CHAPTER III

METHODOLOGY
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The investigator described about the subjects selection, variables selection, reliability of instrument, tester competency, test reliability, subject reliability, orientation of testers test administration and the statistical techniques employed for the determination of various temperatures in this particular chapter.

The research scholar, sought the permission from the Head of the Department, Christ College, Irinjalakkuda, Thrissur, Kerala to conduct the tests in the college

SUBJECTS SELECTION

This investigation had to analyse the influence of seasonal and environmental temperatures on physiological, haematological functions and performance in Athletics. To achieve this purpose 40 boys students have been selected from 1st year, 2nd year and 3rd year from the B.P.E course, Christ College, Irinjalakkuda, Thrissur, Kerala.

The students belonged to different parts of Kerala state and were varied in their socioeconomic status. All the students had fairly well developed physique and all of them are regular in morning health conditioning programme.

In order to ensure full co-operation from the subjects, the scholar explained the requirements, the importance of this study and the subjects voluntarily agreed to undergo the prescribed tests.

SELECTION OF TESTS

In the current exploration ultimate and consistent tests were used to assess the selected physiological, haematological and performance variables. The investigator very much confident about the tests selection and it is very appropriate to this investigation.
### Table I

Tests used for Criterion Variables

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Variables</th>
<th>Instruments/Measurements/Principles</th>
<th>Unit of measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Heart rate</td>
<td>Digital Blood pressure monitor</td>
<td>Number</td>
</tr>
<tr>
<td>2</td>
<td>Respiratory rate</td>
<td>Expirograph</td>
<td>Number</td>
</tr>
<tr>
<td>3</td>
<td>Diastolic Blood pressure</td>
<td>Digital Blood pressure monitor</td>
<td>Hg and in Beats/min</td>
</tr>
<tr>
<td>4</td>
<td>Systolic Blood pressure</td>
<td>Digital Blood pressure monitor</td>
<td>Hg and in Beats/min</td>
</tr>
<tr>
<td>5</td>
<td>Bodytemperature</td>
<td>Digital thermometer</td>
<td>Centigrade</td>
</tr>
<tr>
<td>6</td>
<td>Haemoglobin</td>
<td>Spectrophotometry at 555nm</td>
<td>$10^6/\mu$L</td>
</tr>
<tr>
<td>7</td>
<td>Red blood cells</td>
<td>Impedancemetry</td>
<td>g/dL</td>
</tr>
<tr>
<td>8</td>
<td>White blood cells</td>
<td>Impedancemetry</td>
<td>$10^6/\mu$L</td>
</tr>
</tbody>
</table>

#### Haematological variables

| 9     | 100Mts Dash                | Digital stopwatch                                    | 1/10\textsuperscript{th} of a second                |
| 10    | Putting the Shot           | Measuring tape                                       | M/Cm to 1/10\textsuperscript{th} Cm                |
| 11    | Long jump                  | Measuring tape                                       | M/Cm to 1/10\textsuperscript{th} Cm                |
CALIBRATION OF THE INSTRUMENTS

In this investigation standard equipments were used to assess the selected physiological, Haematological and performance variables. The stopwatches, Digital sphygmananometer, Thermometer, Measuring tapes available at Christ College, Irinjalakkuda, Department of Physical Education were used to quantify speed, Bp, explosive strength, body temperature and shoulder strength performance. The equipments were purchased from reputed firms which ensure reliability.

The blood samples were analysed for Hb, RBC, and WBC in Doctors’ diagnostic center lab nearby Christ College, Irinjalakkuda, Thrissur, Kerala. For the blood analysis, standard solutions, reagents and chemicals were used.

RELIABILITY OF DATA

The data was collected with utmost genuine and correct. The investigator took much effort to collect the correct data without error. Hence the provided data is found to be more accurate and contributing to the study

INSTRUMENT RELIABILITY

Stopwatches were calibrated to 1/100th of a second and flexible steel tape, thermometer etcetera required for this study were all procured from reliable standard companies. Rest of the required instruments was taken from the Christ College, Irinjalakkuda, Trichur, Kerala. The instruments were of high standards and from the best companies available in the market. These were considered to be more accurate enough for the present study.

TESTER COMPETENCY AND RELIABILITY OF TEST

The tester competency was done with ample training given to the personals. Reliability of the test of physical measurement refers to the uniformity with which a particular test measures. The reliability of the test for this particular study was done by repeated tests and the best confirmed the reliability. All these were concerned with the physique of the subjects. A sample of 10 boys and 10 girls were selected for the test at random par with the age and sex of the subjects used for this study.
All those chosen criterion variables were tested and collected in three different temperatures.

Table II
THE CO-EFFICIENT CORRELATION OF THE DEPENDENT VARIABLES

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Criterion variable</th>
<th>Coefficient of correlation</th>
<th>Level of significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Heart rate (pulse count)</td>
<td>0.700</td>
<td>0.05</td>
</tr>
<tr>
<td>2</td>
<td>Respiratory rate</td>
<td>0.720</td>
<td>0.05</td>
</tr>
<tr>
<td>3</td>
<td>Diastolic blood pressure</td>
<td>0.780</td>
<td>0.05</td>
</tr>
<tr>
<td>4</td>
<td>Body temperature</td>
<td>0.896</td>
<td>0.05</td>
</tr>
<tr>
<td>5</td>
<td>Systolic blood pressure</td>
<td>0.728</td>
<td>0.05</td>
</tr>
<tr>
<td>6</td>
<td>Haemoglobin (Hb)</td>
<td>0.900</td>
<td>0.05</td>
</tr>
<tr>
<td>7</td>
<td>Red blood cells (RBC)</td>
<td>0.926</td>
<td>0.05</td>
</tr>
<tr>
<td>8</td>
<td>White blood cells (WBC)</td>
<td>0.923</td>
<td>0.05</td>
</tr>
<tr>
<td>9</td>
<td>100 Mts Dash</td>
<td>0.890</td>
<td>0.05</td>
</tr>
<tr>
<td>10</td>
<td>Putting the shot</td>
<td>0.874</td>
<td>0.05</td>
</tr>
<tr>
<td>11</td>
<td>Long jump</td>
<td>0.913</td>
<td>0.05</td>
</tr>
</tbody>
</table>

All the criterion variables were significant at 0.05 levels and this reveals that all the test items are reliable. Therefore, these tests were used in this study.

SUBJECT RELIABILITY
The repeated test re-test showed the validity of the data and consistency of the performance of the subjects which is found to be more reliable

ORENTATION OF THE TESTER

Since the investigator alone could not organize the administration of the tests, 3 research scholars of Physical Education to serve as testing personals. The intention of the present research, the procedure of the test, how to score a reading were clearly explained and demonstrated to the testers. The investigator had overall supervision on the subjects and the testers. All the testers performed their duty to the utmost gratification.

ORENTATION OF THE SUBJECTS

Prior exploration, the investigator informed the rationale of the study and concise preface of the effect of different varying environmental temperature and seasonal changes in performance and administering the tests. The way of doing each test was demonstrated and explained to subjects by the researcher. Subjects co-operated in their best during the course of experimentation.

VARIABLES

The dependent variables of this study will be as follows:

* Performance in selected track and field events viz, 100 M Dash, Long jump and Putting the Shot

* Physiological parameters viz, HR (Heart Rate), RR (Respiratory Rate), BP (Blood Pressure), Body temperature.

* Haematological (Haemoglobin, R.B.C, and W.B.C.)

The independent variables were the environmental temperature (three times ie, morning, noon, and evening) during main four consecutive seasons viz monsoon, spring, winter and summer
CRITERION MEASURES

Track and Field events measurements were taken as follows:

* 100 M running performance (i.e. Speed ability) was assessed in seconds by a stopwatch nearest to 1/10th of a second.

* Performance of Long Jump (explosive power of the legs) was measured by a measuring tape in M/Cm nearest to 1/10th of a centimeter.

* Shot Put performance (i.e. explosive power of arms) ability was assessed by a measuring tape in M/Cm nearest to 1/10th of a centimeter

* An Expirograph was set up to record the respiratory rate in one minute

* Blood Pressure and Heart Rate were assessed with the help of a digital Sphygmomanometer in mm. Hg and in Beats/min, respectively.

* The body temperature (including oral) was assessed by a thermometer

The items were not complicated and were simple as well as easy to operate on the subjects

The investigator reviewed the available scientific literature and on the basis of discussion with experts. It has been confirmed that the topic is feasible to work out and the instruments measuring the variables were readily available.

DATA COLLECTION

A rise in body temperature is it from environmental factors or a medical condition causes an increase in the heart rate. Whenever performing vigorous work out practice, body temperature increase radically, this is followed by a rapid heartbeat. Frontal passages may have a profound impact on well-being and mortality as large variations in weather conditions can occur instantly. Quick changes in temperature shown to create a number of physiological changes in the body. Swift drops may affect blood pH, Bp, urinary volume, and tissue permeability.
The thermal environment of man begins at the skin surface and extends outward to the surrounding media, which consist of the air that he breathes; the clothing that he wears; man-made sources of heat and cold necessary for health and comfort; heat, cold, and humidity caused by weather; and exposure to solar radiation. All these factors are characterized by temperature, or they in some way affect the heat transfer from the skin surface by radiation, convection, conduction, or evaporation.

The environmental variables in the basic heat balance equation that must be measured are the ambient air temperature, the mean radiant temperature or effective radiant field, the ambient water vapor pressure or humidity, air movement as it affects the convective and evaporative heat loss, and clothing insulation.

During exercise, evaporation is usually the primary mechanism of heat dissipation. The evaporation of sweat from the skin’s surface assists the body in regulating core temperature. If the body cannot adequately evaporate sweat from the skin’s surface, core temperature rises rapidly. A side effect of sweating is the loss of valuable fluids from the limited pool, inside the body, the tempo being associated to implement amount, character difference, ecological circumstances, adjustment state, clothes and inception hydration status.

Athletes whose sweat loss exceeds fluid intake become dehydrated during activity. Therefore, a person with a high sweat rate who undertakes intense exercise in a hot, humid environment can rapidly become dehydrated. Dehydration of 1% to 2% of body weight begins to compromise physiologic function and negatively influence performance. Dehydration of greater than 3% of body weight further disturbs physiologic function and increase an athlete’s risk of developing an exertional heat illness (ie heat cramps, heat exertion and heat stroke). This level of dehydration is common in sports; it can elicited in just an hour of exercise or even more rapidly if the athlete enters the exercise session dehydrated.

The body temperature depends on the difference between heat produced and the temperature lost. Heat is lost by radiation, convection, and conduction, but the net loss by all three processes depends on a gradient between the body and the outside. Consequently, when the outside temperature is stumpy, radiation is the most important form of heat loss. When the external temperature is high, evaporation is the most important form of heat loss. The
equilibrium of heat production and heat lost maintains a constant body temperature. On the other hand, temperature varies throughout the day, and this point is restricted by the hypothalamus.

When body temperature drops due to outside cold, a vital part of protection is vasoconstriction of skin and limb blood vessel. This decline the exterior temperature provides an outer coating layer (such as the fat cell layer) between the core temperature and the outside atmosphere. Like that, when the body temperature elevated, the blood flow to the membrane increases. Therefore, when the skin blood vessel is dilated through alcohol intake, this might give a nice warm shine, but it would increase heat loss (if the external temperature were still low). The main adjustment in the cold air to shiver to increase heat production, and squeeze blood vessels in the outside edge and skin. This helps to reduce heat loss through the skin, and direct blood to the essential domestic organs (Frisancho, 1979).

Almost all the indigenous sports and games of Kerala became vanished-off by the 21st century. Thalappanthukali, Onathallu, Parichamuttukali, Velakali, Kalaripayattu, now a day’s became just an art demonstrated during temple festivals. Kalaripayattu was considered as the mother of all other martial arts of Kerala, was skillful as domestic martial sport of Kerala. Another interesting sport of Kerala is the boat race, predominantly the race of Snake boats.

Foot ball, cricket became the popular and favorite games of Kerala very recently. All these games were introduced in Malabar region during British period. Volleyball is another famous game of Kerala which is used to play in. Jimmy George was a top class performer in this field of volley ball and admired by all Keralites. Further almost all national games were played in Kerala. To put it briefly Kerala is a land of all sportive events.

Thrissur is one of the main districts in Kerala state. It is situated in the middle part of the state. It is known to be the cultural city of Kerala. Temples, churches, mosques were the main attraction of this place. Irinjalakkuda is situated in Trissur district. Thrissur Pooram is the most colourful and spectacular temple festival in Kerala. The Periyar, the Chalakudy, the Karuvannur, the Kurumali River (main tributary of the Karuvannur River) and the Ponnani (Bharatha Puzha) are the main river systems in the district. Irinjalakkuda is a unique district with warm and damp climate and at the same an opposite climatic nature too. Moreover she has got sufficient measure of rainfall also. The hot season of this place begins from March to May and the monsoon season
begins from June to September. And also North East Monsoon season From December to February. The rain seized by the end of October and the rest of the period is generally found to be dry. Irinjalakuda is one of the most major among these villages. Like the other villages this 'Gramam' also followed the 'Chathurvarnya' system of society which lay upon caste system based on the 'Manusmruthi'.

Christ College is situated at Irinjalakuda, in Thrissur district of Kerala. This is an aided college in co-educational sector. The college was started functioning in the year 1956 by the Carmelites of Mary Immaculate (CMI) The college runs a number of undergraduate and postgraduate courses in Arts, Commerce, and Science faculties. Moreover, the college offers professional courses like PG Diploma in Natural Disaster Management; BPE (Bachelor of Physical Education), and a number of UGC aided short-term courses.

The temperature in Irinjalakuda today is 27 °C, while humidity is 46 %. Today would be a good day for wearing cotton if you are already there. If you were looking for weather in Irinjalakuda all through February, anticipate maximum and minimum temperatures ranging from 21 to 27 °C and humidity levels of around 46 %. While the Irinjalakuda weather in March will have temperatures ranging from 14.5 to 37.8 °C. Irinjalakkuda has a tropical weather. At some stage in most months of the year, there is significant rainfall in Irinjalakkuda. There is only a small dry season. The average temperature here is 27.5 °C. Annually the precipitations fall about 3104 mm.

Based on the prevailing scenario and the knowledge enriched from earlier studies, the present research put forwarded to look at the influence of seasonal and environmental temperature on selected physiological, haematological and performance variables among college students. To achieve this purpose of investigation 40 boys students from the B.P.E course, Christ College, Irinjalakkuda, Thrissur, Kerala have been traced as the subjects. The age groups of the subjects were belonging to 18 and 21 years.

**RESOURCES OF THE DATA**

This has become even more important at a time when the state is facing the emergence and re-emergence of some of the communicable diseases along with problems resulting from the
epidemiological and statistical change. To find the way the part through the multiple challenges faced in the health sector Government of Kerala needs to articulate the policy framework under which all the stakeholders can develop their strategies.

After independence Kerala has, as a rule, follow the guidelines of the central government. The state hast to achieve a large amount of the targets to set out in these documents, for instance population stabilization and control of prevention of communicable diseases through a network of institutions modeled on the country wide, even if there were a small number of differences.

Health sector investments continued till the mid 1980s, but thereafter the pace of growth of the public health care system slowed. The shortage was made better by the private sector. The public health care expenditure (as a proportion of the gross state domestic product) decreased by 35% in 1990 and 2002, building Kerala became one of the states with the main reduction in public sector contributions and the highest increase in private funding for health care.

The changing climate will inevitably affect the basic requirements for health maintenance, unpolluted air and clean water, sufficient food and adequate shelter. Weather changes also yet another barrier to the control of infectious diseases. Various major killers are highly climate sensitive as regards to temperature and rainfall, including cholera and the loose bowel syndrome, as well as diseases including malaria, dengue fever and dengue shock syndrome and other infections carried agents of diseases. Also the issues regarding shortage and cyclic changes in the availability of fresh water, regional drop in food production, and rising sea levels, etcetera has the likely to force population imbalance with unenthusiastic health impact.

Climate Change is a new challenge for the control of infectious diseases and public health. It leads to changes in pattern of infection, emergence of communicable diseases such as H1N1, Dengue, Chikungunia, Malaria Letospirosis and other like food infections.

A physically fit and healthy individual will live longer, hence be more dynamic at work and school, and usually contribute more to the country’s growth and development. With a rapid rise of heart and other cardiovascular diseases as well as a wide range of health consciousness, the importance of leading healthy lives that include a well-balanced diet and an adequate fitness regime that embodies healthy lifestyle habits is imperative.
Conceiving the magnitude of sports and physical fitness and close linkage in sports, education and health; sports and physical education form an integral part of a school curriculum to promote all round development of children.

There is no dispute or argument for having a Physical Fitness Programme for people of the country covering all sections of the society, starting from school going children to the aged population sitting at home. Physical fitness initially was needed for survival purposes as “survival of the fittest” was the dictum. Today physical fitness is the underlying paradigm for social as well as economic well being of the country. Blood pressure, diabetes, hypertension, heart disease, etcetera prevalent in children of the country.

It is very important in various anticipated health indicators as also the present status of physical well-being that this whole problem is looked at from an really constructive and perspective of physical well being and fitness based on inculcation of physical fitness as a voluntary yet compulsory life chore rather than as a redressable health and disease concern.

The circulatory system of our body is doing many sort of adjustments to retain all sorts of losses. To maintain the normal working of our body many adjustments are done to cover up the water loss and other similar situations while exercising in heat. There will be an initial boosting in the blood flow to the surface of the skin due to the exercise. The skin surface will be heated as a result of exercise and conveyed in to the muscles. Blood will be pushed in to the skin surface after exercise once it get warmed up and there by internal temperature will be elevated. There starts dissipation via evaporation. It can occur only if the surrounding temperature is less than the skin temperature or else the gained heat will be dissipated out and further more energy loss will happen. If the intensity of the exercise is high, more amount of blood will have to be pumped into the surface area. The brain regulates the skin temperature and internal body temperature. As a result of this, blood flow to the kidneys will be reduced to supply to the skin. (Frisancho, 1979).

Vasodilation of the skin surface is afflicted by the activity of sympathetic nervous system to amplify the body temperature. When there is an increase in blood flow to the surface of the skin, the skin itself will try to decrease the thermal stress and supply more amount of oxygen to activate the muscles. In this circumstance the cardiac system will be not in a position
to meet its demands. And here the system starts a redistribution of blood because of the amplified body temperature. During this time the Bp may vary to a considerable level to cool the body.

During practice when the body temperature is lower than the normal temperature, the body chemistry will be changed. An increase in blood flow may occur which finally reaches to the condition of fatigue due to this due to this shortage comes to a swell in production of lactate and an increase in the muscle temperature.

The sample survey conducted by the Directorate of Sports & Government of Kerala in Thrissur district showed that the physical fitness standards of the school children were very low and significantly differed with their age and sex when compared to American Alliance Health Physical Education Recreation and Dance (AAHPERD) and Health Related Physical Fitness Test (HRPFT) standards.. To tackle this social problem, Government of Kerala launched the Total Physical Fitness Program (TPFP), as a joint initiative of Departments of Education, Sports, Health and LSG through the Kerala State Sports Council for boosting of physical fitness status of Kerala school children.

It is well known that Kerala enjoys a status of a role model of overall development, making it comparable with the developed nations of the world in areas such as health, education and other demographic indices. If the physical fitness level of school children in a state like Kerala is not optimal, as revealed from the statistics presented by TPFP, then the corresponding figures for the rest of the states and the national averages are expected to be less than encouraging.

Other than air temperature, both humidity and radiant heat should be assessed before athletes engage in hard training or competition in hot climatic conditions. The most frequently used heat catalog in sport is the WBGT index which includes measurements of air temperature, humidity, and uniform temperature. This temperature can be simply measured with a whirling hygrometer and a black bulb thermometer placed in a black sphere

When this climatic index exceeds 25° C and the work rate is realistically high, coaches will be aware of the negative effects on athletes. When it exceeds 28° C the coach should avoid vigorous activities for poorly conditioned and un-acclimatized athletes and be cautious of secret
code of heat intolerance. In summer seasons, training should be scheduled in the early morning or evening rather than at noon or mid-afternoon.

When our body is adjusting with the surroundings, then the thermal strain will be eased. Consequently, heart rate and rectal temperatures will come down. There will be an increase in the sweat due to the earlier work. Due to the process of acclimation the body will get fatigued very easily. Elevated temperature and humidity leads to paced heart rates.

A study on acclimatization was conducted by exercise and heat acclimation for 10 days at 45°C and 36°C. The result showed that both exercise and heat acclimatization enhanced sweating. However, heat acclimatization was able to dissipate heat better for the people. From these studies, we can conclude that by conducting training programmes by modifying or increasing energy stores, we can improve the performance (Drust, 2005).

In comfortable environments, non-sweat-related heat loss mechanisms form the bulk of heat exchange from the body. Heat transfer occurs through the transfer of energy in waves to another medium, like air. So, as the temperature around our body increases, these pathways become less effective. Worse yet, once the air temperature reach or exceed the skin temperature (usually around 93°F to 98°F).

If the atmospheric temperature is more than the body temperature the body will produce more sweat. And if the environmental temperature is more than 35°C and at the same time humidity is more, the body will maintain normal temperature through sweat evaporation. This will consume most amount of energy expenditure due to cardiac work. Hot environmental conditions certainly lead to strain in athletes and will reach to a collapsed condition of heat injuries as well as the declined performance.

When the environmental air is warm and relative humidity is high, the vapour tension of air and water is high and thus thermal sweating is not effective. Information is available to indicate that workers who are exposed to severe heat and high relative humidity can sweat at rates as high as four liters per hour over short periods of time. Because of the reduced thermal and vapour pressure gradients brought on by climates that are hot and humid, tremendous
demands are made of both the cardiovascular system and evaporate sweat mechanism. This is especially noticeable during work in the hot dry surroundings.

Athletic performance differs from laboratory studies of exercise in many ways. Perhaps one of the major differences is that the performer is influenced by a wide variety of environmental temperatures (Arnheim & Prentice, 1997). The athlete, however, may find himself competing with extreme environmental conditions like heat or cold, and wind and rain to contend with, although he may come from a country with low temperature to one with high temperature and vice versa. The regulation of body temperature is vitally important because the metabolic process involves chemical reactions, whose rates are affected by heat conditions. As a result, of even slight shifts in body temperature can disrupt the physical performance of athletes. Therefore, environmental temperature has a predominant place in the performance level in all sport and game.

In general, women and men respond similarly to heat at rest. Heat tolerance to exercise is highly related to the acclimation. With repeated exposure to work in the heat, both men and women develop lower mean core and skin temperature, a decreased heat rate and an increase in the amount of time they can withstand the stress. Men usually have a higher sweat rate than women. There are several climatic and situational factors that may lead to heat stroke even in relatively cool ambient conditions, under continuous and high heat production, such as that seen in Marathon or Ultra Marathon competitions. It would be impossible to lose heat when the environmental temperature becomes higher than body temperature. When the outside temperature rises or heat production activity of muscles increases, other internal mechanisms come into play.

When external temperatures are greater than the skin temperature and a negative gradient appears, the body is actually gaining heat by radiation and convection. When the environmental air is warm and relative humidity is high, the vapour tension of air and water is high and thus thermal sweating is not effective. Information is available to indicate that workers who are exposed to severe heat and high relative humidity can sweat at rates as high as four litres per hour over short periods of time. Because of the reduced thermal and vapour pressure gradients brought on by climates that are hot and humid, tremendous demands are made on both the
cardiovascular system and evaporate sweat mechanism. This is especially noticeable during work in hot, dry surroundings. The athletic performance is influenced quite violently due to the environment around him. There are many things athletes can do or adaptations they can make to prepare better for variations in the environment, either expected or unexpected. Training in cool climate does little to prepare the athlete to compete under conditions of extreme heat and humidity (Arnheim & Prentice, 1997).

If the inside temperature of our body raised critically, the heat produced during metabolism as well as the rate of sweat production, blood pressure and pulse count will also elevate simultaneously (Greger et al., 1996). This will help our body to eject out the surplus heat through radiation and thereby cool the surface area and as a result helps to lower the temperature.

Usually our body temperature will show very less in early morning and also will be high in the late afternoon hours. Merely changing one’s living habits such as eating and sleeping can reverse these variations. The body used to regulate its temperature in warm weather condition while doing exercise through vasodilatation. During vasodilatation, the blood flow will be more of the skin surface and thereby improves convey of heat production from inside to the outside surface of our body. Secretion of sweat, on the other hand, provides water or evaporative cooling.

Man adapts to cold climates by maintaining a comfortable microclimate about his skin. This is accomplished through the wearing of clothing, which assures a protective, comfortable insulating layer of air. Often, work productivity in cold climates is reduced, especially due to the discomfort of hands and feet (Frisancho, 1979).

If the atmospheric temperature in more than the body temperature the body will produce more sweat. And if the environmental temperature is more than 35°C and at the same time humidity is more, the body will maintain normal temperature through sweat evaporation. This will consume most amount of energy expenditure due to cardiac work. Hot environmental conditions certainly lead to strain in athletes and will reach to a collapsed condition of heat injuries as well as the declined performance.
PROCEDURES OF DATA COLLECTION

On each day of testing, prior to sample collection, the subjects were weighed on a standard weighing machine. Physiological variables were collected first and the blood samples collected and then the performance variables were taken.

The subjects were motivated to exhibit their true performance by explaining to them the significance of this study and appealing to their professional interest and knowledge in their respective fields. The conditions on the ground and equipment were checked as a precautionary measure.

The subjects were directed to assemble and the procedure of taking measurements in the criterion variables was demonstrated prior to actual trials of measurements was taken. The assistance was given appropriate training and trial practices for data collection were continued for a number of times till they got mastery over each measurement procedure. In this case, subjects’ reliability, testers’ reliability and instrument reliability were determined prior to data collection.

The environmental temperatures of each season’s viz., monsoon, spring, winter and summer were recorded during three different times on three consecutive days in every fortnight:

1. Morning - 05:45 am 1st Day
2. Afternoon - 12:00 Noon 2nd Day
3. Evening - 05:45 pm 3rd Day

Physiological, haematological, variables were assessed during resting condition, whereas prior to field tests in track and field events a constant period of ten minutes was given to warming up. The data were collected for all the selected subjects during the 1st day morning, second day noon and the third day evening in each season.
The heart rate is characteristically spoken as beats per minute (bpm). Heart rate is the speed of the heart beat, particularly the amount of heart beats for each unit of time. The heart rate can vary according to the body's physical needs, as well as the need to sop up oxygen and excrete carbon dioxide. Actions that can irritate alter contain physical exercise, sleep, anxiety, nervous tension, disease, ingesting, and drugs.

The normal resting adult human heart rate ranges from 60–100 bpm. Bradycardiac is a slowing of heart rate, distinct as below 60 bpm. Tachycardia is nothing but heart rate moves in a considerable pace, distinct as above 100 bpm at rest. These abnormalities of heart rate occasionally, but not at all times, show illness.

Depends up on our activity, heart rate varies. Heart rate shoots up with effort - to bring more oxygen and energy for the workout. The pulse can be instituted on the side of the collar, on the within of the elbow, or at the wrist. Most people, it is easiest to get the pulse at the wrist. If you use the inferior collar, be sure not to force down too firm, and never force down on the pulse on both sides of the lower neck at the same time to prevent blocking blood flow to the brain. When taking your pulse: Using the first and subsequent fingertips, force down firmly but quietly on the artery until you feel a pulse. Start counting the pulse when the clock second hand is on the 12. Count your pulse for 60 seconds (or for 15 seconds and then multiply by four to calculate beats per minute).

**Equipments used**

Digital blood pressure monitor

**Purpose**

Digital blood pressure monitor was used to observe the radial artery pulse
Testing Procedure

The pulse was measured at the wrist by winding up the wristlet cuff of the digital blood pressure monitor – wrist measuring model CH 607 from Citizen Systems, Japan, around the left wrist, by placing the body of blood pressure monitor on the inside of the wrist. The measurement must be performed while in sitting position and with the left hand on a table held a level with the nearest. Keep the body still and relaxed during measurement.

Scoring

The count of pulse was recorded per minute as shown in the digital blood pressure monitor

RESPIRATORY RATE

Breathing is an essential part of respiration. The respiratory rate can be taken very easily. This is nothing but the number of breaths over a minute. The rate is usually numbered through a common observation as well as using an expirograph also. Observe the person when he is at rest and watch the number times the upper body rises. Usually if one is having fever or other diseases, we can observe an elevated respiratory rate. And also if one is having any respiratory difficulty during the time of data collection (Sinning, 1973).

The normal reading of the respiratory rate when one is at rest will be between 12 to 16 respirations over a minute. When the heart pumps the blood and the blood passes through the arteries like waves where there will be a pressure on the walls of the arteries. When we exert pressure on that artery with our fingers, we will be able to feel the number of beats gently on the surface of the skin. (Singh, 2004).

Purpose

To measure the number of breaths per minute.
Equipments used

Expirograph.

Procedure

Respiratory rate was assessed using the apparatus Expirograph, when the subject become familiar with the room temperature and attained normal breathing, kymograph was switched on at a speed of 60 mm/minutes. Then the subjects were asked to have the breath normally for 1 minute. Now the sectored pen was moving up and down with marking on the graph, in a minute. This reading will be recorded it was allowed to move up to 60 mm. A common observation can also be used to take the reading, however the investigator used Expirograph to collect the readings.

Scoring

The numbers of breath in one minute was recorded as the respiratory rate of the subjects.

SYSTOLIC AND DIASTOLIC BLOOD PRESSURE

The blood pressure is the force of the blood roughly alongside the walls of the artery. When the heart pumps the blood and it passes through the arteries like waves where there will be a pressure exerted on the walls of the arteries. When we exert pressure on that artery with our fingers, we will be able to feel the number of beats gently on the surface of the skin. (Singh, 2004).

One cannot take readings manually his or her own Bp, but if one can monitor his Bp if he possess an electronic Bp monitor machine is used. We will get two readings while we measure the Bp. The higher number is known as systolic pressure, refers to the pressure within the artery when the heart contract and pumps blood through the body. The lower number is called diastolic pressure, means the pressure in the artery when the heart is at rest.

We are not capable to manage some of the factors that amplify the risk of hypertension, over the age of 35, family history of hypertension, or having type II diabetes or kidney disease.
Blood pressure is the force of blood against the walls of the arteries as the heart pumps blood all through the body. The factors that affect Bp to change from day to day and during the day.

Normal blood pressure is less than 120 mm Hg systolic pressure, less than 80 mm Hg diastolic pressure. Hypertension has got a direct link in the risk of heart attack and brain stroke. With hypertension, the arteries may have an amplified resistance against the blood flow, becomes the reason for the heart to pump more persistently for supplementary transmission.

Cardiovascular system keeps its functioning at hit the highest point efficiency by maintaining homeostasis through proper Bp. The blood vessels will either expand or contract depends on the temperature of the body. When a blood vessel contract, blood pressure will increase if the body maintains the same heart rate because of the amount of blood going through the circulatory system.

Blood pressure can be measured with a Bp cuff and stethoscope. BP is the force of the blood roughly alongside the walls of the artery (Sinning, 1973). An individual cannot take his or her own Bp, but if one can monitor his Bp if he possess an electronic Bp monitor machine is used.

When we measure the BP, we will get two readings. The superior number is known as systolic pressure, refers to the pressure within the artery when the heart contract and pumps blood through the body. The inferior number is called diastolic pressure, means the pressure in the artery when the heart is at rest.

Blood pressure is the force of blood against the walls of the arteries as the heart pumps blood all through the body. The factors that affect Bp to change from day to day and during the day. We are not capable to manage some of the factors that amplify the risk of hypertension, over the age of 35, family history of hypertension, or having type II diabetes or kidney disease (Greger et al, 1996).

Hypertension has got a direct link in the risk of heart attack and brain stroke. With high blood pressure, the arteries may have an increased resistance against the blood flow, becomes the reason for the heart to pump more strenuously for further circulation.
Normal blood pressure is less than 120 mm Hg systolic pressure, less than 80 mm Hg diastolic pressure and 140/90 found to be high Bp as far as an adult is concerned.

The high blood pressure never creates much problem to the body, if it is not an unnatural. A person who normally runs a lower-than-usual blood pressure may be considered hypertensive with lower blood pressure measurements than 140/90.

The human body's cardiovascular system keeps it functioning at peak efficiency by maintaining homeostasis through proper Bp. The blood vessels will either expand or contract depends on the temperature of the body. When a blood vessel contract, blood pressure will increase if the body maintains the same heart rate because of the amount of blood going through the circulatory system (Singh, 2004).

Smoking, obesity, lack of physical work, usage of too much salt in daily food, kidney mal functioning, disorders in thyroid functioning and finally the hereditary factors are the common reasons for elevated Bp. Obviously over stress can lead to the dangerous condition of hypertension. And low Bp is also a dangerous condition in men than women. The Bp has a direct link with the intake food especially salt.

High Bp has become a major health problem among people. Hence we must regulate our Bp through regular exercises. Bp will be lower in people who are physically fit. Our systolic Bp will rise during rigorous exercise since our heart needs to pump more blood with every contraction. If the exercise is more strenuous, the systolic Bp will be higher. Hence this has become one of the major lifestyle diseases in human beings.

Blood pressures usually are elevated in the winter and lower in the summer. That is because of low temperatures can cause our blood vessels to shrink which increases blood pressure because of the elevated pressure is needed to force blood through our shrinking veins and arteries. Besides too cold weather, sudden change in weather can also affect our blood pressure, such as a weather front or a storm. Our body and blood vessels will react against the sudden changes in the humidity, atmospheric pressure, cloud cover or wind in much the same way it reacts to cold. These related variations in connection with the weather with the blood pressure are affected commonly for old people. Other seasonal causes of higher blood pressure
are weight addition and inactivity in winter season. Blood pressure may be affected both by the temperature of someone’s personal environment and by the number of daylight hours.

Among patients referred to hypertension clinics and undergoing ambulatory blood pressure monitoring, each increase of 1° C (1.8° F) in daytime personal-level environmental temperature was related with a 0.14-mm Hg drop in standard daytime systolic blood pressure (95% CI 0.02 to 0.25).

The negative effect of air temperature exerted in the short term is combined with the positive effects on blood pressure of the progressive increase in daylight hours from winter season to summer season. This outline obviously gives reasons for the risk of marked blood pressure reduction when early increase in air temperature occurs afterwards in spring season, while risks increasingly lessen throughout the progression of summer.

So many studies have shown that blood pressure is related to ambient air temperature and seasonality with higher blood pressure during the winter than in the summer but no studies have examined its relationship with personal-level environmental temperature, which takes into account the fact that people spend most of their time inside in controlled environments.

In addition to the relationship between daytime systolic blood pressure and daytime temperature and between nighttime systolic blood pressure and extra daylight, there was a relationship between 24-hour temperature and 24-hour systolic blood pressure, but only in the middle of individuals older than 65 blood pressure was 0.60 mm Hg lower for every increase of 1° C.

The major mechanism which disclosure to elevated temperatures reduces average blood pressure in populations probably reflects short-term physiological adaptations to the temperature with arteriolar vasodilation and reduced peripheral resistance.

The number of daylight hours was also related to the morning blood pressure the surge was 0.54 mm Hg lower for each additional hours of daylight, though the relationship was statistically significant.

**Purpose**

To measure the Systolic and Diastolic blood pressure
**Equipments used**

The Omron blood pressure monitor was used to observe the Systolic blood pressure, Diastolic blood pressure.

**Procedure**

The subject was seated for 5 minutes comfortably. The cuff of the monitor was switched on, the cuff automatically inflated and then deflated. The systolic blood pressure, diastolic blood pressure of the subjects was displayed. Three readings were taken and minimum value was recorded for each subject.

**BODY TEMPERATURE**

The body temperature depends on the activity of the body and the atmospheric temperature. We can protect our body from heat loss which is energy expenditure in a considerable manner further reaches to the condition of fatigue.

Sunstroke and dehydration does not just occur under only in a flaming sun. It is one of the main problems while exercising in cold climate as well. A large number of people do not feel as dehydrated when it is cold, and they take less amount of fluid intake. This is because of cold actually inhibits the thirst sensation. Blood moves away from the extremities and into the body's core.

The main function of nose is to warm and dry out air which is brought into the lungs. If the atmosphere is cold and dry, the nose will produce more amount of fluid. At times it makes more and more, and naturally the nose runs. Water in hot air condenses in cold air. The body in nature warms air before it enters the lungs.

The mixture of exercise and cold exposure does not improve the chemical process taking place within a living cell of fats. Definitely, so many physical processes engaged in fat metabolism slow down in cold temperature. This process of slowing down might be as blood vessels in peripheral fatty tissues tighten when it is freezing outside. The heart rate will be commonly lower in cold atmosphere exercise.
This is because extreme cold temperatures may cause amplify Bp and more chance of blood clots. To put it briefly, exercising in cold water makes you hungry. Energy used by students who ride a stationary bicycle sunken in water at 68° and once more at 91.4°.

When it gets cold, our body temperature will also go down. To remain the warmth of our body, one must need to produce heat. Hence we must eat multifaceted carbohydrates 2 hours before the exercise. All through extensive periods of exercise, eat smaller portions at frequent intervals. Unless we replace the energy you are utilising, we will get bushed and cooled more easily.

The human body normally maintains a set body temperature. At times our temperature will move away from the set point, climate throughout the influence of environment such as exposure to cold or internal processes including fever and exercise. Humans are homeotherms, maintaining an average core temperature of 37 +/- 0.5°Celsius. Core temperature varies slightly due to environmental and the chemical changes of the cells.

Exercise or fever may elevate core temperature by up to 3°, as disclosure to cold may reduce core temperature by a degree. Beyond these limitations, the human is prone to heat stroke (elevated temperature) or hypothermia; both are found to be life threatening circumstances. While core temperature is strongly synchronized, skin temperature changes very much with respect to metabolism and the environment. Temperature receptors in the skin (cold and hot) detect these changes; will start parallel mechanisms through the central nervous system.

The heat transference from the body to the environment is done through a variety of mechanisms. The body can raise the rate of heat remove by both increasing its conduction rate (movement of heat from core to surface) and transfer rate (movement of heat from surface to environment). Conduction rate is really affected by the dilation and shrinkage of vessels, even as transfer rate is a function of air temperature, the sweat ejected out, clothing, food and body position among other factors.

When environmental temperature is elevated than the core, sweat rates can be customized to attain preferred cooling. Sweat glands are inspired by sympathetic cholinergic fibers as well as by epinephrine in the blood. In times of fast temperature change, re-absorption of sodium and
chloride is compromised during perspiration. The human body compensates for this effect through the process of acclimatization in this particular time.

The Sweat glands are capable of increasing re-absorption of electrolytes at high temperatures through an increase in aldosterone levels. While 98.6°F is measured as a normal body temperature, it can change throughout the day based on many factors. Eating, drinking, smoking, exercising, taking a hot bath, undergoing to strong emotions or feeling nervous, exhausted, troubled or restless are all some of the things that can affect your body's temperature.

The temperature can differ, nevertheless, if the reading is taken rectum or via the armpit, measuring the temperature through the ear can offer an exact measure of core temperature, but mostly ear thermometers are not so reliable than digital or programmable thermometer. Normal body temperature may fluctuate by as many as 2°F more or less, due to a broad range of factors.

Exercising may affect our body temperature spectacularly. If you exercise vigorously, your body temperature can go up by as many as 3°F. Such an increase leads to a dangerous situation to the health, there by contributes to your body begins to sweat when your temperature may elevate more than 2°F

When you sweat, your body temperature pull back down to the safe level of 96.6 to 100.6°F. This happens when the hot blood moves from your muscles to the skin surface, where the sweat cools down the skin surface. And then the cooled blood returns to the muscles and organs, and finally lowers your body temperature.

Endurance exercise capacity diminishes under hot environmental conditions. Time to exhaustion can be increased by lowering body temperature prior to exercise (pre-cooling). This systematic literature review synthesizes the current findings of the effects of pre-cooling on endurance exercise performance.

For the achievement of peak sporting performance, many variables need to be optimized, including physical and mental training, rest, nutrition, team dynamics and tactics. Environmental factors on and around the competition venue may also have a significant impact on performance. This review highlights several important environmental conditions and their
possible effect on exercise performance. The factors discussed include temperature, ultraviolet radiation, allergens, atmospheric pollution and altitude.

**Purpose**

To measure the body temperature

**Equipments used**

Programmable digital thermometer was used to obtain accurate readings

**Procedure**

Digital thermometers can be used to take someone's temperature from either their armpit or their mouth. Nevertheless, for children below the age of five years, it is directed to take their temperature should be taken from their armpit, because they may bite the thermometer if it is placed in their mouth. Digital thermometers are an accurate and easy way to take a temperature. The investigator used a digital thermometer to obtain the accurate data. There should not be anything hot or cold in your mouth for 10 minutes before taking your temperature.

The following steps maintained during the course of taking readings:

1. Take the thermometer out of its holder. Put the tip into a new throw-away plastic cover if one is available. If you do not have a cover, clean the pointed end (probe) with soap and warm water or rubbing alcohol. Rinse it with cool water. With your mouth open, put the covered tip under your tongue. Close your lips gently around the thermometer. Keep the thermometer under your tongue until the digital thermometer beeps. Remove the thermometer when numbers show up in the "window". Read the numbers in the window. These numbers are your temperature.

2. Write down the time and your temperature each time you take it. Remove or eject the throw-away cover if you used one. Place the thermometer back in its holder.

**HAEMATOLOGICAL VARIABLES**

The major component of the hematologic system is the blood. Blood consists of three components: RBC, WBC, and Plasma. In the midst of this the RBC and Erythrocytes, are the most common blood cells. White Blood Cells, or leukocytes, are one of the body's defenses. This
includes the amount of haemoglobin in the blood, the number of red blood cells, the proportion of blood cells as a quantity of the total blood volume, the amount of RBC is the average amount of haemoglobin in the RBC, the number of white blood cells (white cell count), the percentages of the different types of white blood cells (leukocyte differential count) and the number of platelets.

A WBC count is to measure the number of white blood cells (WBCs) in blood. WBCs help to fight against infections. They are also known as leukocytes. The normal number of WBCs in the blood is 4,500 to 10,000 white blood cells for each microliter (µL). A low number of WBCs is called leukopenia. If the WBC count below 4500 is less than the normal.

Unusually low numbers of WBC may point to liver or spleen disorder, bone marrow disorder, or contact with radiation or deadly substances. Abnormally high levels of white blood cells may point to infection, tissue injury, inflammations.

The amount of oxygen depends upon the amount of RBCs hold and how well it works. An RBC count is a blood test that tells how many red blood cells (RBCs) you have. RBCs enclose hemoglobin, which carry oxygen. The RBC count is almost always part of the CBC (complete blood count) test. The test can help identify anemia and further situation upsetting red blood cells. The general the range is as follows: Male: 4.7 to 6.1 million cells per microliter (cells/µL), Female: 4.2 to 5.4 million cells/mcL.

The RBC count will increase for several weeks when you move to a higher altitude. A high red blood cell count is generally meant more than 5.72 million red blood cells for every microliter (mcL) of blood for men and 5.03 million for every mcL for women. The thresholds for high red blood cell count vary with age and gender among children.

Hemoglobin also plays an important role in maintaining the shape of the red blood cells. Hemoglobin (Hb or Hgb) is the protein in your red blood cells that bring oxygen. A low Hb count is a below-average concentration of the oxygen-carrying hemoglobin proteins in the blood. A low Hb count is generally meant less than 13.5 grams of hemoglobin per deciliter (135 grams per liter) of blood in men and less than 12 grams per deciliter (120 grams per liter) in women. In children, the norms vary with age and sex.
Purpose

To screen the blood for levels of parameters haemoglobin (Hb), red blood cell (RBC) and white blood cells (WBC).

Equipments used

Elastic band, Disposable syringe, surgical spirit dipped cotton, Vial with anticoagulant.

Procedure

Five milliliters of blood were drawn from the antecubital vein by using a disposable syringe from each subject during sample collection. An elastic band was placed around the upper arm to apply pressure and cause the vein to swell with blood. The puncture site was cleaned with surgical spirit and a needle was inserted into a vein and blood was withdrawn. During the procedure, the band was removed to reinstate transmission, when the blood has been collected, the needle was removed, and the puncture site was covered with cotton to stop any bleeding. Freshly collected 2ml of blood specimen was transferred quickly to an airtight vial coated with K3 EDTA as an anticoagulant, to stop it from clotting, and the rest of the 3ml of blood specimen was transferred into the vial that has no anticoagulant for the purpose of the serum.

PERFORMANCE VARIABLES

Sports and games have an amazing place in the improvement of physical fitness of each individual. The main components of physical fitness are speed and endurance. Daily exercise will improve the fitness (both mental and physical) of the human being. In this study, the researcher investigated whether there is a significant difference in physical, physiological and psychological difference in different kinds of school students in Kerala state. It becomes one of the important parts of the daily healthy life of the human being.

Physical performance has been greatly superior for the past years of history. Athletes Performance standards were beyond our belief recently and the number of athletes talented enough to procreate excellent results in competitive sports. One factor is that athletics is a strenuous job and the information of the systematic principles and the achievement of the same
were provides the best result to the athletics. Both the athletes as well as the coaches should have proper knowledge of the latest investigations in the field of sports training.

Most scientific knowledge, whether from training experience or the latest research provides the better understanding of the body, and the study from allied branches connected to the field of physical education and sports enriches with the theory and the method of training, has become a branch of science. The field knowledge of the coach and the implementation of the latest principles are the result makers of the present age. In order to appreciate the benefits of varying environmental temperatures and seasonal changes, it is all the more necessary to understand the mechanism of human acclimatization to the environment, the physics of low pressure environments, and the physiological changes brought about in the body by exposure to the hot and cold climatic conditions. The changes of the environment, altitude and the climate conditions are direct associations with the optional performance of an athlete. Different activities make different demands upon the organism with respect to the circulatory, respiratory, metabolic and neurologic process which are specific to the activity.

Now sportsmen are able to give outstanding performance because of proper planned scientific training and the methods of different training in appropriate timing. The execution of the right techniques were improves the sports gear and condition of system of sports training.

Scientists and physical educators are deriving innovative and recent methods of training plans intended to accomplish and techniques to achieve best performance in games and sports. Research for maximum sports performance is in bud stage in India, it has already reached a new height of using technical knowledge. Various experiments conducted in recent years have conclusively proved that the performance in any sports activity depends upon the psychophysiological homeostasis and physical fitness as well as related skills of the athletes. The systematic research in the field of physical education and sports adds a valuable advantage to the athletes, trainers and coaches.

Health awareness, now a day is considered as an important and integral part of general education which aims at the harmonious development of the man. But, in practice and from a functional view it has proper recognition or status as an academic subject. Many investigators are of opinion that, along with several factors, the geographical as well as climatic conditions of the place where an athlete lives also play vital role in the level of performance ability. Since the
geographical situation and climatic condition in India are different from other continents, it is assumed that the performance ability of Indian sportsmen may vary when they participate in the competition being organized in different continents in world sports. Supportive incidence is being evidenced in the case of Indian athletes participating in the Asian Games. Here, the performance of Indian athletes is comparatively superior since the geographical and environmental temperatures are approximately similar in the regions of Asia.

Physical fitness factors are the most important for predicting athletic performance. Natural ability is the promise of potential, but fundamentals are the foundation of excellence. Although measurement of psycho-physiological functions and performance abilities in sports is a continuous process in bringing out a good sportsman, in India, research report on environmental temperature in relation to athletic performance is meager. Moreover, no investigation till-to-date is available in this direction, especially on the influence of climatic temperature on track and field athletic performance of all levels of athletes.

Physical Fitness is the shield that resolves the performance level of an individual. Sports performance depends largely on physical fitness factors such as the basic qualities of fitness. Only relatively few athletes require significant muscle mass and bulk whereas maximal strength is an important fitness component even for classic level of sports. The training protocol of the maximum strength is not even same as the training for increase the muscle size or the hyper-trophy training. The scientific approach of the sports training articles outlines how various types of weight training programs fit together into an overall training plan. These sample weight training programs are designed to develop the quality of maximum strength.

100 M Dash

Speed is considered to be an integral and essential part of every sport. This speed component of anaerobic metabolism lasts for approximately eight seconds and should be trained when no muscle fatigue is present (usually after 24 to 36 hours of rest). The 100 meter dash is a sprint race in track and field competitions. This is considered to be the shortest common outdoor running distance. It is one of the most trendy and high-status events in the sport of athletics. 100 meter dash measures one’s sprinting ability, explosive strength. It is important to remember that the improvement of running speed is a complex process that is controlled by the brain and
nervous system. Speed is influenced by the mobility, particular strength, strength endurance and technique. Downhill sprinting, speed, reaction drills is the common method of developing sprinting speed following the acceleration phase.

The speed is which is essential for many physical activities. Speed is a determining factor in the explosive sports such a sprints, jumps and most field events. Speed in one of the most important physical fitness components which are highly essential for many physical activities. Hardayal Singh has quoted that the speed is the performance per-requisite to do motor actions under given conditions (movement task, external factor, individual pre-requisite) in minimum time. Strength is highly related to speed. Without speed there are no sports and physical education. Strength is very much connected to the speed. In general; the superior team wins since it is the fastest team.

Speed ability is specifically related to movement. Speed is a main physical fitness component used in sports for such muscle actions for maximum swift contraction and relaxation of muscles. It is also the capacity to carry out motor actions, in least possible time. Like strength and endurance, speed is also a restrictive ability, but not like those two conditional abilities (strength and endurance) speed depends to a considerable extent on the nervous system. As a result of this, speed is more complex in nature and is comparatively less trainable as compared to strength and endurance. The efficiency of the nervous system, can be subjective only to a partial extent, becomes a limiting factor in the development of speed.

The 100 meter dash is a sprint race in track and field competitions. This is considered to be the shortest common outdoor running distance. It is one of the most trendy and high-status events in the sport of athletics. 100 meter dash measures one’s sprinting ability, explosive strength. It is important to remember that the improvement of running speed is a complex process that is controlled by the brain and nervous system. Speed is influenced by the mobility, particular strength, strength endurance and technique (Clarke & Clarke, 1976).

This speed component of anaerobic metabolism lasts for approximately eight seconds and should be trained when no muscle fatigue is present (usually after 24 to 36 hours of rest). Downhill sprinting, speed, reaction drills is the common method of developing sprinting speed following the acceleration phase (Clarke & Clarke, 1976).
Purpose

To measure the speed

Equipments used

Measuring tape, starting clapper, and stop watch

Procedure

The subject id allowed going for warm-up for 10 minutes. Then the participants were set to be in the starting position behind the line. To indicate the set position, the tester raised both arms sideways. The race was started with the signal of clapper sound. The tester was taken the reading as soon as the race starts. The participant ran as fast as possible across the finishing line. One trial was taken.

Scoring:

The time between the clapper sound and the flash the participant’s body crossed the finish line was recorded.

LONG JUMP

An athlete has to run up to a take-off board and without going past it jumps as far as they can into a sand-pit. The long jump otherwise known as the broad jump is one of the major items among track and field events in which athletes possess multifarious dimensional skill related physical fitness components. It needs a lot of effort to take the jump as well as take-off and landing. So one should need to attain ample level of physical fitness for the best performance. It has got three phases such as run-up, take-off, and landing. All these three phases needs speed to perform better. Speed became an essential component for performing long jump, it is very common that most of the long jumpers are also used to compete in sprint events also (Arnheim & Prentice, 1997).

The ability to accelerate quickly is developed by addressing technique and strength. In the long-jump move toward run, some places flanked by the 4-6 total steps (2 or 3 rights/lefts)
are used to accelerate to utmost speed. The slower your athletes are, the faster they will get to peak speed. The faster athletes will have longer achieved with their maximum speed. The remaining number of steps is done at maximum convenient speed. Upholding of this speed and the erect posture at the end of the approach is crucial to success. Long jump measures leg strength and explosive strength. One or two plyometric training sessions per week can have a significant effect on your explosive strength and in turn, your sprinting and jumping performance (Clarke & Clarke, 1976).

In the long-jump move toward run, some place flanked by the 4-6 total steps (2 or 3 rights/lefts) is used to accelerate to utmost speed. The slower your athletes are, the faster they will get to peak speed. The faster athletes will have longer achievement with their maximum speed. Long jump measures leg strength and explosive strength. One or two plyometric training once in a week can have a considerable effect on your explosive strength, sprinting and jumping performance respectively.

Neuromuscular system can be developed by applying stress to the muscles or to the neural aspects. One must improve the explosive strength of the concerned groups to improve the speed performance. A decrease in strength will affect the range of speed. The strength of the muscle is relating to the contraction of the muscles fibers. Be conscious and vigilant in avoiding injury is the basic thing regarding muscle strength. We can improve speed by giving more and more training and emphasis on the explosive strength, which mainly rely on muscles, co-ordination, muscle size and composition. There is some evidence that strength developed dynamically makes a better contribution to speed than strength developed through statically. It was also depends the metabolic process in the respective muscles. All these factors expect muscle composition, can improve through training procedure.

Strength and speed are directly relating to the involvement of the resistance training and in other words we can say that the high resistance training were the best contributor of heavy strength in the competitive sports. There is some evidence that strength developed dynamically makes a better contribution to speed than strength developed statically. An abundance of research support the idea that increased strength does not detract from speed as some have claimed, and it often has a positive influence on speed, with the influence becoming greater as the resistance is increased.
Strength and speed are only mildly related when light resistance is involved, but when speed movements against heavy resistance are needed, strength becomes more of a contributor. An abundance of research support the idea that increased strength does not detract from speed as some have claimed, and it often has a positive influence on speed, with the influence becoming greater as the resistance is increased. There is some evidence that strength developed dynamically makes a better contribution to speed than strength developed statically.

The biggest benefit of broad jump training for athletes is that it improves the reaction of fast-twitch muscle fibers all through the body. Effective, broad jumps require your leg and core muscles to contract very quickly like other plyometric exercises, so that you can generate maximal force with each leap.

**Purpose**

To compute the explosive power of the legs.

**Equipments used**

Jumping pit, marking material is needed for the starting line (take-off board) along with a tape to measure the distance along the landing area.

**Procedure**

The athlete warms up for 10 minutes. The subjects were trained how to perform running broad jump rightly by the examiner. Subjects were allowed to take ample practice before the real readings were taken. A take-off line was marked on the runway at a distance of one meter from the nearer edge of the pit. The athlete begins running from his initial place and after reaching adequate velocity, jumps, landing in a sand pit, which is built-in with reserve indicator. There is a foul line, in the run-up region that the athlete has to be aware of; jumping from beyond this line results in a foul jump. This complete procedure is administered by a set of rules. The distance between the nearest break point on the takeoff board was recorded as subject’s performance in the nearest centimeters.

**Scoring**
Measuring the jumping distance in meters, the best of three trials recorded

PUTTING THE SHOT

The shot put is a track and field event involving "throwing" (throwing in a pushing motion) a heavy spherical object the shot as far as possible. The distance achieved in the shot is dependent on the height of release of the shot, the angle of release of the shot, speed of release of the shot. The shot-put is a sport in which upper body strength is a critical factor. The parameter that has the greatest effect on the potential distance is the speed of release of the shot. The shot put athlete (or shot-putter) needs power, but must also be fast and synchronized in order to create momentum and maximum force during the throwing motion.

The importance of muscle strength when you performed household tasks such as moving furniture or carrying a full trash bag out to the curb. Energy liberation process in the muscles decided strength, which is a direct product of muscle contraction. Strength is the ability of a muscle to exert force opposite to resistance. Having greater muscle strength helps physical fitness because it allows you to more easily perform tasks. Strength is an unavoidable factor in all motor abilities. Muscles contraction produces all sports movements. Training aims to increase the strength. Result of a performance is directly proportional to the resistance that is applied to the respective muscle and the resistance is higher means the performance of the body is better. Almost all performances depend on the ability of applying greater force against a resistance. Strength recognized in all physical activities and it becomes a basic component of the fitness. In all physical activities muscular strength has been recognized as an essential element and basic components. Strength affects performance as it is the most important components of physical fitness. Increased strength will often contribute to better performance.

Strength is a restrictive ability which is based largely on the energy releasing process of the muscles. Strength is possibly the most significant motor ability in sports as it is a direct result of muscle contraction. All movements in sports are caused by muscle contractions and therefore, strength is an integral part of all motor abilities. Technical skill and training, consequently, suppose to be of high significance for achieving top-class performance in all sportive events.
Strength is the utmost force that can be exerted at a single exertion. All sports require a certain amount of strength, but strength becomes a main concern in sports where profound load such as body must be lifted. The strength of the muscle is related to its size and area. The strength of the muscle has a direct proportion with its size. Strength training develops the contractile protein that gives the muscle its pulling power. This is possible only when the coaches and physical education teachers use the correct and most beneficial and economical means to train their sportsmen.

Explosive strength and dynamic strength involve body or its limbs. In explosive strength, the stains of the muscles are not continued. It has been proven that athletic performance depends either directly or indirectly on qualities of muscular strength. The primary function of the more than 600 muscles in the body is to contract consecutively to cause body actions in various body parts. If the muscle moves stronger and makes forceful contractions into your body, you can run faster, jump higher and can throw harder. It is that simple not to mention having a basis of muscular strength is to avoid injury. Strength training targets the neuromuscular system. It can be developed by two different ways, by applying stress, either to the muscles or to the neural aspects of the system. The former method is using body building methods and result in strength through an increase in muscle size.

Explosive power represents one of the most important features of track and field. Explosive power is defined as the rate of expenditure of energy. Explosive strength and dynamic strength involve movement of the body of its limbs. It is the ability of the muscles or a group of muscles to overcome resistance with maximum speed and effort. Explosive power drills are used by athletes who needs to quick bursts of maximal effort. It is characterized by one short burst of or energy and is seen in such test as standing long jump vertical jump and ball games. The strength of the muscles in the limbs in moving and supporting the weight of the body repeatedly over a given period of time in terms as dynamic strength, sometimes known as speed. The significant aspect of speed is the necessity that the muscular power, which must be recurring as numerous times as possible.

The need for upper body power (UBP) in cross-country ski racing is a consequence of the use of poles for propulsion. Power generated by the upper body is transmitted through the poles
and assists in forward motion. As discussed previously, the upper body is the sole source of power during classical double poling. The upper body may also contribute as much as 50% of the propulsive force during uphill skating. The need for upper body power (UBP) in cross-country ski racing is a consequence of the use of poles for propulsion.

Power generated by the upper body is transmitted through the poles and assists in forward motion. As discussed previously, the upper body is the sole source of power during classical double poling. Further, classical race performance is largely unrepresented in this body of research; all of these studies use either skating races only or a combination of skating and classical races to define the performance variable. To date, no study has attempted to evaluate the relationship between classical ski race performance and ability to generate upper body power over short and long time periods. The answer to this question could provide useful insight into appropriate upper body power training methods for cross-country skiers.

Upper body strength is essential because the upper body controls our capacity to perform daily activities like pulling, pushing and lifting. If we have a strong upper body, we will have more flexibility, mobility. If your upper body strength declines when we go older, it leads to the chance of injuries, disease and a diminished quality of life. Our upper body is built-up with muscles with particular functions. We have muscles of our hands, forearms, upper arm and shoulder. Advantages of strength in these muscles are agreeable, healthy appearance and a strong & good posture. Further important, maintenance of strength in muscles helps to perform daily activities and sports-related activities at the best possible level and to reduce the poor tone in accordance with the age. Moreover upper body muscle strength can helps to stop injuries with activities stress the muscles. The muscles and joints of our hand initially permit us to clutch and clench. The above mentioned abilities allow us to perform fine motor skills. Inability to take hold would limit our functionality considerably.

Muscles in our upper arm are also drawn in in some of those motions. Most of the activities that we perform daily would be limited by an inability to perform those functions. The muscles that connect your upper limbs to your chest permit you to move all the dimensions. The muscles between the upper limbs to our spinal column allow us to draw our shoulders move all the dimensions.
**Purpose**

To measure the shoulder strength

**Equipments used**

The shot is weighing 7.26 for men and 4 kg for women, marking powder

**Procedure**

The weight of the shot used for men is 7.26-kg (16-pound) and for women is 4 kg (8.8 pounds). The shot was made of solid brass used. The put was from a circle 2.135 meters (7 feet) in diameter into a 40° sector as measured from the centre of the circle. The circle has a stop board 10 cm (4 inches) high at its front; if the competitor steps on or out of the circle, the throw is invalidated. The shot was put with one hand and must be held near the chin to set up. Do not go down or behind shoulder level at any time.

**Scoring**

Measuring the distance in meters, the best of three trials recorded

**STATISTICAL TECHNIQUE USED**

Research design for this study included one independent variable, the environmental temperature (three times, i.e. morning, noon, evening) during main four seasons viz., monsoon, spring, winter and summer. Simple descriptive statistics were used to process the data, whereas ANOVA followed by Scheffe’s post hoc test was employed for inferential as well as conclusive results.