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ROLL OF PRANAYAM BREATHING ON HUMAN ELECTROCARDIOGRAM AT DIFFERENT TEMPERATURES

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Abstract—

This paper presents the effect of pranayam breathingon human electrocardiogramat different temperatures. An electrocardiogram (ECG) is a graphic recording of your heart's electrical activity. . Simply put, heartbeats are the result of this electrical activity in the cells of the heart.The person is doing pranayamfor ten minutes at room temperature. We record the ECG of human being at room temperature.After that person is seating inside the chamber. The

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temperature inside the chamber can be increased by infrared lamp. Then same Pranayam can be carried out for ten minutes but at higher temperature. Again record the ECG'Sat different higher temperatures. The temperature inside the chamber can be decreased by AC. Again record the ECG'S at different lower temperatures.It is found that the ECGS becomes changes after Pranayam at different higher & lower temperatures.

Index Terms—electrocardiogram, heart rate, infrared lamp,Pranayam

I.INTRODUCTION

A. Pranayam

In yogic terms prana means the vital energy and ayam means exercise. Pranayam defines the regulation of the inand out flow of this vital energy. It explains that the body, breath and the mind are intricately interwoven. Whenthe air moves the mind moves and when the air is stilled the mind also could be stilled. Hence the varioustechniques employed in Pranayam are to stabilize the flow of air. All over the world, cardiovascular disease imposes a significant morbidity and mortality. In spiteof greatly improved diagnostic and curative cardiology, millions die of heart disease every year. In India, heartdisease was relatively uncommon 50 years ago. However, there has been an alarming increase in Pranayam is an ancient Indian science and its practice is known to improve and maintain health status by improving cardio-vascular, cardio-respiratory and other functional capabilities and also prevent various ailments.

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B. Electrocardiogram (ECG)

An electrocardiogram is a graphic recording of your heart's electrical activity. Simply put, heartbeats are the result of this electrical activity in the cells of the heart. These electrical impulses cause the muscles of the heart to contract and relax in a regular rhythm, creating the pumping action that moves the blood through the body's circulatory system. The ECG records the patterns of that electrical activity. 'Electrocardiogram' is often abbreviated 'cardiogram,' ECG, or EKG (Greek for heart is Kardio, hence the 'K' which is sometimes used instead of a 'C'). Normally, electrical impulses move unimpeded throughout the heart and play an important role in causing the heart to beat. An electrocardiogram can provide considerable information about the health and functioning of your heart. Your doctor can learn about your heart rhythm, the chambers of your heart, the functioning of your heart muscle, whether the heart is enlarged or thickened, and whether you had a heart attack in the past. Abnormalities of the electrical conducting system can also be detected by an ECG.

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Human ECG signal over one Cardiac Cycle.

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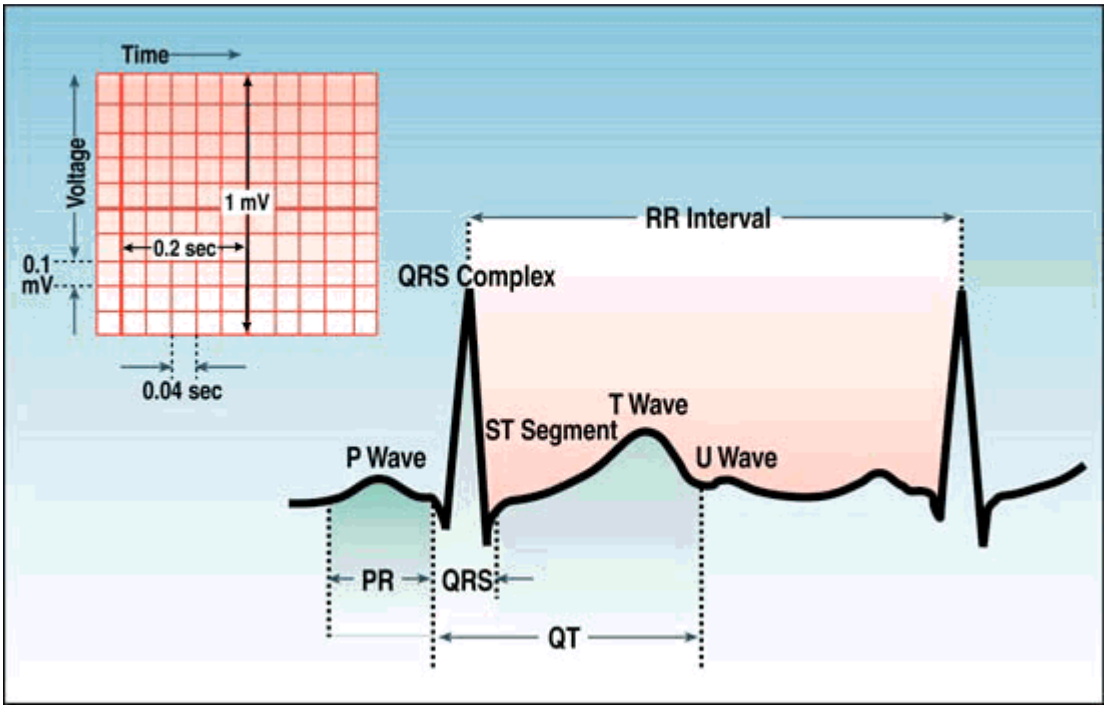

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Electrodes (or leads) are attached to your arms, legs, and chest. The electrodes detect the electrical impulses generated by your heart, and transmit them to the ECG machine. The ECG machine produces a graph (the ECG tracing) of those cardiac electrical impulses. The electrodes are then removed. The test takes less than 5 minutes to perform.

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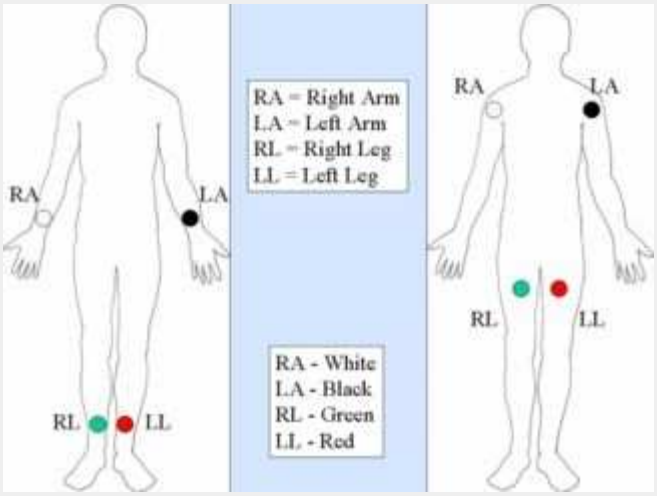
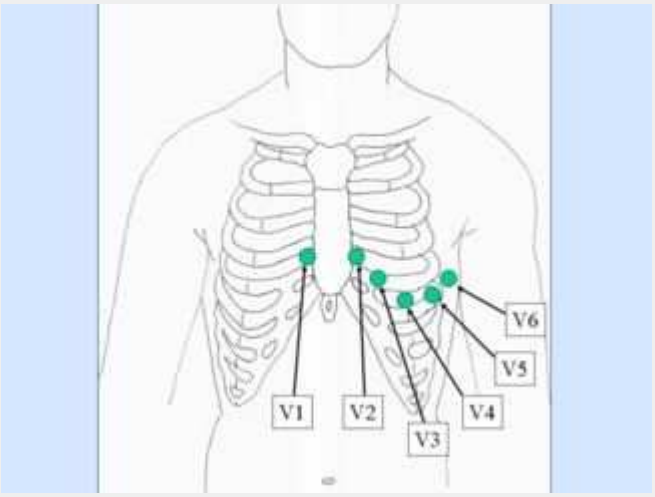
Lead placement for arms and legs



Lead placements for chest



C. Heart rate

Heart rate is the number of heartbeats per unit of time, typically expressed as *beats per minute* (bpm). Heart rate can vary as the body's need to absorb oxygen and excrete carbon dioxide changes, such as during exercise or sleep.The measurement of heart rate is used by medical professionals to assist in the diagnosis and tracking of medical conditions. It is also used by individuals, such as athletes, who are interested in monitoring their heart rate to gain maximum efficiency from their training. The *R wave to R* heart rate (HR) is readily calculated from the ECG as follows:

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HR = 1,500/RR interval in millimeters, HR = 60/RR interval in seconds, or HR = 300/number of large squares between successive R waves. In each case, the authors are actually referring to instantaneous HR, which is the number of times the heart would beat if successive RR intervals were constant. However, because the above formula is almost always mentioned, students determine HR this way without looking at the ECG any further.wave interval (RR interval) is the inverse of the heart rate.

D. heart beat

The electric activity starts at the top of the heart and spreads down

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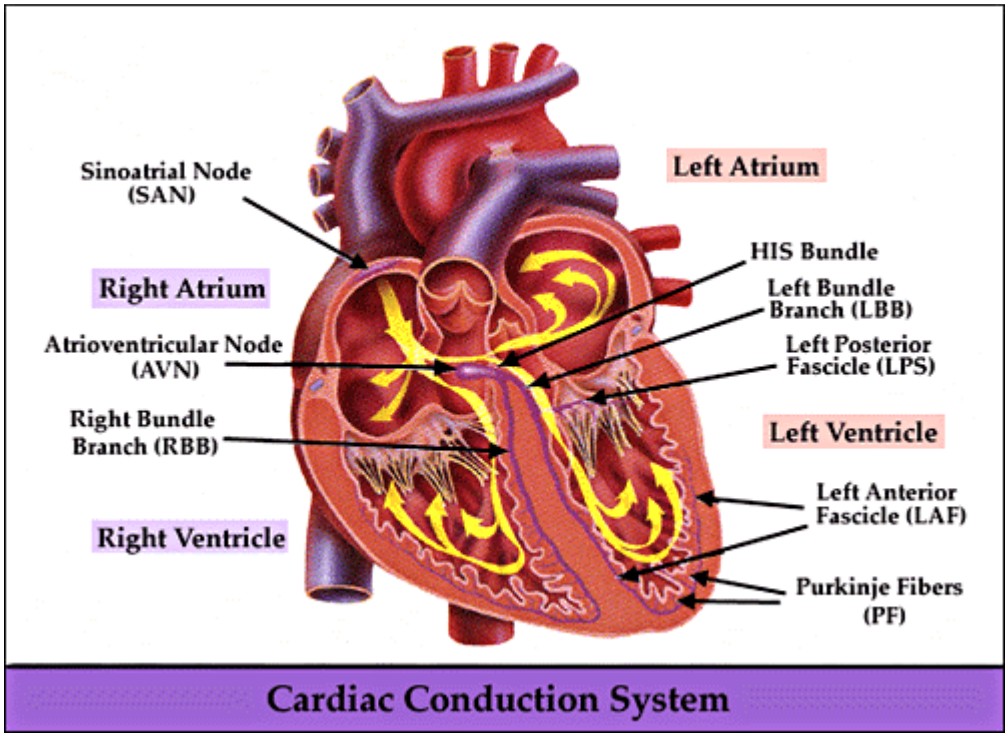

A normal heart beat is initiated by a small *pulse* of electric current. This tiny electric "shock" spreads rapidly in the heart and makes the heart muscle contract.If the whole heart muscle contracted at the same time, there would be no pumping effect. Therefore the electric activity starts at the top of the heart and spreads down, and then up again, causing the heart muscle to contract in an optimal way for pumping blood.

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II METHODS

On detail history, all subjects were nonalcoholic,non-smokers, not taking any drugand were having similar dietary habits,physical and mental activities in workingand home atmosphere. They were subjectedto clinical examination and found healthy.Data on physical characteristics wasobtained such as age, height, weight, diet, hemoglobin, which was showingno significant difference in between Pranayam and control group when subjected toThe somenormal human being where selected for study.ECG leads are attached to the body while the person lies flat on a bed or table. Leads are attached to pre-defined positions. A small amount of gel is applied to the skin, which allows the electrical impulses of the heart to be more easily transmitted to the ECG leads.First of all the person is doing pranayam for ten minutes at room temperature. We record the ECG of human being at room temperature. After some time the person is seating inside the chamber. The temperature inside the chamber can be increased by infrared lamp. Then same Pranayam can be carried out for ten minutes but at higher temperature. The temperature inside the chamber can be measured by thermometer. Again

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record the ECG'S at different higher temperatures. The temperature inside the chamber can be decreased by AC. The temperature inside the chamber can be measured by thermometer. Again record the ECG'S at different lower temperatures. Lastly interpret ECG in different conditions.

III RESULTS& DISCUSSION

Present study was a case-control study.There were 30 subjectsof both sexes. Here we present result of 15 subjects.All are vegetarian. The parameters of age, weight, height, BMI (Body Mass Index) are given in table 1. The heart rate of different higher temperatures inside the chamber is given in table 2. The heart rate of different lower temperatures inside the chamber is given in table 3. It found that the Heart rate & R-R intervals arechanges in high & low temperature shown in table 2 & table 3 respectively.

Table 1

Sr.No	Parameters of subject	Mean
1	Age (Years)	38 $\pm$ 6.57
2	Weight (KG)	72 $\pm$9.81
3	Height (Cm)	168 $\pm$ 6.09

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4	BMI(Kg/m^2)	27.54 ± 7.13

Parameters of subjects

HEART RATE (TABLE 2)

	Normal ECG At room temp. (ECG 1)	AfterPranayamathigh temperature (35 ^{0}c) (ECG2)	AfterPranayamat very high temperature (42^{0}c) (ECG3)
lead I	57.6±0.9bpm	69± 1.2bpm	78.94± 1.0bpm
lead II	60.07± 0.7bpm	70.78±1.1bpm	70.95± 1.1bpm
lead III	63.06± 1.1bpm	66.64± 1.2bpm	67.40± 1.2bpm

It also found that the R-R interval is reduced. This will affect on heart rate. Heart rate goes on increases which are as shown in table2.

HEART RATE (TABLE 3)

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	Normal ECG At room temp. (ECG 1)	After Pranayam at low temperature (23^0c) (ECG2)	After Pranayam at very low temperature (19^0c) (ECG3)
lead I	57.6± 0.9bpm	56± 1.2 bpm	55.94 ± 1.0bpm
lead II	60.07± 0.7bpm	59.78 ±1.1bpm	57.95 ± 1.1bpm
lead III	63.06 ± 1.1bpm	61.64 ± 1.2bpm	57.40 ± 1.2bpm

This will affect on heart rate. Heart rate goes on decreases which are as shown in table3.

IV DISCUSSION

To the best of our knowledge no studyhas been carried out showing effect of Pranayamon parameters at different temperature.Environmental conditions and variety of behavioral factors such as stress, anxiety,affective and attitudinal dispositions of theindividual influence the cardiovascularresponses. Pranayaminvolves physical,mental and spiritual task in a comprehensivemanner. It brings about the behavioralchanges. Pranayam in long duration affectshypothalamus and brings about decreasein the systolic and diastolic BP throughits influence on vasomotor centre, whichleads to reduction in sympathetic tone and peripheral resistance

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V CONCLUSIONS

A number of investigations indicate that change in heart rate has emerged as a new risk factor for mortality in homoeothermic mammals, particularly cardiovascular mortality in human beings. The improvement in ECG in subjects indicated the positive effect of Pranayam. Although Pranayam was not an adequately stressful breathing exercise to produce the change in COPD patients, it improved the respiratory distress and quality of life as indicated by the significant increase in VAS in patients. It was also interesting to note the shift of the autonomic balance towards sympathetic which may suggest that this could be a better coping mechanism induced by Pranayam breathing.

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