ABSTRACT

BACKGROUND
The Yoga is a path of personal spiritual development that utilizes meditation for the brighten enlightenment of physical and mental health. The Yogasanas influence the cardiovascular parameters by altering the pre load and after load. Isometric Hand Grip [IHG] exercise, a convenient and popular means of eliciting reflex cardiovascular responses, has been employed in the clinical evaluation of ventricular performance and aortic murmurs and as a cardiac stress test. So, by keeping this in mind this study was done on 30 male patients suffering from essential hypertension since 3-17 years and were on antihypertensive drugs. The cardiovascular parameters like Heart Rate and Blood Pressure were taken in response to Isometric Hand Grip Test. After that the subjects were given yoga training of Shavasana and Pranayama by a trained teacher for 6 days in a week for 6 weeks, then again their cardiovascular parameters were taken at 6th week. It was observed that Isometric Hand Grip [IHG] test produced highly significant BP, HR and RPP [Rate Pressure Product]. It was also concluded that yoga training results in an improvement of baroreflex hypersensitivity. Our results suggested that the vasocostriction and the cardiac acceleratory responses to Isometric Hand Grip [IHG] test were subnormal in hypertensive subjects and yoga training improved these reflex regulatory mechanisms.

KEYWORDS


INTRODUCTION
The word 'Yoga' is derived from the Sanskrit word 'Yuj' [Concentrate one’s attention on]. The Yoga is "a path of personal spiritual development that utilizes meditation to bring enlightenment, self-realization and ultimately the attainment of god and bliss." Originally, the ultimate goal of Yoga was called Samadhi, or self-realization [Iyengar].1 The health secrets of practicing yoga includes physical heath and relaxation, stress relief, stamina, vitality, zest for life, clarity, concentration, memory, motivation, will power, self-confidence, awareness and inner peace with happiness. It is necessary to include BP in yogasanas may influence rate pressure product by altering pre load and after load. However, there is paucity of literature on the effect of yogasanas on RPP in essential hypertension. In view of this, the present work was planned to study the effect of yoga training on HR, BP and RPP. The vascular reactivity response can readily be detected by isometric stress.2 Voluntary muscle contraction can be divided into Isometric or static contraction, isometric or dynamic contraction and isokinetic contraction.3 Isometric contraction means contraction in which there is no change in the length of the muscle but there is increase in tension.

There are two types of isometric contraction, concentric contraction in which muscle shortens as it contracts and eccentric contraction which is opposite to concentric and occurs when the muscle lengthens as it contracts.4

Prolonged continuous contraction of skeletal muscles inhibits regional blood flow as muscle fibers compress the blood vessels. Early research in the area of isometric exercise focused on the differences between isometric and dynamic exercise.5 It suggests that isometric training could influence slow moving performance. However, in studies where fast training and testing movements have been performed the evidence supports dynamic training over isometric training.

Isometric exercise sets in motion a series of events that work in tandem to activate the sympathetic nervous system and increase BP.6 The cortical impulse that voluntary muscle contractions contribute to the increase in sympathetic tone. Muscle contraction activates the afferent nerve sensitive to mechanical deformation. Isometric Hand Grip [IHG] exercise, a convenient and popular means of eliciting reflex cardiovascular responses, has been employed in the clinical evaluation of ventricular performance and aortic murmurs and as a cardiac stress test. The usefulness of IHG for the diagnosis of sympathetic dysfunction has been debated in the literature. Ewing et al.7 observed a significant correlation between IHG and DBP rise in both normal and diabetic subjects. A subnormal increase in Diastolic Blood Pressure [DBP] was used as a marker of impaired sympathetic function. A time dependent increase in hemodynamic response and muscle sympathetic nerve activity [MSNA] has been observed by several authors.8 We studied the cardiovascular response to Isometric Hand Grip Test [IHG] before and after yoga training for 6 weeks in hypertensive subjects.

MATERIALS AND METHODOLOGY
Materials
The study design was a longitudinal study. It was conducted in Department of Physiology at Santosh Medical College in...
collaboration with Department of Medicine at Santosh Hospital, Ghaziabad. 30 male subjects attending medicine OPD of Santosh Hospital for uncomplicated essential hypertension were selected for the present study. Yogic relaxation training for the study was conducted for total duration of 6 weeks.

Methodology
Heart rate and Blood Pressure responses to Isometric Hand Grip Dynamometer [INCO AMBALA, INDIA] at 0 week were determined by asking the patient to hold the dynamometer in the dominant hand to have a full grip of it. The subjects were instructed to then compress the handle of the device with the maximum efforts and the tension so developed was thus recorded, this whole procedure was repeated again for 2-3 times and the readings were taken similarly. The highest of the 3 recordings which was the maximal Isometric tension [Tmax] was taken. The subjects were then asked to maintain a pressure of 30% of Tmax for 30 min or till fatigue. Blood Pressure was recorded using calibrated sphygmomanometer and ECG lead II taken to calculate the Heart Rate before the release of hand grip dynamometer. After the basal recordings of HR and BP at 0 week, subjects were taught yoga-asana and pranayama by a trained yoga teacher and the yoga training was performed for 35 minutes from Mon-Sat for 6 weeks which includes warm up for 10 minutes, yoga asana included Shavasana for 15 minutes and Pranayama included Savitri Pranayama and Anulom-Vilom for 10 minutes. The response to Isometric Hand Grip Test was measured at 0 week and at the end of 6 weeks of the study period.

OBSERVATIONS AND RESULTS

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Before Yoga Training</th>
<th>After Yoga Training</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Rest</td>
<td>IHG</td>
</tr>
<tr>
<td>SBP (mm Hg)</td>
<td>139.47±4.39</td>
<td>148.53±3.56</td>
</tr>
<tr>
<td>DBP (mm Hg)</td>
<td>92.00±2.51</td>
<td>93.53±4.19</td>
</tr>
<tr>
<td>PP (mm Hg)</td>
<td>47.47±3.59</td>
<td>48.66±5.42</td>
</tr>
<tr>
<td>HR (beats/min)</td>
<td>75.53±2.95</td>
<td>77.2±3.91</td>
</tr>
<tr>
<td>RPP (Units)</td>
<td>105.40±6.34</td>
<td>107.80±10.83</td>
</tr>
</tbody>
</table>

Table 1: Table gives comparison of mean and standard deviation of cardiovascular parameters at rest and IHG test after 6 weeks of yoga training

DISCUSSION
In the present study, the cardiovascular response to stress with Isometric Hand Grip Test was studied before and after 6 weeks of yoga training. The results showed an increase in all the parameters before yoga training with increase in Systolic Blood Pressure being significant. IHG test provides pressor stimuli to cardiovascular system through efferent sympathetic pathways with a resultant increase in Heart rate and Blood pressure.7 Isometric Hand Grip Test [IHG] sets in motion a series of events that works in tandem to activate the sympathetic nervous system and increases Blood Pressure. The cortical impulses that initiate voluntary muscle contraction contributes to the increase in sympathetic tone. Muscle contraction activates afferent nerve sensitive to mechano-receptors. This increase in the muscle metabolism and relative ischemia that results from compression of blood vessels by contracting muscle generates metabolic products that then activates chemo receptors that constitutes the afferent limb of a reflex that results in sympathetic activation and increase in blood pressure. The results demonstrate that a long-term antihypertensive therapy reduces the exaggerated BP response to IHG in essential hypertension. A blunted BP response to IHG may be due to insufficient sympathetic response in our hypertensive subjects. Normally, IHG test increases Diastolic Blood Pressure by 16 mm Hg or more and a rise of 10 mm Hg or less indicates abnormal cardiovascular reflex regulation.8 In our study, the changes in Diastolic Blood Pressure and Heart rate were insignificant and statistically insignificant. After 6 weeks of yoga training, IHG test produced highly significant BP, HR and RPP [Rate Pressure Product]. It was also concluded that yoga training results in an improvement of baroreflex hypersensitivity.

CONCLUSION AND SUMMARY
It was concluded from the present study that yoga practice increases vagal tone, decrease the work load on heart leading...
to decrease in cardiac output and hence Systolic Blood Pressure and it also affects the hypothalamus directly and bring about decrease in blood pressure through its influence on vasomotor center which leads to reduction in sympathetic tone and peripheral resistance. Decreased sympathetic activity in turn reduces catecholamine secretion and also leads to vasodilatation leading to improvement in peripheral circulation. It was also observed that regular yogic practices with Shavasana and Pranayama resulted in significant decrease in basal HR and BP. After yoga training for 6 weeks, there was significant rise in all these cardiovascular parameters.

Our results suggested that the vasoconstriction and the cardiac acceleratory responses to IHG test were subnormal in hypertensive subjects and yoga training improved these reflex regulatory mechanisms. These findings concluded that yoga training optimizes the sympathetic response to stressful stimuli like Isometric Hand Grip Test and restores the autonomic regulatory reflex mechanism in hypertensive subjects.

REFERENCES