Laughter has been used as a therapeutic tool for many years because it is a natural form of medicine. Decades of scientific research had already proven that laughter has a documented positive impact as a form of complementary preventive and therapeutic medicine. The basic concept with Laughter Yoga is that our body cannot differentiate between real or artificial laughter, hence accords all the benefits of real laughter. The aim of the present study was to investigate whether regular practice of Hasya Yoga for 6 weeks can reduce the cardiovascular hyper-reactivity and other cardiac parameters in healthy young medical students. The study group comprises 40 healthy young medical students of 18–23 years age group. At the start of the study, there were 18 hyper-reactors to cold pressor test. The hyper-reactivity of 13 volunteer (72.22%) converted to hypo reactivity after the Hasya Yoga therapy (combination of laughter and Bhastrika Pranayam) of 6 weeks. Other parameters like basal blood pressure, a rise in blood pressure after cold pressor test, pulse rate, Rate Pressure Product (RPP) and Mean Arterial Pressure (MAP) were also statistically significantly reduced. Regular practice of Hasya Yoga significantly reduces the values of basal blood pressure, cardiovascular hyper-reactivity to blood pressure after one minute of cold stress, heart rate, rate pressure product & MAP after 6 weeks of yoga practice. Laughter is one of our best defenses against stress, and it is important that we find ways to laugh more to cope with stress and remain healthy in the modern world. Laughter Yoga is a perfect way to laugh and get exercise at the same time. Other non-pharmacological methods like meditation, diet, weight reduction and life style modification should also be encouraged to control the modifiable risk factors.

**KEYWORDS** stress, hasya yoga, bhastrika pranayama, cold pressor test

**INTRODUCTION**

Stress is a well-known slow killer, is rampant in our society, and is very expensive at all levels. It creates havoc in the human body. Stress cannot be ignored. Stress and anxiety have been implicated as contributors to many chronic diseases and to decreased quality of life. Cardiovascular disease (CVD) is the leading cause of death and disability worldwide. The understanding of the risk factors for CVD may yield important insights into the prevention, etiology, course, and treatment of this major public health concern. Autonomic imbalance, characterized by a hyperactive sympathetic system and a hypoactive parasympathetic system, is associated with various pathological conditions. Walter Cannon (1911) et al. was the first person to propose that emotional stress causes excess of adrenaline secretion from adrenal medulla leading to tachycardia, high blood pressure etc. Later it was found that all these manifestations occur not only from adrenaline secretion but also from over activity of the sympathetic nervous system which liberates nor-adrenaline at its nerve endings. On entering the professional college the student is in a new challenging and stressful environment. Factors contributing to high levels of stresses in professional colleges could be highly competitive curriculum, intense academic pressure, etc. Later it was found that all these manifestations occur not only from adrenaline secretion but also from over activity of the sympathetic nervous system which liberates nor-adrenaline at its nerve endings. On entering the professional college the student is in a new challenging and stressful environment. Factors contributing to high levels of stresses in professional colleges could be highly competitive curriculum, intense academic pressure, etc.

**DISCLAIMER** Any views expressed in this paper are those of the authors and do not reflect the official policy or position of the Department of Defense.

**Source of funding:** None.

**Competing interest / Conflict of interest:** The author(s) have no competing interests for financial support, publication of this research, patents and royalties through this collaborative research. All authors were equally involved in discussed research work. There is no financial conflict with the subject matter discussed in the manuscript.

**Statement of originality of work:** The manuscript has been read and approved by all the authors, the requirements for authorship have been met, and that each author believes that the manuscript represents honest original work.


Available at www.jspbms.info
Can 6-week practice of Hasya Yoga reduce the cardiovascular hyper-reactivity?

Hasya Yoga or Laughter Yoga, as demonstrated by Madan Kataria, an Indian doctor, may be self-triggered laughter for a reason or without a reason. The basic concept with Laughter Yoga is that our body has the ability to induce autonomic functions that are specially advised for the treatment of various disorders. There are evidences that pranayama training produces a deep psychosomatic relaxation and an increase in the cardiorespiratory efficiency. Pranayama is a controlled and conscious breathing exercise which involves mental concentration. In the ancient Indian Vedic literature, it has been indicated that breathing with consciousness improves the mental and physical health. There are different types of pranayamas that are specially advised for the treatment of various disorders. There are evidences that pranayama training produces a deep psychosomatic relaxation and an increase in the cardiorespiratory efficiency and the autonomic functions.

Laughter has been used as a therapeutic tool for many years because it is a natural form of medicine. Laughter is available to everyone and it provides benefits to a person’s physical, emotional, and social well-being. The basic concept with Laughter Yoga is that our body cannot differentiate between real or artificial laughter. The laughter language is understood and appreciated by everyone in the world. Decades of scientific research had already proven that laughter has a documented positive impact as a form of complementary preventive and therapeutic medicine. Hasya Yoga or Laughter Yoga combines laughter with yogic breathing-pranayama. This may be self-triggered laughter for a reason or without reason. But laughter can affect your mind positively.

Laughter Yoga is a method in which there is a combination of unconditional laughter with Yoga breathing exercise (Pranayama) and was firstly suggested in 1995 by Madan Kataria, an Indian doctor. A new study has shown that Laughter Yoga can significantly lower systolic and diastolic blood pressure levels, as well as bring about significant reductions in the stress hormone cortisol.

**MATERIALS AND METHODS**

The study group comprised 40 healthy young medical students of first year in the 18–23 years age group. The inclusion criteria were being interested in participating in the research; no cardiac diseases, hernia, acute hemorrhoid (accompanied with bleeding), hypertension, chronic coughs, incontinency, epilepsy, acute low back pain, medications affecting general health components and no history of any surgery in the past 3 months. The exclusion criteria were no interest to continue in the study, absenteeism for more than two sessions, and consumption of medications affecting general health components. The study protocol was explained to the subjects and written consent obtained. Approval by the ethical committee of S. S. Medical College, Rewa, M.P., was obtained. All the volunteers were clinically examined to rule out any systemic diseases. The basal Heart Rate and Blood Pressure were then recorded and on the basis of these parameters, Rate Pressure Product (RPP) and Mean Arterial Pressure (MAP) were calculated.

**Heart rate (beats per minute)**

The subjects were asked to rest in the supine position for 15 min. After fixing the ECG leads the subject was asked to lie quietly for 3 min. At the end of 3 min ECG was recorded in lead 2, which was run for one full minute for each test. The R-R peaks indicated the heart rate and the calculation was done noting the speed of the ECG paper in unit time. Since 25 mm/second is the speed normally used, the heart rate is counted with the following calculation:

\[
\text{Heart rate/minute} = \frac{1500}{\text{Distance between two consecutive R-R waves in mm}}
\]

**Systolic and diastolic blood pressure (mmHg) by using a sphygmomanometer**

The subject was asked to rest in the supine position for 15 min. The blood pressure was recorded by means of sphygmomanometer by auscultatory method. Three BP recordings at one minute interval were taken and the lowest of these values was included in the study. The subjects were asked to relax during the procedure.

**The Rate Pressure Product (RPP)**

Rate Pressure Product is an easily measurable index, which correlates well with myocardial oxygen consumption and defines the response of the coronary circulation to myocardial metabolic demands. The rate pressure product was calculated for each reading.

\[
\text{RPP} = \frac{\text{HR} \times \text{SP}}{100}
\]
Mean Arterial Pressure (MAP)

It is the average of all the pressures measured during the cardiac cycle. A reasonable approximation of the mean arterial pressure is: one third of pulse pressure plus diastolic pressure. (MAP = DBP + 1/3 PP). The significance of MAP: It is the pressure that helps in the forward movement of blood in the lumen of the blood vessels. MAP also determines tissue perfusion. All the volunteers were then subjected to the cold pressor test devised by Hines & Brown in 1932.

Cold pressor test

For the cold pressor test, a thick walled thermocol box measuring 38 cm × 26 cm × 18 cm, closed from all sides, was used. A hole was made in the centre of the top of the box to allow entry to one hand of the subject. Another small hole was made at the corner of the top of the box for laboratory thermometer. Before starting the experiment the box was filled with a mixture of ice and water and the laboratory thermometer was placed such that its mercury bulb was immersed in the mixture of ice and water. The temperature inside the box was measured about 3°–4°C. The hand was immersed in cold water up to the wrist for one minute (cold stress). An elevation above the basal level of more than 20 mm of Hg in systolic or of more than 15 mm in diastolic was considered as hyper-reactive response. In the present study, out of 40 subjects, 18 were hyper-reactors to cold pressor test whereas 22 were hypo reactors. All these 18 hyper-reactor volunteers were trained under the guidance of a certified “Hasya Yoga” teacher for 15 days. After initial training, Laughter Yoga sessions (a total of eighteen sessions) were held at 7.00–8.00 a.m., thrice a week, for the duration of one Hour in the Department of Physiology, S. S. Medical College, Rewa. The protocol was as under:

First 20 min were devoted to relaxation techniques, deep breathing exercises (Bhastrika Pranayama), and warm up. For warm-up exercises, the subjects held their palms parallel to each other while clapping, so that their palms and fingers thoroughly clapped. This stimulated palm pressure points and increased the level of energy and coordination in the group. Rhythm of 1, 2, 3, and 1, 2 was added to clapping while bending the knees and shaking the head, which made clapping very joyful and left everybody in a good mood for laughing and smiling. Then, Laughter Yoga techniques were practiced for 20 min which included artificial laughter until one subject started natural laughter.

Finally, 20 min of meditation was administrated. For this the subjects comfortably sat down on the ground calmly with closed eyes and concentrated on their breathing. In the end, the group leader asked the subjects to leave meditation and invited them to peace and relaxation. All the above parameters like heart rate, RPP and MAP were measured again after 6 weeks of the Hasya Yoga (Laughing exercises and Bhastrika Pranayama, the yoga component) in the hyper-reactor subjects.

Statistics

The data were analyzed statistically by using the statistical software Graph Pad in Stat vs. 3.10 and MS Excel (2003) (Figs. 1 and 2), and Statistical analysis of BP, pulse rate, MAP and RPP were done using students t test and P < 0.05 was considered as significant.

RESULTS

Our results showed that “Hasya Yoga” causes significant reduction in the cardiovascular hyper-reactivity. A total of 40 male volunteers were included in the study. Out of which 18 were hyper-reactor to cold pressor test. These hyper-reactors practiced yoga regularly for 6 weeks and

![Fig. 1](Changes in blood pressure in mmHg. During cold pressor test in hyper reactors before and after 6-week practice.)

![Fig. 2](Comparison of heart rate, rate pressure product (RPP) and MAP in hyper reactive subjects before and after 6-week practice of Hasya Yoga.)
after this period 15 volunteers became hypo reactors. However, the hyper-reactivity did not change in 03 volunteers. The statistical analysis was carried out using student’s t test. It was observed that the basal blood pressure, rise in BP due to cold stress (Table 1) and, heart rate and rate pressure product were statistically significantly reduced (Table 2).

**Blood pressure**

The basal mean systolic blood pressure decreased from 124.4 ± 5.249 mmHg to 122.9 ± 4.296 mmHg ($P < 0.000$) and the diastolic blood pressure was found in the study to change from 82.44 ± 2.955 mmHg to 76.78 ± 3.574 mmHg ($P < 0.000$) after 6 weeks of laugh yogic exercises, Bhastrika Pranayama and meditation. The average rise in systolic blood pressure, due to cold pressor test, initially was 21.56 ± 3.399 mmHg, and this rise reduced to 16.56 ± 3.417 mmHg ($P < 0.000$). While the rise in diastolic blood pressure initially was 15.89 ± 3.252 mmHg and this reduced to 12.78 ± 1.70 mmHg ($P < 0.000$).

**Heart rate, Rate Pressure Product (RPP) & MAP**

Heart rate decreased from the mean value of 76.11 ± 4.351 per minute to 71.33 ± 3.413 beats per minute ($P < 0.000$) and RPP decreased from the mean value of 93.06 ± 7.077 to 87.52 ± 5.395 which is significant ($P < 0.000$). Similarly, the basal Mean Arterial Pressure (MAP) reduced from 96.44 ± 2.472 to 92.15 ± 2.933.

**DISCUSSION**

The aim of the present study was to investigate whether regular practice of Hasya Yoga for 6 weeks can reduce the cardiovascular hyper-reactivity and other cardiac parameters in healthy young medical students. We found that 6 week practice of Hasya Yoga (a combination of Artificial laughter and Bhastrika pranayam), resulted in a significant decrease in the basal heart beat rate, the blood pressure, the response to cold stimulus in the hyper-reactive subjects, RPP and mean arterial pressure (MAP) which indicates decrease in sympathetic activity and increase in parasympathetic activities which is mainly due to increase in vagal tone$^{17-20}$. The basal heart rate is the function of the parasympathetic system. The calculated RPP also decreased significantly$^{21}$. Pramanik et al. observed that after slow Bhastrika Pranayama breathing, both the systolic and diastolic blood pressure decreased significantly with a slight fall in heart rate$^{22}$. The significant decrease in the RPP following the pranayama training in the hyper-reactive subjects indicated a reduction in the work which was done by the heart as RPP is an index of the myocardial oxygen consumption and the load on the heart. The significant decrease in resting pulse rate, systolic and diastolic blood pressure after the yoga practice in the present study is in accordance with the findings of other studies on physiological effects of yoga practice in healthy individuals$^{23}$. Similar reduction in resting PR and blood pressure after yoga practice were also reported in hypertensive patients$^{14,24}$. In the present study a highly significant reduction in PR, SBP, and DBP can be attributed to modulation of autonomic activity with parasympathetic predominance and relatively reduced sympathetic tone. This autonomic modulation in yoga is mediated through modification of breathing patterns which triggers various central and autonomic mechanisms as well as mechanical and hemodynamic adjustments causing both tonic and phasic changes in cardiovascular functioning$^{26}$. Madamnohan et al. also reported that the pranayama training resulted in

### Table 1

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>Parameters</th>
<th>Before Hasya Yoga practice</th>
<th>After 6 weeks of Hasya Yoga practice</th>
<th>$P$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Blood pressure (mmHg)</td>
<td>Mean value</td>
<td>SD</td>
<td>Mean value</td>
</tr>
<tr>
<td>1</td>
<td>Basal BP</td>
<td>Systolic 124.4</td>
<td>5.249</td>
<td>122.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diastolic 82.44</td>
<td>2.955</td>
<td>76.78</td>
</tr>
<tr>
<td>2</td>
<td>BP after hand dip in 4° water for 1 minute</td>
<td>Systolic 146.0</td>
<td>8.203</td>
<td>139.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diastolic 98.33</td>
<td>5.006</td>
<td>89.56</td>
</tr>
</tbody>
</table>

### Table 2

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>Parameters</th>
<th>Before Hasya Yoga practice</th>
<th>After 6 weeks practice of Hasya Yoga</th>
<th>$P$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean value</td>
<td>SD</td>
<td>Mean value</td>
</tr>
<tr>
<td>1</td>
<td>Heart beat rate/min.</td>
<td>76.11</td>
<td>4.351</td>
<td>71.33</td>
</tr>
<tr>
<td>2</td>
<td>Rate pressure product (RPP)</td>
<td>93.06</td>
<td>7.077</td>
<td>87.52</td>
</tr>
<tr>
<td>3</td>
<td>Mean arterial pressure (MAP)</td>
<td>96.44</td>
<td>2.472</td>
<td>92.15</td>
</tr>
</tbody>
</table>
a decrease in the oxygen consumption. These studies showed that the pranayama training produced an overall reduction in the oxygen consumption, the metabolic rate and the load on the heart produced by a decrease in the basal sympathetic tone and an increase in the basal parasympathetic activity. As a technique, pranayama can assume rather complex forms of breathing. But the essence of the practice is slow and deep breathing. Slow breathing induces a generalized decrease in the excitatory pathways regulating respiratory and cardiovascular systems. As respiratory and cardiovascular systems have similar control mechanisms, alteration in one system will modify the functioning of the other. During slow and deep breathing lung inflates to the maximum. This stimulates pulmonary stretch receptors, which bring about withdrawal of sympathetic tone in skeletal muscle blood vessels leading to widespread vasodilatation and decrease in peripheral resistance and thus decrease diastolic blood pressure. While practicing pranayama one concentrates on the act of breathing which removes attention from worries and “de-stresses” him. This stress-free state of mind evokes relaxed responses in which parasympathetic nerve activity overrides sympathetic activity. Madan Kataria, an exponent and pioneer of laughter therapy, found that after a 3-week session of laughter therapy in 200 IT professionals, a more than 6 mmHg reduction in SBP and more than 3 mmHg Reduction in DBP was observed. S. Cortisol levels also significantly reduced. Laughter decreases stress hormones and increases immune cells and infection-fighting antibodies, thus improving your resistance to disease. Laughter triggers the release of endorphins, the body’s natural feel-good chemicals. Endorphins promote an overall sense of well-being and can even temporarily relieve pain. A link between laughter and healthy function of blood vessels was first reported in 2005 by researchers at the University of Maryland Medical Center with the fact that laughter causes the dilatation of the inner lining of blood vessels, the endothelium, and increases blood flow.

CONCLUSIONS

Laughter is one of our best defenses against stress, and it is important that we find ways to laugh more to cope with stress and remain healthy in the modern world. Laughter Yoga is a perfect way to laugh and get exercise at the same time. Other Non-pharmacological methods like meditation, diet, weight reduction and lifestyle modification should also be encouraged to control the modifiable risk factors. It can thus be concluded that these results and their explanations would justify the incorporation of Hasya Yoga as part of our life style in the prevention of age-related cardiovascular complications.

REFERENCES

Can 6-week practice of Hasya Yoga reduce the cardiovascular hyper-reactivity?


