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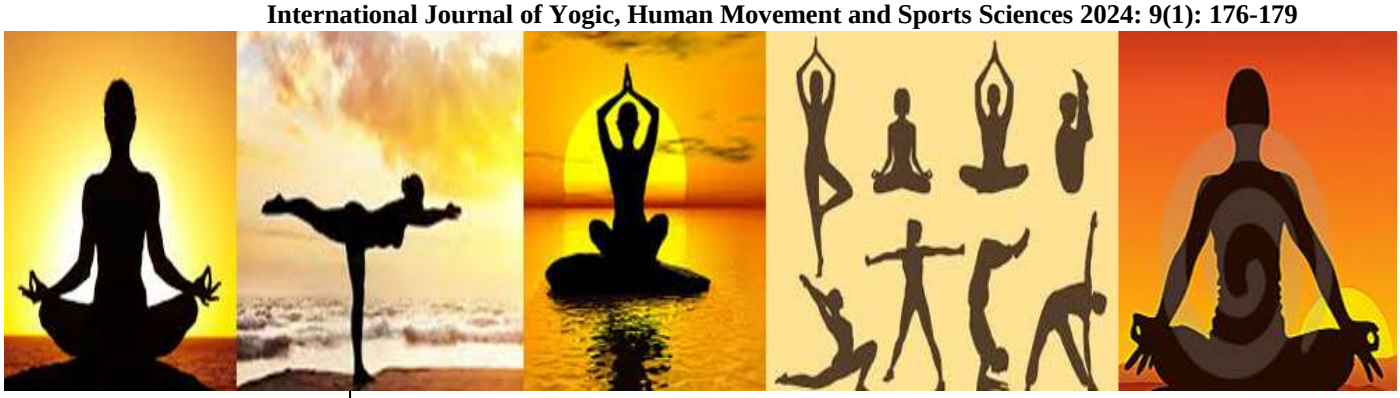

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Effect of yoga protocol training on selected physiological variables on school going children belonging to Garhwal

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Abstract
Background: This study was conducted to investigate the effect of yoga protocol training on Respiratory Rate, Oxygen Saturation Level (SpO2), Systolic Blood Pressure, and Diastolic Blood Pressure of school-going children belonging to Garhwal.
Objectives of the study: 1. To characterize the Respiratory Rate, Oxygen Saturation Level (SpO2), Systolic Blood Pressure, and Diastolic Blood Pressure of school-going children belonging to Garhwal. 2. To study the effect of yoga protocol on mean scores of Respiratory Rate, Oxygen Saturation Level (SpO2), Systolic Blood Pressure, and Diastolic Blood Pressure of school-going children belonging to Garhwal.
Material and Methods: For this purpose, a sample of forty-two (N=42) male adolescents of age ranging between 14 to 17 years were randomly selected from Saraswati Vidya Mandir Inter College, Srikot, Ganganali Pauri Garhwal, Uttarakhand, India. All the participants were informed about the objectives and methodology of this study and they voluntarily participated in this experimental study. The study was restricted to Respiratory Rate, Oxygen Saturation Level (SpO2), Systolic Blood Pressure, and Diastolic Blood Pressure variables. Respiratory Rate was measured through the Total number of exhalations or inhalations per minute and recorded number of breaths with the help of a stopwatch, Oxygen Saturation Level (SpO2) was measured through Pulse Oximeter, Systolic Blood Pressure, and Diastolic Blood Pressure was measured through Digital sphygmomanometer (mm/hg) respectively. Subjects were undergone 8 weeks. Six days in a week in the morning session with a maximum duration of 40 minutes training was given to the subjects. The subjects were evaluated before and after the 8 weak yoga protocol training programs.
Results: For evaluation of the data Paired sample t-test was applied. The level of significance was set at 0.05. Results revealed significant differences between pre and post-tests of the experimental group in Respiratory Rate (t =2.30) and diastolic Blood Pressure (t =3.21), and the results did not reveal a statistically significant effect of yoga protocol on SpO2 (t-value=0.88) and Systolic Blood Pressure (t-value=0.83).
Conclusions: Based on the results it was concluded that the Yoga Protocol may effectively Increase SpO2, suggesting improved oxygen delivery and decreased DBP, indicating reduced stress and improved cardiovascular health. While SpO2 and Systolic Blood Pressure did not show a statistically significant difference, the observed effect size warrants further investigation with a larger sample size.

Keywords: Pulse Oximeter, systolic blood pressure, sphygmomanometer

Introduction

Yoga has spread throughout Western society and medicine during the past decade. As we study more about this ancient discipline, we realize that its advantages extend far beyond improved flexibility and muscle tone. A widespread misconception about yoga is that it primarily focuses on improving flexibility; however, Hatha Yoga, or other different forms of yoga, does emphasize optimal postural alignment, physical strength, and endurance, as well as harmony, the study and practice of yoga combines mindfulness-based activities such as mindful breathing methods, focused concentration, meditation, and self-reflection. (Stephens, 2017) [14]. Over the last century, modern medicine has made significant progress in reducing communicable diseases, to the point where non-communicable diseases (NCDs) have reached epidemic proportions and account for the vast majority of fatalities globally.

The World Health Organisation (WHO) estimates that 80% of NCD deaths are related to four major disease types: cardiovascular disease, cancer, diabetes, and respiratory disorders. (Khalsa *et al*., 2016) [8]. Unfortunately, lifestyle is the primary cause of NCDs, including the use of tobacco, sedentary lifestyle, lack of regular physical activity, poor diets, and chronic psychosocial stress (Khalsa *et al*., 2016) [8]. Yoga is documented as one of several traditional therapeutic systems by the World Health Organization. (Gohel *et al*., 2021) [4]. Yoga practices can be used for the prevention and potential treatment of medical conditions. Beyond the physical elements of yoga, which are important and effective for strengthening the body. Medical yoga also incorporates appropriate breathing techniques, mindfulness, meditation, and self-reflection/study to achieve the maximum benefits.

The practice of yoga synchronizes human physiology through controlled postures, breathing, meditation, a set of regular physical exercises, and relaxations (Pallav Sengupta, 2012) [10], (Ross & Thomas, 2010) [11]. Certain types of yoga practice improve autonomic nervous system by modulating parasympathetic and sympathetic activity, significant changes in brain rhythms, sensory motor rhythm, regulation of breathing rate, and improvement in the cardiac activity and enhance the sense of "well-being" (Sathyaprabha *et al*., 2008) [13], (Telles *et al*., 2011) [16]. Yoga practice has many physiological benefits including increase of heart rate variability (HRV), decreased blood pressure, and increase in respiratory rate and baroreflex sensitivity and balances autonomic nervous system (ANS) activity by reducing sympathetic activity and increasing parasympathetic activity (Ross & Thomas, 2010) [11]. A research showed that yoga practices have immense impact on performance of central nervous system and improve their attention, concentration, and other cognitive faculties (Jatiya *et al*., 2003) [6]. Many studies suggested that yoga can increase grey matter volumes in temporal and frontal lobes, producing positive impacts on mental health and improved cognitive functions (Balaji *et al*., 2012) [1], increase attention, concentration, visual processing capacity, and enhancement in motor activity (Sarang & Telles, 2006), improve eye-hand coordination, improved reversal skills, speed, accuracy, and enhanced cognitive processes (Balaji *et al*., 2012) [1]. Practicing of pranayama, asanas, and meditation resulted in improved verbal skills, improvement in hand-eye coordination, and improved neural performances (Telles *et al*., 1997) [16].

Methodology Selection of Subjects

For this purpose, a total of Forty-Two (N=42) male participants were selected as subjects for the proposed study. All the participant's ages ranged between 14 to 17 years were randomly selected for this study were from Saraswati Vidya Mandir Inter College, Srikot, Ganganali Pauri Garhwal, Uttarakhand, India. The selected students were also delimitated for class 9 to 12. All the participants were informed orally and in writing about the nature and demands of the study. They were also informed that they could withdraw their name from the study at any time, even after giving their written consent.

Subjects were under gone 8 weeks yoga training programme. Six days in a week in the morning session with the maximum duration of 40 minutes training was given to the subjects. The subjects were evaluated before and after the 8 weak yoga protocol training programs.

The physiological variables selected for this study are as follows - Respiratory rate, Oxygen saturation level (SpO2), Systolic Blood Pressure, Diastolic Blood Pressure.

Administration of Test

In the study, all the subjects were informed before taking the data. They were fully relaxed; no motivational techniques were applied to the subjects. Data was collected from Srikot, Garhwal, Uttarakhand.

Respiratory Rate

Total number of exhalations or inhalations per minute recorded for respiratory rate; It was recorded as the number of breaths (Cretikos *et al*., 2008) [2].

SPO2 (Oxygen saturation level)

Oxygen saturation level is measured by a device called a pulse oximeter. This device is a small, clip-like device that attaches to a body part, most commonly to a finger. It measures the oxygen saturation level of your blood, which shows how efficiently blood is carrying oxygen to the extremities furthest from your heart, including your arms and legs. (Jensen *et al*., 1998) [7].

Systolic and Diastolic blood pressure

Blood pressure is calculated by an instrument called a sphygmomanometer (mm/hg), more commonly referred to as a blood pressure cuff. Subjects were instructed to place the bare arm in a resting position on a table or chair keeping slightly bent at the level of the heart. The blood pressure cuff was attached around the arm above the bend of the elbow. Subjects were asked to make sure that the cuff fits snugly, press the "on" button of an electronic cuff once it has indicated it is ready. The research scholar watched the cuff inflated to 200. Then, it deflated slowly, flashing two sets of numbers when finished. These are systolic and diastolic measurements that indicate arterial pressure between beats (Tholl *et al*., 2004) [17].

Table 1: Yoga protocol training schedule

Training	
Prayer	1.5 minutes
Sun Salutation	6 minutes
Yogasana	21 minutes
Standing Postures	
Vrikshasana	
Garudasana	
Natarajasana	
Ardh Chakrasana	
Sitting Posture	
Ustrasana	
Shasankasana	
Paschimotanasana	
Ardh Matsyendrasana	
Prone Posture	
Sarvangasana	
Setubandhasana	
Bhujangasana	
Dhanurasana	
Pranayam	9 minutes
Kapalbhati Pranayam	
Bhastrika Pranayam	
Bhramri Pranayam	
Shanti Path	2.5 minutes

Statistical tool

The obtained data was explained through two parts: Descriptive and Analytical. Descriptive statistical (mean and

standard deviation) was used to describe the physiological variable. To find out the significant difference in selected physiological variables between Pre group and post group, the paired t-test was used at 0.05 level of significance, which was considered as appropriate and adequate for this study.

Table 2: Comparison of Mean scores, Std. Deviation, t-value and p-value of Respiratory Rate, Oxygen saturation Level (SpO2), Systolic Blood Pressure and Diastolic Blood Pressure of male school going Children of Garhwal

Variables	Mean	Std. Deviation	Std. Error Mean	t- value	Df	p- value
Respiratory Rate - Post Respiratory Rate	2.43	6.85	1.06	2.30	41.00	0.03
Pre Oxygen Saturation Level (SpO2) - Post Oxygen Saturation Level (SpO2)	0.21	1.59	0.24	0. 88	41.00	0.39
Pre Systolic Blood Pressure - Post Systolic Blood Pressure	14.07	109.29	16.86	0.83	41.00	0.41
Pre Diastolic Blood Pressure - Post Diastolic Blood Pressure	4.79	9.67	1.49	3.21	41.00	0.00

Table-2 reveals that mean and standard deviation scores difference of pre and post data of Respiratory Rate, Oxygen Saturation Level (SpO2), Systolic Blood Pressure and Diastolic Blood Pressure of school going children had been found 2.43±6.85, 0.21±1.59, 14.07±109.29 and 4.79±9.67 respectively.

Table-2 also shows that there was found significant difference was mean scores of Respiratory Rate because t-value is 2.3 and P-value is 0.03 which is less than 0.05.

Table-2 also shows that there was not found significant difference mean scores of Oxygen Saturation Level (SpO2) because t-value is 0.88 and P-value is 0.39 which is not less than 0.05.

Table-2 also shows that there was not found significant difference mean scores of Systolic Blood Pressure because t-value is 0.83 and P-value is 0.41 which is not less than 0.05.

Table-2 also shows that there was found significant difference was mean scores of Diastolic Blood Pressure because t-value is 3.21 and P-value is 0.00 which is less than 0.05.

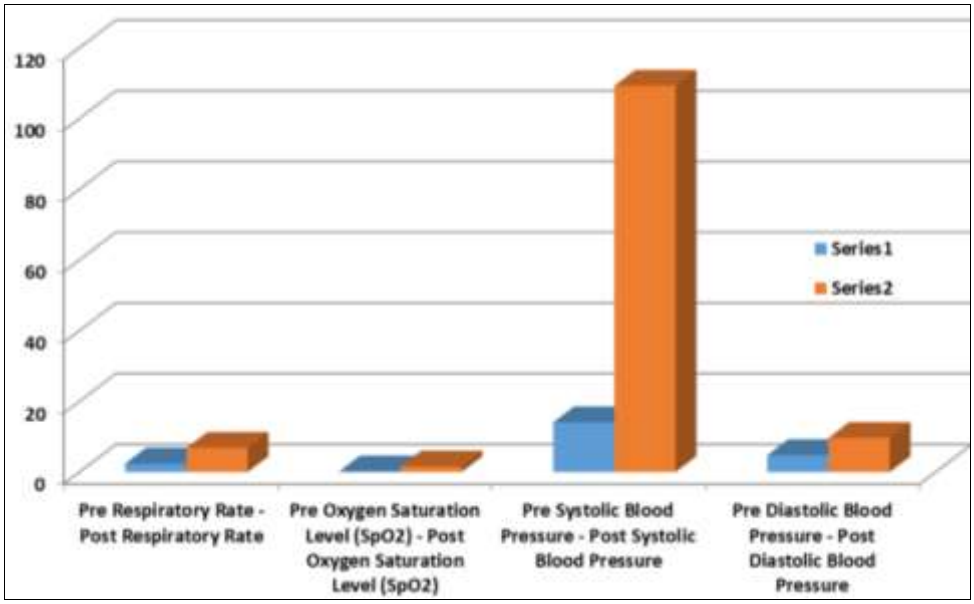

Fig 1: Graphical Representation of Respiratory Rate, Oxygen saturation Level (SpO2), Systolic Blood Pressure and Diastolic Blood Pressure of male school going Children of Garhwal

Results and Discussions

The aim of this study was to assess and compare the selected physiological variables between pre and post data of school going children in hilly region. Results of the study shows that physiological effect after yoga intervention, have higher mean and standard deviations than with the same group before yoga intervention in variables such as Respiratory rate, SPO2 (Oxygen saturation level), Blood Pressure. - For evaluation of the data Paired sample t-test was applied. The level of significance was set at 0.05. Results revealed significant differences between pre and post-tests of the experimental group in leg Respiratory Rate (t =2.30) and diastolic Blood Pressure (t =3.21), and the results did not reveal a statistically significant effect of yoga protocol on SpO2 (t-value=0.88) and Systolic Blood Pressure (t-value=0.83). Students showed significant differences in physiological variables between pre and post group. The regular practice of meditation helps to reduce systolic and diastolic blood pressures Practitioners might have gone through the continuous practice of pranayama that has affected the respiratory rate and breath-holding of practitioners (Beutler, Beltrami, Boutellier, & Spengler, 2016). Despite corpus of research on the students, there is lack of evidence on how yoga can help the school students of mainly living in the hilly region. Hence further research is needed to check the impact of yoga and its potential benefits on school going students of hilly region. Yoga offers many positive effects on cognitive faculties, reduction of stress, and emotional intensity. Previous studies were mainly conducted on unhealthy or relatively elder subjects. The focus was generally on physical and neurological benefits. Further investigation is required to study the potential benefits of yoga on healthy school going students of hilly region in the functions of the vital organs and their relation with physiological parameters. In this study the effects of yoga practices on Physiological variables such as respiratory rate, SPO2 (Oxygen saturation level), Blood Pressure, Pulse rate, Vital capacity are analysed on school students of Hilly region.

Conclusion

From the above findings, the obtained data on the subjects through the application of statistical technique revealed that Respiratory Rate, Systolic Blood Pressure, Diastolic Blood Pressure, And SpO2 after the intervention was better than the same group before intervention. And also found significant differences among the physiological variables of student between before and after effect of intervention in same group. Based on the outcomes of the study, we are able to conclude that the Yoga gives positive effect on physiological variables in students and may effectively Increase SpO2, suggesting improved oxygen delivery and decreased DBP, indicating reduced stress and improved cardiovascular health. While SpO2 and Systolic Blood Pressure did not show a statistically significant difference, the observed effect size warrants further investigation with a larger sample size. The test data obtained from this study provide a good baseline and reference for the better health of students and decreasing the chances of non-communicable diseases. It also enabled the physical as well as physiological strength and weakness of the players, so that appropriate training programs could be designed to improve their health.

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