included only female participants. Age group can be changed.
- Small sample size was used.
- Immediate effect of yoga was seen. The study can be done to check the long term effect of yoga.

Implication of the future

- To prevent cardiovascular disease.
- To improve Physical fitness.

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