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Effects of Yoga and Pranayama on Human Reaction Time and Certain Physiological Parameters in Normal and Obesity College Male Students

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Abstract

Yoga is a process of gaining control over the mind, as defined by Patanjali. Stress has been implicated as one of the major causes of essential obesity. Yoga works on every cell of the body. Yoga influences body as well as controls the stress in the individual. An index of the processing ability of central nervous system and a simple means of determining sensory-motor performance is referred to as reaction time (RT). It has been proclaimed that human performance including central neural processing is improved by yoga training. It improves cardio respiratory performance, balances autonomic nervous system, decreases pulse, respiratory rate, systolic and diastolic blood pressure. To show the effects of yoga and pranayam on auditory and visual RT and on certain physiological parameters such as weight, body mass index, pulse rate, respiratory rate, systolic blood pressure, and diastolic blood pressure in normal and obesity men. This comparative type of study included 30 normal and 30 obesity. It was carried on subjects between 17 and 25 years of age. Auditory reaction time (ART) and visual reaction time (VRT) were studied in subjects with "Response Analyzer" reaction time apparatus. The physiological parameters such as weight, body mass index, pulse rate, respiratory rate, systolic blood pressure, and diastolic blood pressure were measured. Parameters were measured in two sittings; on admission to yoga center and after six Weekes. Statistical software STATA Version 10.0 was used for statistical analysis. Result: It was found that changes in the RT and physiological parameters were significant in normal students when compared with obesity individuals. Conclusion: Yoga is a helpful intervention in obesity students. Yoga and pranayama are more beneficial to obesity students. RT is an index of cortical arousal, and a decrease in it indicates an improved sensory-motor performance and an enhanced processing ability of the central nervous system.

Keywords: Yoga; Pranayama, Reaction time; Hypertensive Subject.

Introduction

Yoga is a process of gaining control over the mind, as defined by Patanjali in his second aphorism (Yoga Sutras: 1.2). Life style related diseases such as coronary artery disease, obesity are shockingly on the increase in our modern society. Stress has been implicated as one of the major cause of essential obesity. Treatment by weight reduction, yoga, and muscle relaxation each produces smaller unappreciable changes in blood pressure. Yogic techniques especially Dhyana and Shavasana improve attentiveness. Increased attentiveness decreases reaction time. The time interval between the application of a stimulus and the emergence of appropriate voluntary response by a subject is called RT. It involves stimulus processing, decision making, attention mechanism, and response programming. With this point of view, we aim to study the degree of effect that yoga brings in normal subjects when compared with obesity subjects in terms of human RT, blood pressure, and various other physiological parameters. This study shows the effects of yoga and pranayama on auditory and visual reaction time and on certain physiological parameters such as weight, body mass index, pulse rate, respiratory rate, systolic blood pressure, and diastolic blood pressure in normal and obesity college level men subjects.

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Materials and Methods

The sample of study consists of sixty (n=60) male students of S.I.V.E.T College Gowrivakkam TamilNadu, who are randomly selected as subjects. Further, the subjects are divided equally into two groups, thirty (n=30) normal students and thirty (n=30) obesity male students. The age of students ranged between 17 to 25 years. Tools to measure the human reaction time and certain physiological parameters Exclusion criteria. The Subject already practicing yoga and pregnant women were also excluded. Planned Intervention: After taking consent, a detailed history of the subjects was taken. General and systemic examination of the subjects was done. After screening with physical examination,

subjects underwent yogic session daily for one and-a-half hour duration from 6 am to 7.30 am in the morning for a period of 45 days (i.e., six weeks). The session started with Awayawa–dhyana and a short prayer, followed by various asanas such as paschimottanasan, vrukshasan, tadasan, padmasan, ardhpadmasan, pranayam, and meditation and ended with a short prayer.

Table 1
Effect of Yoga on Different Parameters

VARIABLES	GROUP	Pre Test	Post Test	SD	t	P
Weight (kg)	Normal	70.11 ± 5.29	67.17± 5.42	3.04± .77	0.0030**	<0.0001**
	Obesity	71.39 ± 8.20	67.26± 7.44	4.28± 1.53		
BMI (kg/m2	Normal	26.27± 2.71	25.23± 2.71	1.15± 1.22	0.0055**	<0.0001**
	Obesity	26.12± 3.47	24.62± 3.15	1.54± 0.59		
Pulse rate (beats/min)	Normal	72.7± 3.19	69.31± 2.85	3.15± 2.64	0.0104*	<0.0001**
	Obesity	76.72± 4.63	72.24± 3.79	4.78± 2.01		
Respiratory rate (respiration/min)	Normal	14.42± 2.37	11.90± 1.51	3.00± 2.33	0.0004**	<0.0001**
	Obesity	17.4± 2.04	12.9± 1.58	4.37± 1.50		
SBP (mm Hg)	Normal	116.45± 2.68	112.05± 1.95	4.63± 1.99	0.0004**	<0.0001**
	Obesity	136.11± 7.88	130± 7.01	6.20± 3.05		
DBP (mm Hg)	Normal	76.02± 2.95	71.73± 2.31	4.70± 1.90	0.0013**	<0.0001**
	Obesity	88.0± 4.34	82.25± 3.79	5.83± 1.83		
ART (milliseconds)	Normal	181.05± 9.93	166.31± 6.50	15.55± 6.01	0.0442*	<0.0001**
	Obesity	184.5± 10.18	166.78± 8.22	17.88± 6.54		
VRT (milliseconds)	Normal	196.17± 5.28	185.25± 4.72	10.91± 4.72	<0.01**	<0.0001**
	Obesity	192.25± 8.33	176.35± 6.76	15.9± 5.62		

*$p < 0.05$, statistically significant; **$p < 0.01$.

Parameters were measured on admission to physical education department (i.e., on the 1st day and after six Weekes). Parameters measured were age (years), height (cm), weight (kg), body mass index (BMI) (kg/m2), pulse rate (beats/min), respiratory rate (respiration/min), blood pressure (mm Hg). RT (milliseconds) was measured by "Response analyzer." Statistical Analysis: Clinical parameters were compared between the 1st days and after six Weekes in normal and obesity subjects by performing paired t-test. Categorical variables were compared by $\chi 2$ -statistics. All the tests were two-sided. P<0.05 was considered as statistically significant. Statistical software STATA Version 10.0 was used for data analysis.

Result

Weight, BMI, pulse rate, and respiratory rate were found to be significantly decreased in obesity student when compared with normal student. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) also decreased significantly in obesity student when compared with normal student. The decrease in ART and VRT was statistically significant in obesity student when compared with normal student. The subjects were given yoga training including asanas, pranayam, and meditation for six week. Physiological parameters such as weight, BMI, pulse rate, respiratory rate, SBP and DBP, ART, and VRT were studied at the beginning of the study and after six week.

Discussion

In accordance to our finding, Khadka showed significant decrease in body weight after yoga. Khadka and Tundwala showed statistically significant reduction in BMI, similar to our results. The mechanism of the beneficial effect of yoga in the management of obesity cannot be explained by simple excess caloric expenditure because practice of asanas does not bring about increased, rapid large muscle activity and energy generation. However, yoga in the management of obesity is of significance. Pulse Rate (Beats/Min): Bharshankar, Vijayalakshmi and Khadka showed significant reduction of pulse rate after yoga training. These results are similar to our study. Slow breathing as in yogic practice enhances heart rate variability and bar reflex sensitivity by desynchronizing inherent cardiovascular rhythms. This is owing to increased vagal modulation. Yoga-based guided relaxation helped in the reduction of sympathetic activity with reduction in heart rate, skin conductance, oxygen consumption, and increase in breath volume. Statistically significant reduction in pulse rate after regular practice of yoga is attributed to increased vagal tone. Decreased sympathetic activity reduces catecholamine secretion and also leads to vasodilatation leading to improvement in peripheral circulation. Regular yogic practices reduce basal metabolic rate and resting oxygen consumption. All these may be responsible for reduction in resting pulse rate. Respiratory Rate (Breaths/Min): Our results are similar to the findings of Doijad and Surdi and Abel. They found significant decrease in RR. Recitation of the yoga

mantras (chanting) slowed respiration to almost exactly six breaths per minute and enhanced heart rate variability and bar reflex sensitivity. By following pranayama for few weeks, the bulbopontine complex is adjusted to a new pattern of breathing which is slower than its basal rhythm causing decrease in respiratory rate. During daily practice of pranayama, the fundamental activity of bulbopontine complex is altered in such a way as to bring down its rhythm by voluntarily extending the phases of inspiration and expiration by stretching to their fullest extents, thus making the lungs to work to their maximal extent to take O2 and expire CO2 maximally Systolic Blood Pressure (mm Hg): In accordance to our finding, studies done by Sundar, Murugesan and Dickinson. Different mechanisms have been postulated to explain the blood pressure-lowering effect of weight loss, a reduction of extracellular volume thus decreasing cardiac output, suppression of the sympathetic nervous system, an improvement in insulin resistance, and a normalization of the Aldosterone-Renin interrelationship. The blood pressure-lowering effect of weight loss is most likely a result of an improvement in insulin sensitivity and a decrease in sympathetic nervous system activity and occurs independent of salt restriction.

Regular meditation practice may bring down age-related thinning of the frontal cortex. Increased cortical thickness could be owing to greater arborization per neuron, increased gill volume, or raised regional vasculature. The right anterior insular is associated with bodily attention and raised visceral awareness. Increased thickness in this region is associated with increased capacity for awareness. The right hemisphere is essential for sustaining attention, which is a center for insight meditation. It has been obesity that by becoming increasingly more aware of sensory stimuli during formal practice, the meditation practitioner is progressively able to use this self-awareness to more successfully navigate through potentially stressful encounters that emerge throughout the day. Long-term meditation practice is linked with modified resting electroencephalogram patterns, indicative of long-lasting alterations in brain activity. Meditation reflects cognitive brain functions such as sequential information processing, stimulus discrimination, and short-term memory. Yoga reduces physiological arousal, simultaneously improving performance on tasks requiring attention.

Conclusion

It was found that changes in the physiological parameters were significant in obesity student when compared with normal individuals. Yoga is a helpful intervention in obesity student. Yoga and pranayama are more beneficial to obesity student than normal individuals. In normal student, yoga is helpful for keeping the parameters at the baseline, which plays a role in prevention of the disease. Pranayam and meditation improve (a) sensory information processing ability; (b) central integration of learning and memory, and (c) motor function and coordination, visual scanning, mental flexibility, sustained attention, psychomotor speed, and speed of information processing. These skills improves sustained attention. This probably improves ART and VRT. This is of applied value in conditions needing faster creativeness such as sports, machine operation, race driving, and specialized surgery. It may also be of value to train mentally challenged children and older sports persons who have prolonged RT. Moreover, yoga and pranayam reduce weight, pulse rate, and blood pressure, which are the risk factors for noncommunicable diseases.

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