

Immediate Effect of Laughter Yoga on Blood Pressure in Elevated Blood Pressure

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Abstract: *Aim:* To study the immediate effect of laughter yoga on blood pressure in subjects with elevated blood pressure. *Procedure:* Experimental study done 55 subjects wherein they performed laughter yoga session and immediate blood pressure was recorded. *Results:* The results showed improvement in mean values for Systolic Blood Pressure from 125.35 ± 2.27 to 124.65 ± 2.80 and for Diastolic Blood Pressure from 75.24 ± 2.32 to 74.58 ± 2.51 which was statistically significant as p values was < 0.001 . *Conclusion:* The study concludes that laughter yoga is effective in immediately reducing the blood pressure in individuals with elevated blood pressure.

Keywords: Laughter yoga, blood pressure, hypertension

1. Introduction

Raised blood pressure is the biggest contributor to the global burden of disease, leading to 10.5 million deaths each year.

⁽¹⁾ Hypertension is amongst the major risk factor for cardiovascular disease (CVD). In a nationwide household survey carried out from 20 January 2015 to 4 December 2016 among subjects aged 15–49 years from 1.3 million adults in India, it is realized that 25% of adults had raised blood pressure (BP), with a substantial prevalence, at 12 % in young adults aged 18–25 years ⁽²⁾

Hypertension is a tough condition to manage as the patients are generally symptomless. Pharmacological intervention of BP-lowering medication is recommended in stage 1 hypertension with clinical CVD or a 10-year risk of ASCVD 10% or greater and in those with stage 2 hypertension. It includes 2 BP- lowering medications along with healthy lifestyle changes.

Blood pressure lowering medications include diuretics, beta blockers, angiotensin II receptor blockers, ACE inhibitors; etc which has different life threatening side effects on long term use. The AHA guidelines recommend non pharmacological treatment viz. diet, exercises and lifestyle modifications alone for individuals with elevated BP and stage 1 hypertension which help decrease the daily dose of antihypertensive medication and delay the advance of disease from prehypertension to hypertension stage.

Participation in regular exercise is a key determinant of hypertension and is recognized as a mainstay therapy for the primary prevention, treatment, and control of hypertension. Regular aerobic exercise lowers resting systolic BP 5-7 mmHg, while resistance exercise lowers resting systolic BP 2-3 mmHg in individuals with high BP. Exercises promote numerous cardiovascular and muscular adjustments that are antihypertensive. Epidemiological studies indicate that greater physical activity is associated with a lower blood pressure. ⁽⁸⁾

Laughter is a physiological event. It can provide an aerobic workout ⁽⁹⁾. It refers to a physical reaction characterized by a distinct repetitive vocal sound, certain facial expressions,

and contraction of various muscle groups ⁽¹⁰⁾. Laughter is found to exercise and relax muscles, improve respiration, stimulate circulation, decrease stress hormones, increase the immune system's defenses, elevate pain threshold and tolerance and enhance mental functioning. ⁽¹²⁾

Respiratory and cardiovascular systems have control mechanisms which are similar in nature. Slow breathing causes a generalized reduction in the excitatory pathways balancing respiratory and cardiovascular systems. ⁽¹³⁾ Studies suggest that slow and regular breathing elicits acutely a number of beneficial effects via the cardiovascular reflex control system, including increased heart rate variability and baro reflex sensitivity, BP reduction and an increase of oxygen saturation in chronic heart failure. ⁽¹⁴⁾

Laughter Yoga (LY) combines laughter with breathing. The laughter in LY is simulated which leads to real and contagious laughter. Participants laugh without relying on jokes, humour, or comedy. Laughter whether simulated or natural, body cannot differentiate hence gives same health benefits. It can be easily adapted to a variety of environments and skill levels. Its ease of use and portability helps to make LY accessible to a variety of populations, including older adults. ⁽¹⁵⁾

Evidences suggest LY intervention for a period of 4-6 weeks has benefited in improving blood pressure, pulse rate and heart rate variability. ^(12, 15, 16) However minimum accountable studies are available those show the immediate effect of laughter yoga. Hence, this justifies the need for the present study.

2. Materials and Methodology

Study design- Experimental study, **Study population:** Subjects with elevated blood pressure, **Duration of study:** 1year, **Sample size-** 55, **Sample calculation-** G power 3.1.9.2 -taking a moderate effect size of 0.5 with an alpha error 0.05 with power of 0.5 the sample size works out to be 55, **Sampling technique-** Convenient sampling

Materials; Pillow, Chair, Pen, Paper, Sphygmomanometer

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Method of Selection

Inclusion criteria: Age -25 -34 years , Subjects with blood pressure – Systolic pressure: 120 -129 mmHg, Diastolic pressure: below 80 mmHg⁽³⁾

Exclusion criteria: Recent pelvic or abdominal surgery in 3 months, hernia, mental illness, visual , hearing impairment, disorientation , Subjects with ischemic heart disease, aneurysm, cerebrovascular accident and respiratory infections, Acute orthopedic conditions such as rib, shoulder, vertebral fractures, etc⁽⁷⁾

Procedure

The study received approval from institutional and MUHS ethical committee. All the participants were screened as per the inclusion and exclusion criteria and requested to participate in the study. Those willing to participate were briefed about the nature of the study in the language best understood by them and written informed consent was obtained. Subjects were then evaluated for baseline data which included demographic data and blood pressure. Blood pressure was measured using the blood pressure monitor (with the patient sitting on a chair and hands supported) before the session. Laughter yoga session was conducted .The 20-minute laughter yoga session consisted of three parts:

- 1) Simple breathing and stretching exercises (5 min) (image 1 and 2)
- 2) Alteration of laughter exercises (e.g., imitating laughter on a cell phone, lassi mixing laugh) with rhythmic clapping, chanting, gentle stretching, and deep breathing (10 min)) (image 3, 4, 5 and 6)
- 3) Quiet seated deep breathing and group chanting (5 mins)⁽¹²⁾

Immediately on completion of LY session, blood pressure was measured with the blood pressure monitor.

3. Results

Number of participants	Mean Age (yrs)	Std Dev	Male	Females
55	28.18	2.28	33	22

The Above table shows that there were 55 subjects in the study out of which 33 were male subjects and 22 were female subjects The Mean age of the subjects is 28.18 years with a standard deviation of 2.28.

Outcome Measures		Pre-Intervention	Post-Intervention
Systolic BP	Mean (In mmHg)	125.36	124.66
	Median	126	124
	Standard Deviation	2.28	2.8
	t value	2.89	
	p value	0.006	
Diastolic BP	Mean (In mmHg)	75.24	74.58
	Median	76	74
	Standard Deviation	2.33	2.51
	t value	2.89	
	p value	0.006	

The results showed significant improvement in Systolic Blood Pressure as well as Diastolic Blood Pressure after the intervention in subjects. The improvement in mean values for Systolic Blood Pressure was from 125.35±2.27 to 124.65±2.80 and for Diastolic Blood Pressure was from 75.24±2.32 to 74.58±2.51 which was statistically significant as values is p<0.001

4. Discussion

The results of the present study showed significant improvement in Systolic Blood Pressure as well as Diastolic Blood Pressure after the intervention in subjects. The improvement in mean values for Systolic Blood Pressure was from 125.35±2.27 to 124.65±2.80 and for Diastolic Blood Pressure was from 75.24±2.32 to 74.58±2.51 which was statistically significant as values is p<0.001 .

Miller and Fry had stated that through the laughter, β -endorphins are released by the pituitary which activates μ 3 opiate receptors that in turn, up regulate nitric oxide synthase to enhance production of nitric oxide (NO)⁽²⁶⁾ which exerts a variety of cardioprotective cellular processes via cellular signaling pathways that include a cGMP-dependent pathway responsible for vasodilation and reduced platelet aggregation as well as inhibition of leukocyte trafficking for reduction of vascular inflammation , which explains the reduction in blood pressure.

One very early report by Paskind et al.⁽³⁾ examined the impact of laughter upon muscle tone. It was demonstrated that periods of intense laughter lead to decreased skeletal muscle tone or relaxation of muscle groups. During laughter, various muscle groups are activated for periods of seconds at a time, while the period immediately after the laugh leads to general muscle relaxation. This post-laughter relaxation can last up to 45 min.

Supporting this study, a similar study with thirteen healthy volunteers doing a variety of 10 different tasks (including laughter, simulated laughter and various respiratory movements) was conducted. The results indicated that laughter resulted in H-reflex suppression. Findings from this study indicate that both laughter and simulated laughter decreased spinal motor excitability, and that true laughter evoked more H-reflex depression than simulated laughter, which suggests that mirth on its own can depress the H-reflex, leading to the post-laughter muscle relaxation. The muscle relaxation in turn decreases the peripheral vascular resistance and thus leads to decrease in blood pressure

Laughter can also affect arterial stiffness and central hemodynamics. In a study, 18 healthy subjects viewed a comedy video for 30 min, and the results showed that laughter reduced pulse wave velocity (by 0.30 m/s, p < .01), and augmentation index (by 2.72%, p < .05) which reflects arterial elasticity. Both large artery stiffness and wave reflections are determinants of mechanical integrity of arteries and left ventricular function .Thus laughter can be beneficial in delaying the pathology resulting in hypertension.

The effective impact on the pulse was also scientifically proven in the studies on the effects of laughter on the endothelium.^[5, 6] Movie clips creating mental stress shown 14 of the 20 volunteers experienced reduced blood flow in the brachial artery due to constricted blood vessels. In contrast, arterial widening was increased in 19 of 20 volunteers after watching the movie segments that generated laughter. Overall, mean upper arm flow mediated vasodilation (a measurement of blood flow through the arteries) was increased 22 percent during laughter and reduced 35 percent during mental stress.^[8] Therefore inline with the results of our study.

Nasir et al. investigated the effect of laughter on RAS (rennin angiotensin system) in patients with type 2 diabetes (T2DM)^[45]. In this study, 18 patients were recruited with T2DM. Patients viewed comedy movies once a week (30–40 min) for six months. Blood samples were collected before the beginning of the study, after 3 months and after six months for the measurement of renin, angiotensin I and prorenin plasma levels by ELISA. The mean plasma renin concentrations were 24.6 ± 12.1 ng/ml/h at baseline which laughter therapy reduced to 8.2 ± 3.4 ng/ml/h after 3 months and 7.7 ± 1.7 ng/ml/h after 6 months. The mean plasma angiotensinogen concentrations were 0.19 ± 0.08 g/ml at baseline which were increased and restored to normal levels (0.47 ± 0.12 g/ml after 3 months and 0.42 ± 0.14 g/ml after 6 months).

RAS has direct effect on blood pressure regulation and thus laughter affects the blood pressure levels.

Another more recent study provided evidence for this protective potential. The authors selected blood prorenin level which can be used a marker of micro vascular complications. Hayashi et al. designed an experiment to test this hypothesis [46]. In this study, 23 patients with T2DM were divided into 12 nephropathy (-) and 11 nephropathy (+) patients and 16 normal controls. For all subjects, prorenin and prorenin receptor gene expression was analyzed using ELISA and RT-PCR respectively. All subjects attended a 40-min Japanese comedy show together with 1100 participants immediately after lunch and blood samples were collected directly after, and 1.5 h after watching the show for baseline determination, blood prorenin assay, and gene expression analysis. As expected, prorenin levels were higher in patients with T2DM in both without nephropathy (-) (93.4 ± 33.7 ng/l; $P=0.002$) and with nephropathy (+) patients (196.6 ± 127.4 ng/l; $P = .001$) compared to control subjects (32.5 ± 11.6 ng/l). Those high levels were decreased 1.5 h after the laughter experience (60.4 ± 31.2 ng/l; $P = .006$) in nephropathy () patients.

Studies also state that the psychological effects of laughter relate primarily to both its use as a coping mechanism and, to a lesser extent, its enhancement of interpersonal relationships. The research reviewed in this area is greater in volume and strength and can be summarized as follows laughter : (1) reduces stress, anxiety, and tension, and counteracts symptoms of depression; (2) elevates mood, self-esteem, hope, energy, and vigor; (3) enhances memory, creative thinking, and problem solving; (4) improves interpersonal interaction, relationships, attraction, and

closeness; (5) promotes psychological well-being; (Scholl and Ragan 2003; Gelkopf et al. 2006; Arminen and Halonen 2007)

Psychosocial factors that induce emotional stress can evoke a physiological response mediated in part by activation of the sympathetic nervous system, inflammation, and the hypothalamic–pituitary–adrenal axis. Repeated activation of this system can result in failing to return to resting blood pressure (BP) levels

Thus concluding that laughter therapy can be an adjunct therapy to maintain normal resting blood pressure.

Breathing

Study by Russo MA et al, stated that that respiration has strong influence on the cardiovascular system^[25, 29, 30, 39, 40]. It is reported that slow and deep breathing exercises reduce blood pressure in individuals under the influence of autonomic system. It says that breathing reportedly is capable of achieving optimal sympathovagal balance and thus helping with decreasing blood pressure.

Roopa B. Ankad et al also states that 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.

It also says that slow breathing induces a generalized decrease in the excitatory pathways regulating respiratory and cardiovascular systems. 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 wide spread vasodilatation and decrease in peripheral resistance and thus decrease diastolic blood pressure. While practicing one also, 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.

Laughter yoga being a combination of laughter and deep breathing exercises has beneficial effects which in turn reduces the blood pressure and supports the alternate hypothesis.

5. Conclusion

The study concludes that laughter yoga is effective in immediately reducing the blood pressure in individuals with elevated blood pressure

6. Future Scope of Study

- 1) The study can be done with added effect of Dietary modification in one or both the groups.

- 2) The study can be done by comparing laughter yoga with low intensity exercises.
- 3) Comparison with pharmacological treatment can be done.

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