Chapter - 1 : Planning in Sports

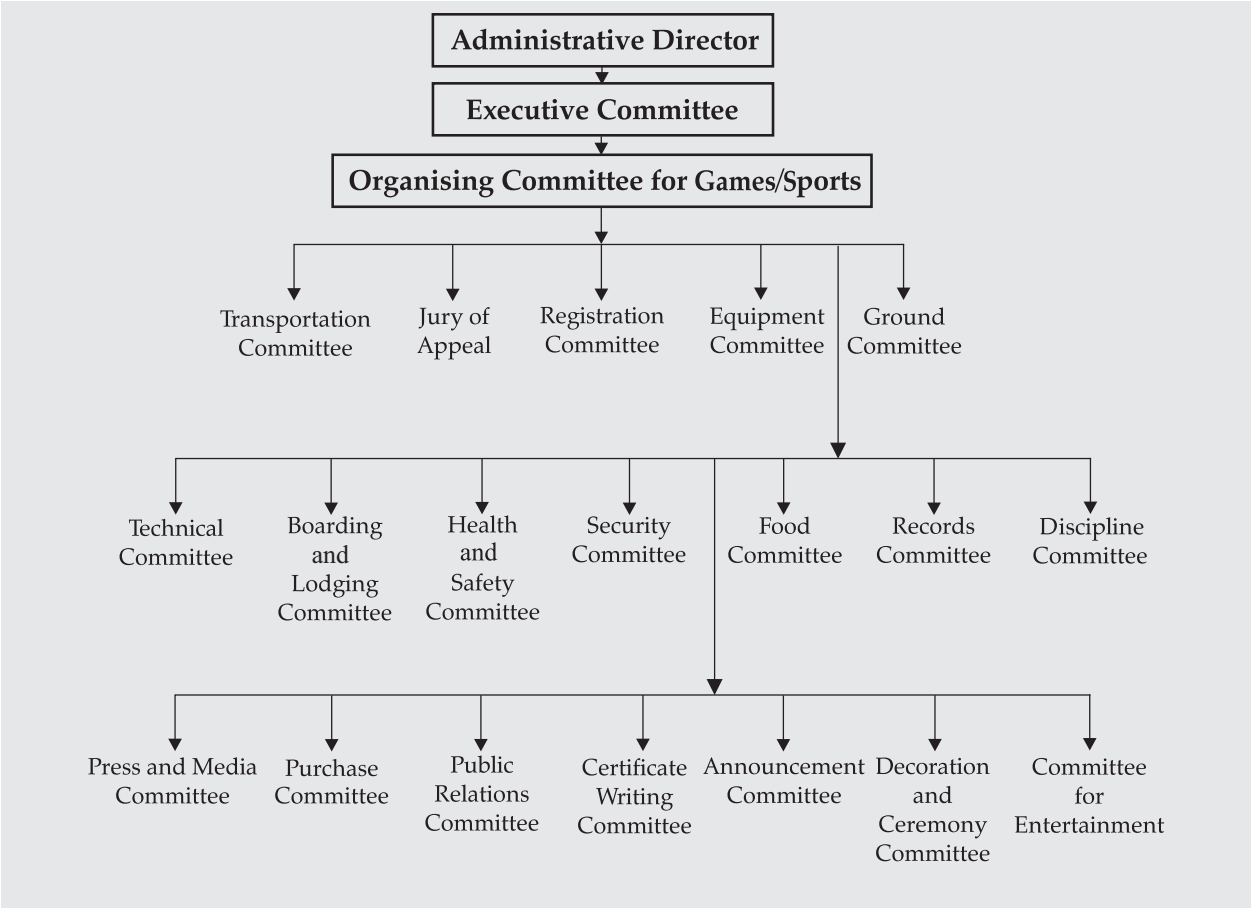
TOPIC-1
Meaning and Objectives of Planning and Various Committees

Quick Review

- "**Planning** is a process of setting objectives and deciding how to accomplish them".
  Objectives of Planning are :
  (i) Improving the success rate
  (ii) Completing task within given time period
  (iii) Finding out causes for failure
  (iv) Working efficiently
  (v) Remaining within the budget while achieving the required targets.
- Various committees are formed to plan and successfully implement the plans like, to organise a tournament, there are different committees which are formed and each of them are assigned with a different task.

Flowchart

Various Sports Committees and their Responsibilities



TOPIC-2
Tournaments and Fixtures

Quick Review

- **Tournament** is a competition held among various teams in a particular activity according to a fixed schedule where a winner is decided.
- **Fixture** is the process of arranging the teams in a systematic order in various groups for competition in a physical activity.
- **Types of Tournaments are :**
  (a) Knock-Out or Elimination Tournament
  (b) League or Round Robin Tournament
  (c) Combination Tournament
  (d) Challenge Tournament
- **Seeding** is the procedure by which good teams are placed in fixtures in such a way that stronger teams do not meet each other at very start of the tournament. Seeding can be done only if the standards of the teams are known before the tournament starts.
- **Bye** is a privilege given to a team which is decided generally by seeding it or by draw of lots.

TOPIC-3
Intramural, Extramural and Specific Sports Programmes

Quick Review

- **Intramurals :** The word intramural is derived from the Latin word intra and muros, which means within walls. The team competes within the walls of the institution *e.g.* inter class.
- **Extramurals :** This encompasses the activities which are performed outside the walls of the institute or schools. It means that students of two or more schools participate in such competitions.
- **Specific Sports Programmes :** Specific Sports Programmes are those programmes of sports which are not usually related to competitions. The programmes have various objectives like creating awareness, creating a sense of integration among people.

  Some of these programmes are as follows :
  (i) Health Run
  (ii) Run for Fun
  (iii) Run for Unity
  (iv) Run for Awareness
  (v) Run for Specific Causes

❑❑

Chapter - 2 : Sports and Nutrition

TOPIC-1
Balanced Diet and Nutritive Components

Quick Review

- **Nutrition :** Nutrition is defined as the science of food and its relationship to health. In other words, it can be said that nutrition is the science of food which deals with the dynamic process in which the food consumed is digested.
- **Nutrients :** Essential substances present in the food.
- **Diet :** Contains variety of foodstuffs. This helps in protecting us from diseases and in the repair of worn out tissues and giving energy.

- **Balanced Diet :** A diet that contains right amount of carbohydrates, proteins, fats, minerals, salts, vitamins, roughage and water is called a balanced diet.
- **Roughage :** The fibre present in the food which helps to eliminate wastes from the body.
- **Elements of Diet :** A diet which contains all the foodstuffs necessary to maintain good health consists of following elements :
  - **(i)** Carbohydrates,
  - **(ii)** Proteins,
  - **(iii)** Fats,
  - **(iv)** Minerals,
  - **(v)** Vitamins,
  - **(vi)** Water.
- **Proteins :** Proteins are nutrients that help to build the body and make new cells. They help us in the repair of worn out tissues. They are especially important for growing children. They are called body building food. Milk, eggs, cheese, pulses, meat and fish have lots of proteins.
- **Carbohydrates :** Carbohydrates gives us energy to work. Sugar and starch are carbohydrates. Potato, rice, bread, banana and grapes are rich sources of carbohydrates. These are called energy giving foods.
- **Fats:** Fats provide us with twice as much energy as carbohydrates. We can store extra fat in our body to be used later. Butter, ghee and nuts are rich sources of fats, but too much of fats can lead to diseases like blood pressure, heart problem and obesity.
- **Vitamins :** Vitamins are needed by our body in a very small amount. They keep us healthy by helping the body to fight against the diseases. They also help our eyes, nerves, gums, skin, etc., to work properly. Vitamins consist of two groups- fat and water soluble groups.
- **Vitamin 'A' :** Keeps eyes and skin healthy.
- **Vitamin 'B' :** This is good for muscles and nerves.
- **Vitamin 'C' :** Makes strong gums and heals our wounds faster.
- **Vitamin 'D' :** Makes teeth and bones strong.
- **Minerals :** Minerals are also needed in a very small quantity to keep us fit and healthy. Calcium is a mineral used for building bones and teeth. It is present in milk and green leafy vegetables. Iron is another mineral which helps our blood in carrying oxygen. These are called protective foods.
- **Water :** Almost two-third of our body is made up of water. Water helps our body to work well and maintain our body temperature. We need to drink atleast 10-12 glasses or approx, 6-7 litres of water every day.
- **Macro-Nutrients :** Nutrients that are needed in large quantities by our body in order to cover its energy requirements are called Macro-Nutrients, *e.g.*, Proteins, Carbohydrates, etc.
- **Micro-Nutrients :** Nutrients that are needed in very little quantity for the effective functioning of our body are called Micro-Nutrients, *e.g.*, Vitamins, Minerals etc.
- **Nutritive components of Diet :** Food contains a variety of nutritional components that can be categorised by macro-nutrients and micro-nutrients. Macro-nutrients are nutrients needed in large amounts that provide calories or energy for growth, metabolism and other functions in our body. These include carbohydrates, fats and proteins. Micro-nutrients, such as vitamins, minerals and antioxidants, are involved with cellular and chemical processes in our body.
- **Non-Nutritive components of diet :** Food contains some components that are not classified with the basic nutrient groups. All sorts of substances can be found in food natural, intentional and unintentional. Non-nutritive components of diet means, components which do not add or supply energy or calories. Non-nutritive components of diet are discussed below :

(i) **Colour components :** Food is made more appetizing and interesting to be hold by the wide spectrum of colours made possible through pigments. Most natural pigments are found in fruits and vegetables, the colours of food from animal products and grains are less varied and bright. The dominant pigment found in plants are carotenoids (orange-yellow), chlorophyll (green) and flavonoids (blue, cream and red).

(ii) **Flavour components :** The flavour in foods are derived from nutrient and non-nutrient components. These are sometimes too numerous to track as the source of a specific flavour. Among the non-nutrient components in foods are the organic acids that determine whether foods are acidic or basic. An acidic pH in foods not only contributes to a sour taste, but the colour of fruit juices, the hue of chocolate in baked products, and the release of carbon dioxide in a flour mixture. An alkaline pH contributes a bitter taste.

(iii) **Plant components :** In addition to colour and flavour components, some plants contain other non-nutritive substances that, when ingested, may have either beneficial or normal effects. Many of the possible anti-carcinogens, or compounds that inhibit cancer, come from plants. In particular, phytochemicals, called indoles is found in vegetables, which is found in plants. The vegetables like cabbage, cauliflower, kale, mustard greens and colards have this. Laboratory animals which were given indoles and then exposed to carcinogens developed fewer tumors than animals exposed to some cavenogens, but not given indoles.

TOPIC-2
Effects of a Diet on the Performance and Eating for Weight Control

Quick Review

- **Role of diet in performance :** A proper diet is essential for good performance. The total energy requirement for a person engaged in physical activity ranges from 3500 to 6000 calories. Diet mainly aims to enclave performance. It improves body composition and increases strength and speed. To identify the role of a particular diet, it would be better to be familiar with the role of vital nutrients on performance. The vital nutrients are discussed below :
  - **(i)** **Carbohydrates :** Carbohydrates are the chief fuel for muscular contraction. Studies suggests that carbohydrates helps in increasing the endurance of sportpersons. Athletes should not be given carbohydrates in excessive amount, as it may be risky for them. Low level of carbohydrates generally leads or results in exhaustion.
  - **(ii)** **Fats :** For a distance runner, high jumper and a gymnast, a minimum amount of fat is desirable. These athletes need nominal fat because, if they put on weight, it will hamper their performance. Distance swimmers need a particular amount of fat distributed close to the skin surface to reduce the heat loss to the water.
  - **(iii)** **Proteins :** Proteins are essential for growth and development of various tissues of the body. If fats and carbohydrates are obtainable, they are preferred over protein, as the supply of energy. Presently studies suggested that protein helps in the growth of lean tissues but does not have any major effect on performance.
  - **(iv)** **Vitamins :** In the normal diet for good performances in work and sports, vitamins are essential, but there is no prominent evidence that additional amount of vitamins improves the performance. As a matter of fact, body is not able to store the large amount of vitamins; the majority of the excess amount of vitamins is excreted through the urine, giving only extra work to the excretory organs.
  - **(v)** **Minerals :** It is well identified regarding minerals, their quanti can decrease in hot climate. Sweating reduces the amount of sodium and chloride in the body. Excess quantity of salt consumption can lead to potassium loss and increased water retention.
- **Causes of Dehydration in Athletes :**
  - **(i)** Inadequate fluid intake
  - **(ii)** Excessive sweating
  - **(iii)** Exercise in dry, hot weather
  - **(iv)** Drinking only when thirsty
  - **(v)** Failure to replace fluid losses during and after exercise
- **Healthy eating tips for Athletes :**
  - **(i)** Eat all variety of foods
  - **(ii)** Eat regular meals and snacks
  - **(iii)** Eat food with enough calories
  - **(iv)** Drink plenty of fluids
- **Healthy Weight**

"A healthy body weight is a weight at which the body functions most efficiently and effectively, affording maximum protection against illness and disease."

Height and Weight Chart and BMI (Body Mass Index)

Height (Feet / Metres)	Men Weight (Kgs)	Women Weight (Kgs)
5'-0" or 1.523 m	50.8- 54.4	50.8-54.4
5'-1" or 1.548 m	51.7-55.3	51.7-55.3
5'-2" or 1.574 m	56.3-60.3	53.1-56.7
5'-3" or 1.599 m	57.6-61.7	54.4-58.1
5'-4" or 1.625 m	58.9-63.5	56.3-59.9
5'-5" or 1.650 m	60.8-65.3	57.6-61.2
5'-6" or 1.675 m	61.6-66.7	58.9-63.5
5'-7" or 1.700 m	64.0-68.5	60.8-65.3
5'-8" or 1.726 m	65.8-70.8	62.2-66.7
5'-9" or 1.751 m	67.6-72.6	64.0-68.5
5'-10" or 1.777 m	69.4-74.4	65.8-70.3

5'-11" or 1.802 m	71.2-76.2	67.1-71.7
6'-0" or 1.827 m	73.0-78.5	68.5-73.9
6'-1" or 1.853 m	73.3-80.7	73.3-80.7
6'-2" or 1.878 m	77.6-83.5	77.6-83.5
6'-3" or 1.904 m	79.8-85.9	79.8-85.9

- **Pitfalls of Dieting :**
  - **(i)** **Extreme reduction in calories :** The intakes of calories are reduced tremendously for dieting. Studies indicate that to meet all nutritional requirements of an individual, 1800 calories a day is not sufficient. If intake of calories is reduced, it produces a havoc weight loss.
  - **(ii)** **Restriction in some nutrients :** Some nutrients like carbohydrates and fats are restricted in dieting, which can lead to improper functioning of the body.
  - **(iii)** **Skipping meals :** If meals are skipped, it lowers the metabolism to preserve energy.
  - **(iv)** **Intake of calories through drinking :** To lose weight, most probably more stress is on not to eat more and not on what to drink. As a fact, beverages like coffee with cream and sugar, sweetened juices and sodas really add to weight gain.
  - **(v)** **Not performing exercise :** If an individual does not perform exercise and goes on dieting, it will not work properly. In place of losing weight, possibility is likely to gain weight.
- **Food Intolerance :** Food Intolerance is more widespread than food allergy. It is a term used broadly for wide - ranging physiological responses related with particular food. In easy words, food intolerance means the individual elements of particular foods that cannot be correctly processed and absorbed by reasonable amount of the food but if eaten in a large amount or too often, they get symptoms of food intolerance because the body cannot tolerate unlimited amounts.
  - **(a)** **Causes :** Partial or complete absence of the enzymes accountable for breaking down or absorbing the food elements, causes food intolerance. These deficiencies are generally by birth.
  - **(b)** **Symptoms :**
    - **(i)** Nausea
    - **(ii)** Stomach pain
    - **(iii)** Nervousness
    - **(iv)** Diarrhea
    - **(v)** Vomiting
    - **(vi)** Gas
    - **(vii)** Cramps
    - **(viii)** Heat burn
    - **(ix)** Irritability
    - **(x)** Flatulence
  - **(c)** **Management:**
    - **(i)** Fructose intolerance therapy
    - **(ii)** Lactose intolerance therapy
    - **(iii)** Histamine intolerance therapy

  These therapies can be applied for managing food intolerance.
- **Food Myths :** Numerous food myths exist not only in India but also all over the world as they sound like they could be true.

  The most common food myths which are still widespread in our modern society are given below :
  - **(i)** Potatoes make you fat.
  - **(ii)** Eggs increase cholesterol levels, so avoid them.
  - **(iii)** Drinking while eating makes you fat.
  - **(iv)** Starve yourself if you want to loose weight.
  - **(v)** Fat-free products helps you in loosing weight.
  - **(vi)** There are some magical food that cause weight loss.
  - **(vii)** Exercise make you eat more.
  - **(viii)** Do not drink milk immediately after eating fish.

TOPIC-3
Sports Nutrition

Quick Review

- **Sports Nutrition :** Sports nutrition refers to the practice of diet and nutrition relating to sports performance. It is mainly concerned with consumption of quality food, that is food rich in vitamins, minerals, supplements, proteins and fats by an athlete during training or competition. A successful performance of an athlete is a combination of systematic training and a sensible approach towards nutrition.

- **Benefits of Sports Nutrition :**
  - **(i)** Delays the onset of fatigue
  - **(ii)** Helps in enhancing performance
  - **(iii)** Improves body composition and strength
  - **(iv)** Enhances concentration
  - **(v)** Promotes optimal recovery
  - **(vi)** Reduces the potential for energy
  - **(vii)** Reduces the risk of heat cramps
  - **(viii)** It enables training for longer duration
  - **(ix)** Helps in maintaining healthy immune function
- **Pre-competition Meal :** The pre-competition meal is the meal that is consumed during the day of competition or just before the competition as it provides calories, nutrients and liquids that is needed by an athlete to complete the competition to its optimum level.

  Some foods recommended for Pre-Competition Meal are :
  - **(i)** Sandwich
  - **(ii)** Fruit shake
  - **(iii)** Low fat yogurt
  - **(iv)** Vegetables, rice, fish
  - **(v)** Non-fat chocolate milk
  - **(vi)** String Cheese

  Importance of Pre-Competition Meal
  - **(i)** Avoids being hungry during the competition
  - **(ii)** Provides plenty of energy available for competition
  - **(iii)** Helps in enhancing stamina and endurance
  - **(iv)** Allows the stomach to be relatively empty at the start of competition
  - **(v)** Helps in maintaining normal blood sugar
- **During Competition Meal :** It refers to the food that is consumed within the duration of competitive period. The aim of during competition meal is to conserve muscle glycogen and maintain blood pressure.

  Some foods recommended for during competition meal :
  - **(i)** Cereal bars
  - **(ii)** Sports drinks
  - **(iii)** Cola drink
  - **(iv)** Sports gels
  - **(v)** Three small bananas
  - **(vi)** Jelly beans
  - **(vii)** Sports bars
  - **(viii)** Liquid meal supplement

  Importance of During Competition Meal :
  - **(i)** Helps in replacing fluids lost in sweat and reduces the risk of heat stress, maintain normal muscle function.
  - **(ii)** Helps in refuelling the muscle and liver glycogen.
  - **(iii)** Consumption of sports drink maintains blood volume, regulate body temperature.
- **Post Competition Meal :** It is the meal which is consumed after the competition is over. It should be rich in protein and carbohydrate for restoration of liver glycogen store.

  Some foods recommended for the post competition meal are :
  - **(i)** Fruit smoothie
  - **(ii)** Vegetables
  - **(iii)** Chicken roll
  - **(iv)** Eggs, Fish
  - **(v)** Whole grain bread
  - **(vi)** Peanut butter spread
  - **(vii)** Yogurt with fresh fruits
  - **(viii)** Fruit juice

  Importance of Post Competition Meal :
  - **(i)** Consuming protein assists in repairing the torn tissues
  - **(ii)** Restoring the fluid and electrolytes lost in sweat
  - **(iii)** Support the immune system to handle the damage
- **Food Supplement for Children :** Food supplements are concentrated sources of nutrients taken as dietary tone-up. They are given in addition to the regular diet. Food supplements are vitamins, minerals, herbs etc. We can take these in the form of pills, capsules, powder, drinks and energy bars. Food supplements can add missing nutrients to diet.

  Advantages :
  - **(i)** Give necessary protein to the body
  - **(ii)** Help in tissue maintenance
  - **(iii)** Develops immunity in the body
  - **(iv)** Gives necessary growth to the body
  - **(v)** Maintain optimum health

Disadvantages :

(i) Can lead to unwanted weight gain

(ii) Can cause liver abnormalities

(iii) Lead to indigestion

- **Need for Food supplement :** No doubt that supplements play a vital role in proper growth and development of children. Though, it is not essential to consume food supplements but it becomes necessary when there is a lack of proper nutritions diet. In fact, it can be said that food supplement are unnecessary, if a child takes a balanced diet regularly. Moreover, there are various food supplements which have no practical effect. For e.g. food supplement Omega-3 fatty acids has been shown to be without any benefit for healthy children.
- **Precautions taken before taking food supplement :**

(i) Consult a doctor first.

(ii) Before purchasing, an individual should ensure that it is free from preservatives, contains no filter and no added sugar.

(iii) Don't pay heed to the word of salesmen or advertisements.

❑❑

Chapter - 3 : Yoga and Lifestyle

TOPIC-1
Asanas as Preventive Measures

Quick Review

- **Asana:** The term asana means sitting in a particular posture, which is comfortable and which could be maintained steadily for long time. Asana gives stability and comfort, both at physical and mental level.

Some Guidelines for the practice of Asana's:

(i) Generally, the asanas are practiced in the sequence of standing, sitting, prone-lying and supine-lying position.

(ii) Asanas must not be practiced in haste or by applying any sort of undue force. Jerks should be avoided.

(iii) Asanas should be performed with body and breath awareness. There should be co-ordination between breath and the movements of body parts.

(iv) As a general rule, inhale while raising any part of the body and exhale while bending down.

(v) The practitioner has to follow instructions sincerely and practice them with optimal attention.

(vi) Final position of asanas must be maintained for as long as one is comfortable.

(vii) One should maintain the final posture according to one's own limitations and should not go beyond one's capacity.

(viii) An utmost care must be taken in increasing the time for maintain success.

(ix) Regular practice is essential. Body starts listening to your command only after a regular and diligent training for a sufficient period of time.

- **Asanas as preventive measures:** Asanas play a vital role as being a preventive measure to many body related diseases and problems. These are some major asanas listed below which lead to avoid many problems.
- **Yoga for health (Asanas):**

(a) Surya Namaskar : This is the practice of sun salutation which comprises of a series of different postures involving 12 steps in it.

Benefits of Surya Namaskar:

(i) It helps to reduce abdominal fat.

(ii) It increases the flexibility of spine and limbs.

(iii) It strengthens the breathing capacity.

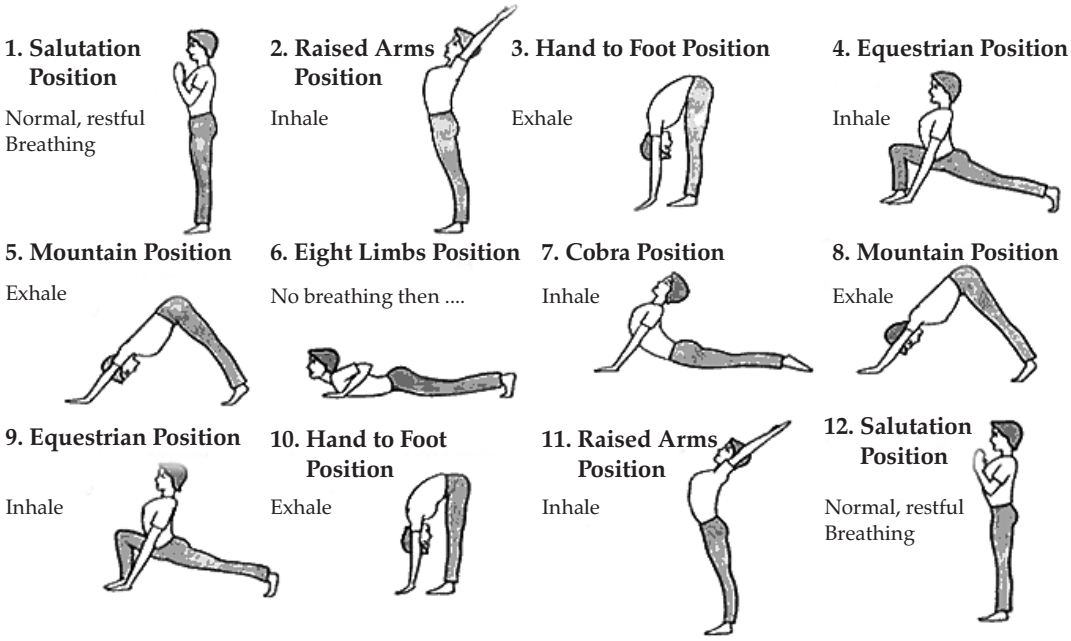
(iv) It reduces the effects of hypertension, diabetes etc.

(v) It penetrates and rejuvenate most of the vital organs of the human system.

The 12 steps are given below:

Surya Namaskar

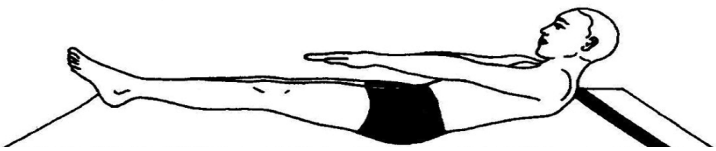
A Salute to the sun



(b) Naukasana (Boat Posture): Nauka in Sanskrit means 'boat. The final position of this asana resembles a boat, hence the name has been given Naukasana. This asana can be performed with both in supine and prone position.

Benefits:

(i) It stimulates digestive system.
(ii) It give relief in gastric problems.
(iii) It removes lethargy resulting into improved concentration.
(iv) It removes nervous tension and brings relaxation.
(v) It reduces fat around waist and abdomen.

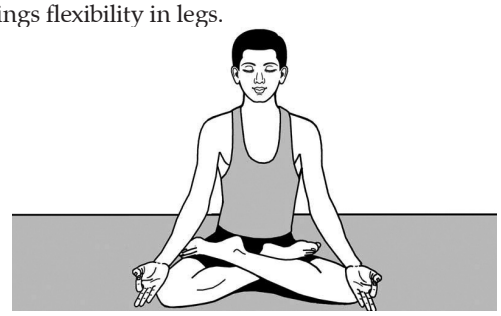


Naukasana

(c) Padmasana: Padmasana is made of two words: Padma and asana. Padma means 'lotus'. The legs in sitting position of this asana give the appearance of a lotus. This is a meditative asana.

Benefits:

(i) It is good for concentration and memory.
(ii) It brings calmness and peace.
(iii) It is good for digestion.
(iv) It stretches leg muscles and brings flexibility in legs.



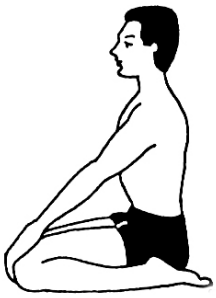
Padmasana

➢ **Asanas improving physical fitness/ flexibility:**

(a) Hastottasana: Hastottasana is made of three words: hasta, uttana and asana. Hasta means 'arms', uttana means 'stretch up' and asana means 'posture'. In this posture, the arms are stretched upwards, hence it is called 'Hastottasana'.

Benefits:

(i) It stretches muscles of back.
(ii) It reduces pain in neck, shoulders and arms.
(iii) It is beneficial for increasing height for growing children.
(iv) It increases flexibility of spine.



Hastottasana

(b) Katichakrasana (Lumber Twist Posture): Katichakra is made of three words, Kati, Chakra and asana. Kati means 'Waist', chakra means ' wheel' and asana means 'posture'. In this asana, the waist and arms move like a wheel.

Benefits:

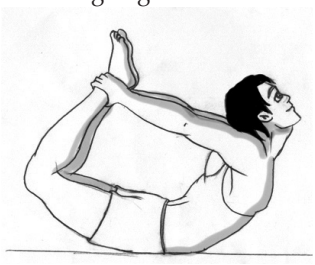
(i) It stretches the waist region and makes the lower back strong.
(ii) It strengthens shoulders, neck, arms, abdomen, back and thigh region.

Katichakrasana

3. Dhanurasana (Bow Posture): In sanskrit Dhanur means 'Bow'. This is called the bow posture because in this posture the body resembles a bow with a string attached to it.

Benefits:

(i) Dhanurasana is a good practice for joint of the shoulders, knees, ankles and entire backbone.
(ii) It is beneficial for management of diabetes, mellitus as it massages the liver and pancreas.
(iii) It helps to reduce excess fat around the belly, waist and hips.
(iv) It removes stiffness of the ligaments, muscles and nerves in the back, arms, legs, neck, shoulders and abdomen.
(v) It helps in reducing backache.
(vi) It is good for the conditions of hunched back and dropping shoulders.
(vii) It stimulates and regulates the functioning of glands.



Dhanurasana

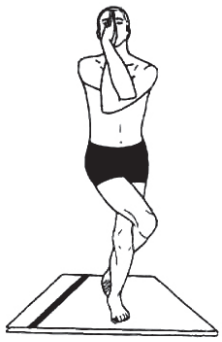
➢ **Asanas for concentration:**

(a) Garudasana: This asana is named after the well-known bird Garud (eagle). In this asana, the hands with arms placed in front look like the beak of an eagle.

Benefits:

(i) It enhances concentration.

(ii) It stabilizes your mind.
(iii) It develops body balance.



Garudasana

(b) Baddhapadmasana: Baddha means 'bind' and Padma means 'lotus'.
Benefits:
(i) It creates an inner peace.
(ii) It gives move blood supply to pelvic region.
(iii) It improves concentration.
(iv) It improves memory.

1. Taking the position

2. Releasing the position

3. Asana Position
Baddhapadmasan

TOPIC-2
Obesity

Quick Review

- **Obesity :** Obesity is a condition in which excess body fat has accumulated to the extent that it may have a negative effect on health. People are generally considered obese when their body mass index (BMI) is not perfect.

Causes of obesity :

(a) Increased calorie intakes :
- **(i)** Binge eating
- **(ii)** Frequent intake of sugary and fatty foods, fast food.
- **(iii)** Emotional problems related to bulimia and other abnormal eating patterns.

(b) Decreased Energy expenditure, lack of exercise:
- **(i)** Sedentary lifestyle eg: watching TV, playing computer games.
- **(ii)** Heavy homework, use of leisure time for study.
- **(iii)** Avoiding regular exercises etc.

- **Vajrasana :** This is a meditative posture. It is the only asana which can be practiced immediately after taking meals.

  Procedure :

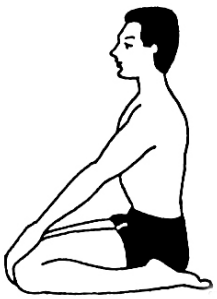
  (i) Starting Position: Sit with legs extended together, hands by the side of the body, resting on the ground.
  (ii) Fold the left leg at the knee and place the foot under the left buttock.
  (iii) Similarly fold the right leg and place the foot under the right buttock.
  (iv) Place both the heels so that the big toes overlap each other.
  (v) Position the buttocks in the space between the heels.
  (vi) Keep the hands, on respective knees.
  (vii) Keep spine erect, gaze in front or close the eyes. Initially you can stay for 10-15 seconds.

  Benefits:

  (i) It is a meditative posture and helps in concentration.
  (ii) It improves our digestive system.

  Contraindications :

  (i) A person suffering from joint pain should avoid this asana.
  (ii) People who have any spinal column ailments, especially on lower vertebrae should not attempt this asana.



Vajrasana

- **Hastasana:** It is also known as salute pose.

  Procedure:

  (i) Stand with your arms at your sides. Then, gently raise them to the ceiling.
  (ii) Make sure that your arms are parallel to each other. You can also bring your palms together over your head. While you do this, make sure your shoulders are not hunched.
  (iii) Now join your palms and stretch upward, the thigh and hands both must be stretching.

  Benefits :

  (i) It gives a good belly stretch.
  (ii) It relives stress and anxiety.
  (iii) It helps enhance body posture.
  (iv) It helps in increasing capacity of lungs.
  (v) It improves blood circulation in the body.

  Contraindications :

  You must avoid practicing this asana with your arms raised if you had an injury in your neck or shoulders.

Hastasana

- **Trikonasana (Triangle posture):** Trikona, a sanskrit word means 'Triangle'. In this asana, the body makes the shape of a triangle hence, it is called Trikonasana.

Procedure :

(i) Move your leg 1-2 feet apart.

(ii) Stretch the arms sideways and raise them to shoulder level. The arms should be parallel to the floor in one straight line.

(iii) Bend to the left side from the waist.

(iv) Place the left hand on the left foot.

(v) Stretch the arm up. Here, the two arms will be at 180°. Maintain this position with normal breathing comfortable for 5-10 seconds. Optimally the right arm can be further bent toward left side, keeping arms at 90° angle.

Benefits :

(i) It stretches up the muscle of trunk, legs and hips.

(ii) It improves the flexibility of spine.

(iii) It helps to increase the height of growing children.

(iv) It relieves back pain.

Contraindications :

(i) Avoid doing this pose if you are suffering from migraine diarrhoea, low or high blood pressure.

(ii) Avoid this asana, if you have back pain problem.

Trikoasana

- **Ardh-Matsyendrasana :**

Procedure:

(i) Bend the right leg and place right foot near the buttock. The outer edge of the foot should touch the ground.

(ii) Bend the left leg at the knee and place left foot flat on the floor near outside of the right knee.

(iii) Bring the right arm over the left knee and hold the left foot with right hand. Slowly twist the trunk to the left side and take the left arm behind the back and wrap it around the waist.

(iv) Turn the head towards the left and look back. Maintain the position for 5-10 seconds.

Benefits :

(i) It improves concentration.

(ii) Every vertebra of the spine gets fully stretched.

(iii) It reduces digestive problems.

(iv) It brings the trunk muscle in proper tone.

Contraindications :

Person suffering from peptic ulcer, hernia, enlarged liver, or having any surgery in abdominal region should not practice this asana.

Ardh-Matsyendrasana

TOPIC-3
Diabetes

Quick Review

- Diabetes is a defect in the body's ability to convert glucose (sugar) to energy. Glucose is the main source of fuel for our body. When food is digested it is changed into fats, proteins or carbohydrates. Foods that affect blood sugar are called carbohydrates.

  Types of diabetes :
  There are two main types of diabetes:

(a) **Type -1 Diabetes :** It occurs most frequently in children and young adults, although it can occur at any age. It is caused due to genetic reasons.

(b) **Type- 2 Diabetes :** This is much more common and account for 90-95 % of all diabetes. Type – 2 diabetes primarily affects adults. Main causes are physical inactivity and obesity.

Symptoms of Diabetes :

(i) Blurred vision
(ii) Unusual thirst
(iii) Slow healing cuts
(iv) Erectile dysfunction
(v) Unexplained Tiredness
(vi) Frequent urination
(vii) Rapid weight loss
(viii) Numbness or tingling in hands or feet

- **Bhujangasana :** Bhujanga in sanskrit means in 'Cobra'. In Bhujangasana one imitates a cobra with its hood fully expanded.

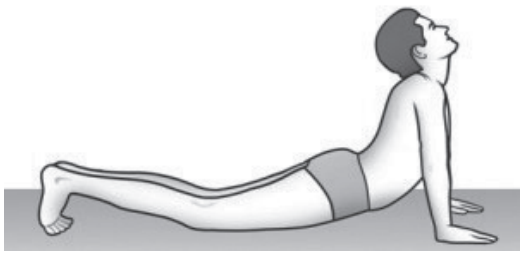
  Procedure :

  (i) Bend the arms at the elbow, place the palms by sides of the shoulders on the floor.
  (ii) Inhaling slowly, raise the head, neck and shoulders. Raise the trunk upto navel and arch the back. Maintain the posture for 10-15 seconds.

  Benefits :

  (i) This asana makes spine flexible.
  (ii) It solves many digestive problems.
  (iii) It helps in enhancing focus.

  Contraindications : Person suffering from peptic ulcer, hernia and intestinal tuberculosis should not practice this asana.



Bhujangasana

- **Paschimottansana:** Paschimottansana means stretching the posterior region. In this posture, posterior muscles of the body get stretched hence, it is called Paschimottansana.

  Procedure :

  (i) Bend the elbows, make hoops with the index fingers.
  (ii) Bend the body forward and catch hold of the toes with the hooks of the fingers.
  (iii) Place the head between the arms.
  (iv) Keeping a little bend in the elbows and without bending knees. Maintain the position for 5-10 seconds.

  Benefits:

  (i) It gives a good posterior stretch to the spinal column.
  (ii) It helps to increase the flexibility of the spinal and abdominal muscles.

(iii) It helps to improve the blood circulation in organs situated in the abdominal region.
(iv) It helps to correct posture deformities.

Contraindications :

(i) Those suffering form heart diseases, ulcer in abdomen should not practice it.
(ii) People with lower back problems or slipped discs should not do this asana.

Paschimottansana

- **Pavanmuktasana :** The sanskrit word pawana means 'air' or 'wind' and mukta means freedom. This is called as the wind relieving posture as it assists in releasing trapped digestive gas from the stomach and the intestines.

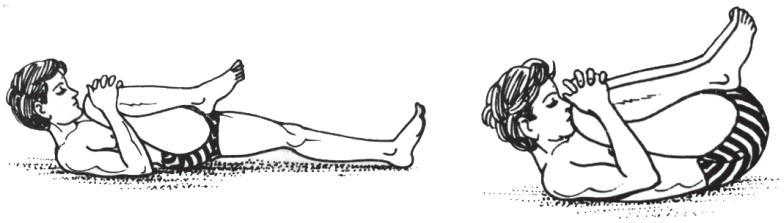
Procedure:

(i) Inhaling, fold both the legs at the knees over the belly.
(ii) Avoid the knees with the interlocked arms and press them on the belly.
(iii) While exhaling, raise the head and let the chin touch the knees.

Benefits:

(i) It increases digestive power.
(ii) It helps to release trapped gas from the stomach.
(iii) It helps to dissolve extra fat deposited in the abdominal region.

Contraindications : Do not practice, if suffering from severe back pain or abdominal injuries.



Pavanmuktasana

TOPIC-4
Asthma

Quick Review

- **Asthma :** A chronic inflammatory disorder of the airways in which many cells and cellular elements play a role.

The chronic inflammation is associated with airway hyper – responsiveness that leads to a recurrent episodes of wheezing, breathlessness chest tightness and coughing particularly at night to early morning.

Causes of Asthma :

(i) Occurs when exposed to a trigger,
(ii) Muscles surrounding bronchioles contract and produce excess mucus.
(iii) Airways become red, inflamed (swollen) and narrow.

Symptoms of Asthma:

(i) Coughing or wheezing
(ii) Difficulty in breathing, shortness of breath,
(iii) Chest tightness.
(iv) Excessive fatigue.
(v) Difficulty in talking, while walking due to shortness of breath.

- **Sukhasana**: The term 'sukhasana' is derived from the Sanskrit word 'sukham' which signifies 'delight' or 'bliss' and asana signifies "posture". This is meditative and relaxive pose, very easy to perform.

  Procedure:

  (i) Sit down normally on the floor. Stretch out your legs ahead in front.
  (ii) Now cross your legs and broaden your knees in order that you can slip your both foot under the opposite knee.
  (iii) After that bend your knees and fold your legs.
  (iv) Keep your feet loose, in order that the external edges lay on the floor and the inner curves are settled beneath the inverse leg.
  (v) Now sit with your buttock in a neutral position. Attempt to hold for a breath or two and after that gradually bring down yourself on the floor.
  (vi) Keep your hands on your knees with palm facing down and expand your tailbone against the floor.

  Benefits:

  (i) It stretches and Lengthens your spine.
  (ii) Its your collarbone and chest.
  (iii) It calms your mind.
  (iv) It enhance your condition of peacefulness and serenity.
  (v) It helps in reducing fatigue.
  (vi) It strengthens your back.
  (vii) It kicks out anxiety, stress and mental tiredness.

  Contraindications:

  (i) Individuals having backache should not practice this.
  (ii) Someone with severe arthritis should avoid this.
  (iii) Sukhasana should be avoided by individuals who have undergone knee replacement surgery.
  (iv) An individual with any issue related to spine should avoid this pose.

Sukhasana

- **Chakrasana :** Chakra means 'wheel'. In this asana, the body assumes the shape of a wheel, hence it is called chakrasana.

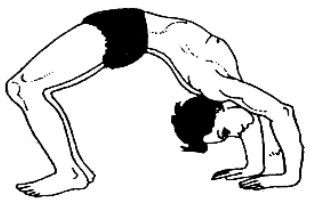
  Procedure :

  (i) Raise the arms up, bend them at the elbows, take them behind over the head. Place the palms on the floor besides the head, fingers pointing towards the shoulder.
  (ii) Slowly raise the body and arch the back.
  (iii) Straighten the arms and legs. Move the hands further towards the feet as far as possible. Maintain the position comfortably for 5-10 seconds.

  Benefits :

  (i) It makes spine flexible.
  (ii) It is good for digestion.
  (iii) It improves functioning of heart.

  Contraindications : Person suffering from weak wrist, high B.P., hernia, abdominal problems etc. should not practice this asana.



Chakrasana

- **Gomukhasana :** Go means 'Cow' and mukh means 'face'. In this asana, the position of legs look like the face of cow, hence, it is called Gomukhasana.

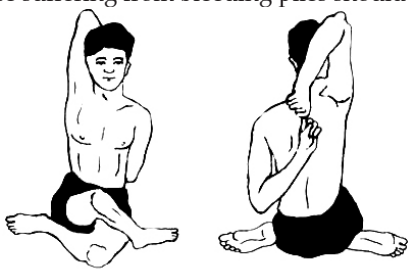
  Procedure :

  (i) Bend the right leg at the knee, bring the right foot to the left side and place it close to the left buttock.
  (ii) Fold the left leg at the knee. Bring the left foot to the right side and place it close to the right buttock.
  (iii) Take the left arm over the left shoulder and right behind the back. Clasp the fingers of both hands at the back.
  (iv) Sit in the position for 10-15 seconds.

  Benefits :

  (i) It increases concentration and induces inner peace.
  (ii) It is beneficial for improving lung capacity.
  (iii) It is useful in arthritis.
  (iv) It relieves backache.

  Contraindications : Those who are suffering from bleeding piles should not practice this asana.



Gomukhasana

- **Parvatasana (Mountain Pose)**

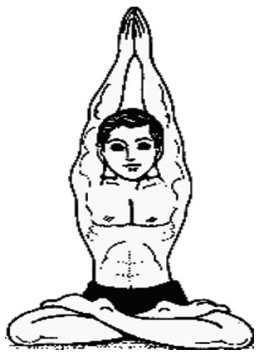
  Procedure :

  (i) Sit in vajrasana , or padmasana keep, the spine and neck straight, close your eyes gently and inhale raising both hands above the head.
  (ii) Join the two palms in namaskara mudra.
  (iii) Elbow should be straight and hands stretched upward, stay in this position for some seconds.

  Benefits :

  (i) It gives natural massage to the heart.
  (ii) It is very useful in relieving the lumbar pains, back pain, shoulder pain.
  (iii) It helps to strengthen the thighs and legs.

  Contraindications : Person suffering from hip, back shoulder injury should not practice this asana.



Parvatasana

- **Bhujangasana :** Refer to Quick Review page 29
- **Paschimottasana :** Refer to Quick Review page 29
- **Matsyasana :** Matsya means 'fish'. In this asana, body takes the posture of a floating fish.

  Procedure:

  (i) Sit in padmasana in a comfortable position.
  (ii) Bend backward, supporting the body with arms and elbow. Lift the chest, take the head back and lower the crown of the head on the ground.
  (iii) Place middle part of the head on the ground. Hold the big toes. Elbow should touch the ground.

  Benefits:

  (i) This posture has therapeutic value for mild backache and fatigue.
  (ii) This is useful in throat problems like tonsillitis.
  (iii) Good massager for the spine.

Contraindications : Avoid practicing the asana in case of peptic ulcer, heart disease, hernia and back problems.

Matsyasana

TOPIC-5
Hypertension

Quick Review

- Hypertension is a long term condition in which the blood pressure in the arteries is persistently elevated.

  Causes of Hypertension :

  (i) Smoking
  (ii) Obesity
  (iii) Too much salt in diet
  (iv) Stress
  (v) Genetics
  (vi) Too much alcohol consumption

  Symptoms of Hypertension : There are only rare symptoms for this:

  (i) Dizzy spells
  (ii) Headaches
  (iii) Nose bleeds
  (iv) Sweating

  When symptoms do occur, it is usually when blood pressure spikes suddenly and extremely enough to be considered a medical emergency.

- **Tadasana :** In this asana, body imitates like a palm tree known as Tada in sanskrit.

  Procedure :

  (i) Stand erect, legs together, hands by the side of the thighs.
  (ii) Stretch the arms upward, over the head and parallel with each other, with palms facing each other.
  (iii) Slowly raise the heels and stand on the toes. Stay for a few seconds in this final position.

  Benefits :

  (i) It strengthen thighs, knees and ankles.
  (ii) It helps in improving height of growing children.
  (iii) It helps to remove laziness.

  Contraindications : Three who have complaints of reeling sensation should not practice this.

Tadasana

- **Ardh-Chakrasana :**

Procedure :

(i) Stand straight with feet together and arms alongside the body.
(ii) Balance your weight equally on both feet.
(iii) Breathing in ,extend your arms overhead, palms facing each other.
(iv) Breathing out, gently bend backwards pushing the pelvis forward, keeping the arms in line with ears, elbows and knees straight, head up and lifting your chest towards the ceiling.

Benefits :

(i) It stretches the front upper torso.
(ii) It tones the arms and shoulder muscles.

Contraindications :

(i) Pregnant women should avoid this pose.
(ii) Hernia patient should avoid this pose.

Ardh-Chakrasana

- **Bhujangasana :** Refer to Quick Review pg. 28

TOPIC-6
Back Pain

Quick Review

- **Back pain :** Back pain is pain felt in the backbone. Episodes of backpain may be acute, sub acute, or chronic depending on the duration. The pain may be characterized as a dull ache, shooting or a burning sensation. The pain may originate from the muscles, nerves, bones or joints.

Causes of Back pain :

(i) Strained Muscles
(ii) Ruptured Disc
(iii) Sciatica
(iv) Arthritis
(v) Osteoporosis
(vi) Abnormal Curvature of spine
(vii) Cancer of the spine

Symptoms of Back pain :

(i) Weight loss
(ii) Pain reaches below the knees
(iii) Difficulty in urinating
(iv) Numbness around genital
(v) Persistent back pain
(vi) Inflammation (swelling) on the back

- **Tadasana :** Refer to Quick Review pg. 33
- **Ardhmatsyendhasana :** Refer to Quick Review pg. 26
- **Vakrasana :**

Procedure :

(i) Sit down stretching your legs forward on the ground. Keep your hands beside your thighs or buttock.

(ii) Bend your right leg straight and stretched, keep the left foot beside the right knee raised upward.
(iii) Inhale and raise the arms shoulder high, keeping the elbows straight.
(iv) Exhaling twist to the left, place the right arm by the outer side of the left knee and hold the left ankle with the right hand.
(v) Look backward towards left side, hold on this final position.

Benefits :

(i) It increases elasticity of spine.
(ii) It stretches the muscles
(iii) It reduces belly fat
(iv) It loosens the hip joint
(v) It massages the abdominal organs.

Contraindications :

(i) Avoid the asana if suffering from severe back pain.
(ii) This asana is also not recommended for people suffering from ulcer and hernia.

Vakrasana

- **Shalabhasana :**

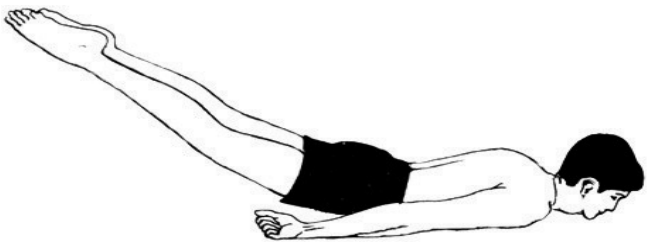
Procedure :

(i) Lie flat on the stomach, legs together, hands by the side of the thighs palm facing downwards.
(ii) Stretch both the arms and place the hands under the thighs.
(iii) Inhaling, raise both the legs upwards as high as possible. Maintain the position for 5 – 10 seconds.

Benefits :

(i) It reduces lower back pain.
(ii) It enhances concentration
(iii) Waist becomes elastic and flexible

Contraindications : Person suffering from ulcer in stomach, high B. P, cardiac complaints should not practice this asana.



Shalabhasana

- **Bhujangasana :** Refer to Quick Review pg. 28

❑❑

Chapter - 4 : Physical Education and Sports for Differently Abled

TOPIC-1
Concept of Disabilities and Types of Disabilities, Its Causes and Nature

Quick Review

- Disability is an impairment that may be cognitive, developmental, intellectual, sensory, physical, mental or source combination of these. It substantially affects a person's life activities and may be present from birth or occur during a person's lifetime. Disability is a contested concept, with different meaning for different communities. It may be used to refer to physical or mental attributes that some of institutions, particularly medicine view as needing to be fixed.

  Types of disabilities are:

  (i) Cognitive disability
  (ii) Intellectual disability
  (iii) Physical disability

(i) Cognitive disabilities: It refers to anyone with lower than average intellectual functioning. A person who has cognitive disability has trouble performing mental tasks that the average person would be able to do. The term cognitive disability can be used to describe other various disabilities such as mental retardation, dyslexia, autism, and other learning disabilities. The severity of the cognitive disability has as an affect on how independently the person can function.

Nature of cognitive disability: Cognitive disabilities do not include the category of physical disabilities. A person may have both cognitive and physical disabilities but these are separate entities. The term cognitive refers to the brain, so another way to think of cognitive disability is a brain disability. Cognitive disabilities can affect a person's performance in any of the following areas: memory, attention, problem solving, math calculation and reading comprehension. These are source characteristics of having a cognitive disability, here are few examples -

(i) Problem in remembering
(ii) Difficulty processing emergencies
(iii) Problem processing information
(iv) Problem accessing information

- **Intellectual disabilities:** Intellectual disability once called mental retardation, is characterized by below average intelligence or mental ability and a lack of skills necessary for day to day living. People with intellectual disabilities can and do learn new skills, but they learn them very slowly. There are varying degrees of intellectual disability from mild to profound. Someone with intellectual disability has limitation in two areas. These areas are:

(i) Intellectual functioning: Also known as IQ, this refers to a person's ability to learn, reason, make decisions and solve problems.

(ii) Adaptive behaviours: These are skills necessary for day-to-day life, such as being able to communicate effectively, interact with others and take care of oneself.

Nature of intellectual disability:

- An intellectual disability is characterized by a combination of deficit in both cognitive functioning and adaptive behaviour. The severity of the intellectual disability is determined by the discrepancy between the individual's capabilities in learning and in the expectations of the social environment.
- Mental retardation/ intellectual disability is a term used when a person has certain limitations in mental functioning and skills such as communication, taking care of himself/ herself and social skills.
- Intellectual Disability in DSM-IV-TR is an Axis II Disorder criteria that includes:
  (i) Intelligence test series
  (ii) Adaptive Functioning
  (iii) Age of onset

- **Physical Disabilities:** A Physical disability is a limitation on a person's physical functioning, mobility, dexterity or stamina. Other physical disabilities include impairments which limit other facts of daily lining, such as respiratory disorders, blindness, sleep disorders etc.

Nature of physical disability: People with a physical disability have an acquired or congenital physical and motor impairment such as cerebral palsy, muscular dystrophy, arthritis, developmental coordination disorder, amputations, genetic disorders etc. The disability may interfere with the development of function of the bones, muscles, joints and central nervous system.

Physical characteristics may include:

- Paralysis
- Altered muscles tone
- An unsteady galt
- Loss of , or inability to use
- Difficulty with gross motor skills such as walking or running.
- Difficulty with fine motor skills such as buttoning, clothing or printing/writing.

The impairment may range from mild to severe, may have minimal impact on the person or interfere subsequently with functional ability.

TOPIC-2
Concept and Types of Disorder, Its Causes and Nature (ADHD, SPD, ASD, ODD, OCD)

Quick Review

- **Disorder:** A disturbance of function, structure, or both resulting from a genetic or embryonic failure in development or from exogenous factors such as poison, trauma, disease.
- **Types of Disorders:**

(i) ADHD: Attention- Deficit/Hyperactivity Disorder (ADHD) is a disorder that makes difficult for a person to pay attention and control impulsive behaviour. He or she may also be restless and almost constantly active.

Causes of ADHD:

(i) Genes
(ii) Cigarette smoking
(iii) Alcohol consumption
(iv) Drug during pregnancy
(v) Low birth weight
(vi) Brain injury

(ii) SPD: Sensory Processing Disorder is a condition in which the brain has trouble receiving and responding to information that comes in through the senses. Formerly referred to as sensory integration dysfunction, it is not currently recognized as a distinct medical diagnosis. Some people with sensory processing disorder are oversensitive to things in their environment. Common sounds may be painful or overwhelming. Sensory processing problems are usually identified in children. But they can also affect adults.

Causes: The causes of SPD are not clear yet. But in a few researches it is found that SPD are coded into the child's genetic material. Prenatal and birth complications have also been implicated, and environmental factors may be involved. Birth rise factors may also cause SPD (low birth weight, prematurity etc).

(iii) ASD: Autism Spectrum Disorder is the name for a group of developmental disorders. ASD includes a wide range or "a spectrum'' of symptoms, skills and levels of disability.

Causes:

(i) Genes
(ii) Environmental Triggers
(iii) Muscular dystrophy
(iv) Infantile spasms
(v) Birth Factors

(iv) ODD: Oppositional Defiant Disorder is a condition in which a child displays an ongoing pattern of an angry or irritable mood, defiant or argumentative behaviour and vindictiveness towards people in authority. The child's behaviour often disrupts the child's normal daily activities within the family or at school.

Causes:

(i) Biological Factors
(ii) Environmental Factors
(iii) Genes

(v) OCD: Obsessive Compulsive Disorder(OCD) is a mental disorder where people feel the need to check things repeatedly, perform certain routines repeatedly or have certain thoughts repeatedly. People are unable to control either the thoughts or the activities for more than a short period of time. Common activities include hand washing, counting of things and to see if a door is locked .

Causes:

(i) Brain imaging
(ii) Biological factors
(iii) Genetical effect
(iv) Environmental causes

TOPIC-3
Disability Etiquettes and Advantage of Physical Activity for Children with Special Needs

Quick Review

- **Disability Etiquettes:** Disability etiquette is a set of guidelines dealing specifically with how to approach people with disabilities.

Few of these are:

(i) When talking to a person with disability, speak directly to that person rather than through a companion or a sign language interpreter.
(ii) When introduced to a person with disability it is appropriate to offer to shake hands. People with limited hand use or who wear an artificial limb can usually shake hands.
(iii) When meeting a person who is visually impaired, always identify yourself and others who may be with you. When conversing in group, remember to identify the person to whom you are speaking.
(iv) Treat adults as adults. Address people who have disabilities by their first name only when extending the same familiarity to all others. (Never patronize people who use wheelchairs by patting them on the head or shoulder)

- **Advantages of Physical activity for children with special needs:** All individuals benefit from regular physical activity and children with special needs specially. We could all gain from these physical, mental and social benefits by being active.

Advantages are:

(i) See improvements in muscle strength, coordination and flexibility.
(ii) Improve exercise endurance, cardiovascular efficiency and possibly increased life expectancy.
(iii) Experience better balance, motor skills and body awareness.
(iv) Will show improvement in behaviour, academics, self confidence and building friendships.
(v) Will have positive changes in their health, quality of life and boost their self-esteem.
(vi) Gets to experience a sense of accomplishment and possibly the taste of winning or personal satisfaction.
(vii) Experience increases in attention span on task behaviour, and level of correct responding.
(viii) Will increase appetite and quality of sleep.
(ix) Will find an outlet for their physical energy, will help them cope with stress, anxiety and depression.

- **Strategies to make physical activities assessable for children with special needs:**

(i) Sensory Integration: The first two things we always notice about physical education classes are the loud music and fluorescent lights in the gym. These are major barriers to students with some type of neurological differences. Many students are also sensitive to light like bright sunlight outdoors and the sound of squeaking sneakers on the gym floor. The music problem is easy to solve-lower the volume or turn it off. Sound proof headphones may be also used indoors and sunglasses can be use outdoors. Schools may find other indoor lighting options that are most cost effective, taking advantage of green energy incentives for LED light bulbs or simply shutting of some light and relying more on natural lightining.

(ii) Behaviour: Behaviour is always a concern in physical education classes where there's plenty of movement and incidents can happen in rapid succession. Positive behaviour interventions or support (PBIS) is a systematically proven method to prevent negative behaviours and increase healthy interactions. Behavioural expressions are explained from the beginning with support such as picture scheduler. Then the class material is taught through positive interactions.

(iii) Team building: Physical Education is the perfect opportunity for team building exercises. Instead of competitive games, the class can focus on creative games that only succeed when a whole team works together.

(iv) Accessibility: Hard surfaces such as concrete and asphalt may be dangerous for individuals with dyspraxia and softer such as sand or wood chips make it difficult to maneuver a wheelchair. Gym surfaces and outdoors mats are one way to make physical activity more accessible for the use with special needs. Another way is to level the playing field by having the whole class play a game such as sitting volleyball or scooter soccer.

❑❑

Chapter - 5 : Children and Sports

TOPIC-1
Motor Development in Children

Quick Review

- **Motor Development :** Motor development involves underlying biological environment and task demands influencing both motor performance and movement abilities of individual from infancy through older adulthood. It goes on all the time from conception until late teens. At the same time, the nervous system matures for any movement. The brain, nerves and muscles have to work together.
- **Gross Motor Development :** It refers to the movement involving large muscles such as arms, legs or entire body. Performing plenty of movements for developing coordination among different muscles is Gross Motor Development. For example, walking, kicking, sitting, lifting etc.
- **Fine Motor Development :** Fine motor development involves skills of the smaller muscles of the body. Such as, fingers, hands etc. For example - holding a pencil, catching a cricket ball, kicking up toys with fingers etc.
- **Stages of Motor Development :**
  - **(i)** Early childhood (2 to 6 years)
  - **(ii)** Middle childhood (7 to 10 years)
  - **(iii)** Late childhood (11 to 12 years)

- **Obstacles of Motor Development :** Everyone is different and develops at different rates. Abnormalities occur in the muscles, joints and nervous system. These abnormalities include health issues, hearing impairments, heart abnormalities, obesity etc. It means the child is not doing the things what he/she should be doing at his/her maturity level.

TOPIC-2
Factors Affecting Motor Development

Quick Review

- **Factors affecting motor development :**
  - **(i)** Obesity
  - **(ii)** Postural deformities
  - **(iii)** Sensory impairments
  - **(iv)** Biological factors
  - **(v)** Environmental factors
  - **(vi)** Nutrition
  - **(vii)** Opportunities
  - **(viii)** Physical activities

TOPIC-3
Advantages and Disadvantages of Weight Training

Quick Review

- **Weight Training :** It is a form of training that exercises your muscles and makes them stronger and more durable. These exercises are specially for strength development. It includes equipments such as dumbells, barbell bars, weight machines. Generally, these exercises involve lifting of heavy weight.

  Advantages :
  - **(i)** Increase in muscle strength
  - **(ii)** Increase in bone strength
  - **(iii)** Effective weight control

(iv) Better appearance and body posture
(v) Better sports performance
(vi) Strengthens entire body
(vii) Good conditioning of muscles

Disadvantages:

(i) May lead to injury
(ii) Safety is a major issue
(iii) Muscle cramps
(iv) Use of heavy weight causes tearing of internal organs

TOPIC-4
Concept of Correct Posture (Standing and Sitting)

Quick Review

- **Posture** means the position of body in regard to the environment at any given instant. In medical terms, the posture means, an unconscious adjustment of tone in different muscles involved in active movement or a static position, for
  (i) Making the movement or position accurate
  (ii) For maintaining the line or point of gravity constant.
- **Standing posture :** Standing posture is balanced, free from muscular and ligamentous strain that the line of gravity of the centre of the head, chest, abdomen and pelvic fall in straight line. In standing position, weight should be equally distributed between the ball of the foot and the heel.
- **Sitting posture or position :** In simple sitting position, parts of the body, head, shoulder and hip should be well placed in proper alignments with each other. The weight of the sitter should be supported over a large area so as to equally distribute the pressure.
- **Concept of correct posture :** The correct posture or good posture both static and dynamic require normal muscle tone, mechanical freedom, better coordination, good neuromuscular control and well-developed postural reflexes. Correct posture is a position that is mechanically most favourable for the transmission of body weight. All the axes being parallel to vertical line (abdomen in, chest held high, spine not twisted and shoulder are in erect position).

TOPIC-5
Advantages of Correct Postures

Quick Review

- Correct posture helps in carrying one's body and creates a good impression about one's personality. It is a visible factor that creates the first impression and can be assessed from a distance. It is important to pay attention to good posture because a weak and deformed physique has a negative effect.

  Some Advantages of correct posture :

  (i) You will have more energy in your body
  (ii) Flexibility in the body
  (iii) Increases your positive vibrations
  (iv) Reduces stress
  (v) Increases intelligence and better concentration

TOPIC-6
Causes of Bad Posture

Quick Review

- **Bad Posture :** Bad posture is the posture that results from certain muscles tighting up on shortening while other lengthens and become weak which often occurs as a result of one's daily activity.

Causes of Bad Posture :

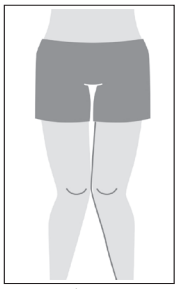
(i) Bad habit or faulty position
(ii) Over straining of muscles
(iii) Excessive body weight
(iv) Due to accident or any disease
(v) Lack of body exercise
(vi) Weak bones or muscles
(vii) Congenital
(viii) Improper diet

TOPIC-7
Common Postural Deformities

Quick Review

➢ **Some Common Postural Deformities are :**

1.Knock Knee : Knock Knee is a postural deformity in which both the knees touch or overlap each other in the normal standing position. Due to this deformity, an individual usually faces difficulty during walking.



Knock Knees

Causes :

(i) Weakness of ligaments and muscles **(ii)** Overweight body
(iii) Lack of balanced diet **(iv)** Lack of Vitamin D

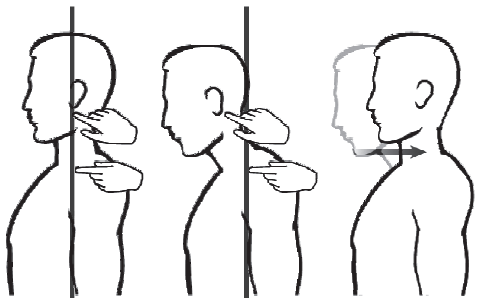
2. Flat Foot : It is a deformity in which there is no arc in the foot and the foot is completely flat. The individual faces problem in standing, walking, jumping and running.

Flat Foot

Causes :

(i) Heaviness of the body **(ii)** Standing for a long time
(iii) Faulty posture **(iv)** Use of poor quality footwear not having arc

3. Round Shoulder : It is a postural deformity in which the shoulders are drawn forward, the head is extended and the chin points forward.



Correct **Forward Head**

Causes :

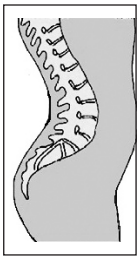
(i) Due to poor posture in work, particularly in desk job

(ii) Faulty furniture

(iii) Carrying heavy load on shoulders

(iv) Wrong habit of sitting and standing

4. **Lordosis :** It is the inward curvature of spine. It is an increased forward curve in the lumbar region. It creates problems in standing and walking.



Lordosis

Causes :

(i) Habitual overeating

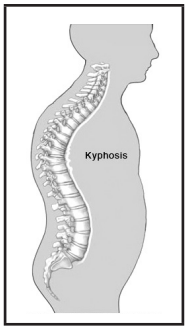
(ii) Improper environment

(iii) Lack of exercise

(iv) Diseases affecting vertebrae

(v) Improper development of muscles

5. **Kyphosis :** It is a deformity of the spine in which there is an increase of exaggeration of a backward curve or a decrease of a forward curve. It is also called round upper back.



Kyphosis

Causes :

(i) Reading in dim light

(ii) Carrying heavy load on shoulders

(iii) Wearing light and shapeless clothes

(iv) Habit of bending while walking

6. **Bow legs :** It is a deformity just the reverse of the knock knee position. In fact, if there is a wide gap between the knees, the deformity can be observed easily when individual walks or runs.

Bow Legs

Causes :

(i) Putting extra weight on leg muscles

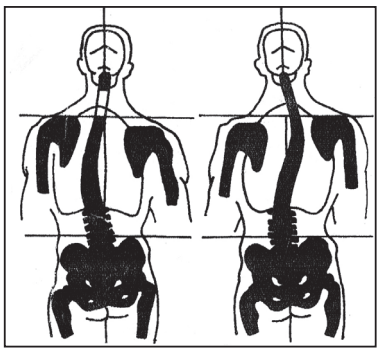
(ii) Lack of balanced diet

(iii) Lack of calcium or phosphorus in bones

(iv) Improper way of walking

(v) Forcing babies to walk at very early age

7. **Scoliosis :** It is a postural defect in which there is one large lateral curve extending through the whole length of the spine, or there may be two curves. This type of deformity is also called as curve.



Scoliosis

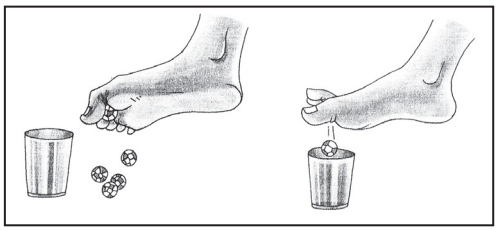
Causes :

(i) Short leg of one side
(ii) One side flat foot
(iii) Heredity defects
(iv) One side paralysis of spinal muscles

TOPIC-8
Corrective Measures for Postural Deformities

Quick Review

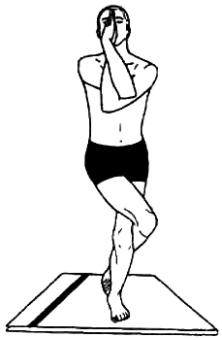
- **Postural Deformities :** There are two types of postural deformities i.e. functional and structural. In functional deformities, only the soft tissues *i.e.* the muscle and ligaments are affected. In this case, correction of postural deformities is possible through various physical activities.
- **Exercises for Kyphosis :**
  - **(i)** Swimming, Benchpress, Push-ups are beneficial as remedial measures.
  - **(ii)** In corner exercises, the patient stands facing a corner with one hand on each wall, arms at the shoulder level and elbow at 90° from this position, the body moves forward mainly from the angle joint. This is a very good exercise for stretching the pectoral muscles.
  - **(iii)** Lying one the back on a narrow bench with ring weight hanging from elbows, the arms may flex to avoid any stress to elbows.
  - **(iv)** Holding a towel or stick in a wide hand grips with arm extended above the hand and shoulder gives a good stretch to pectoral muscle and also strengthens posterior neck.
- **Exercises for Flat Foot :**
  - **(i)** By rising on the toes, by climbing stairs, by cycling.
  - **(ii)** The emphasis should be upon the exercises involving the flexion, foot and angle flexion.
  - **(iii)** Exercise like sitting on a chair : grasp a pencil under the toes of one foot and try to write the alphabets with long strokes.
  - **(iv)** One should wear special shoes properly fitted with arch support made by orthopedic centre.



Exercise for Flat Foot

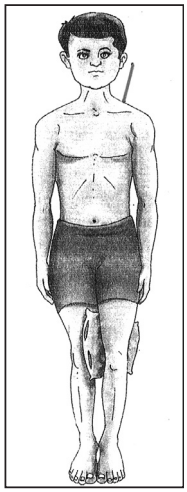
- **Exercises for Bow Legs :**
  - **(i)** Walking by bending the toes inwards.
  - **(ii)** Walking for some distance on the inner edge of the feet.
  - **(iii)** Performing Ardhmatseyandrasana and Garudasana

Ardhmatseyandrasana



Garudasana

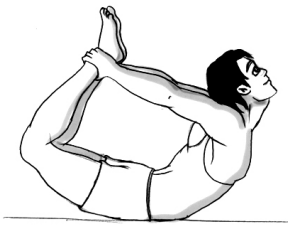
- **Exercises for Knock Knees :**
  - **(i)** Use of walking calipers.
  - **(ii)** Horse riding is the best option for this deformity.
  - **(iii)** Keeping a pillow between the knees and standing erect for sometime.
  - **(iv)** Performing Padmasana and Gomukhasana.
  - **(v)** Seated quadriceps contraction and hamstring curls.



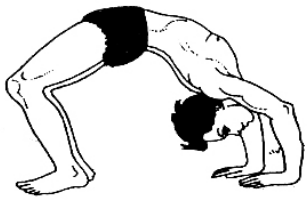
Exercise for Knock Knees

- **Exercises related to Round Shoulders :**

  Round shoulders is a common postural deformity. It can be corrected with the help of following exercises :
  - **(i)** Keep your tips of fingers on your shoulders and encircle your elbows in clockwise and anti-clockwise direction for some time.
  - **(ii)** Hold the horizontal bar for some time regularly.
  - **(iii)** Perform chakrasana and dhanurasana for some time.

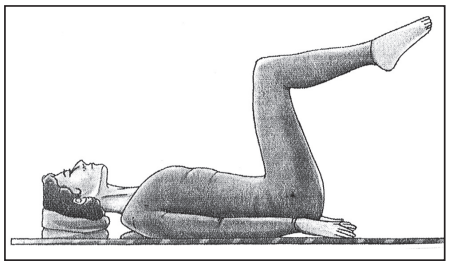


Dhanurasana



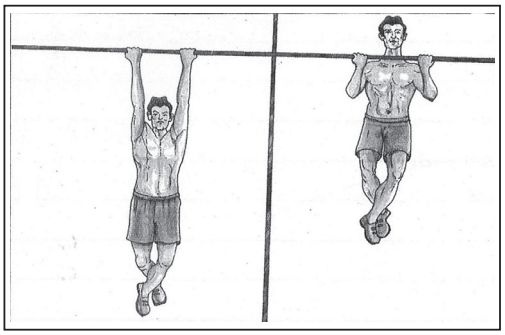
Chakrasana

- **Exercise for Lordosis :**
  - **(i)** Lunge forward with knee on a mat. Take position of the foot beyond knee. Place both hands on knee. Straighten hips of rear leg by pushing hips forward and hold stretch. Repeat with opposite side.
  - **(ii)** Sit on a chair with feet wide apart. Bend and position your shoulders between knees. Then reach to the floor under back of chair. Hold this position for some duration.
  - **(iii)** Lie in prone position on the floor. Keep the palms of your hands on the floor according to shoulders' width. Push torso up keeping pelvis on floor. Hold this position for some time.
  - **(iv)** Sit down with knees extended, feet together and hands at sides. After that bend forward, touching the fingers to toes. Hold this position for some time. Then come back and repeat.



Exercise for Lordosis

- **Exercises for Scoliosis :**
  - **(i)** To swim by breast stroke technique.
  - **(ii)** Hanging from horizontal bar.
  - **(iii)** Holding the horizontal bar with your hands and swing you body to left and right side.
  - **(iv)** Bending exercise should be performed in opposite side of ' C ' shaped curve.



Exercise for Scoliosis

❑❑

Chapter - 6 : Women and Sports

TOPIC-1
Sports Participation of Women in India

Quick Review

- **Sports Participation of Women in India :** Here, Sports participation of women means women's participation in the field of sports. In the first modern Olympics held at Athens in 1896, there was no participation of women. Women started to participate in sports in the year 1900 onwards. They participated in two events only. Carrying-on in 2000, Sydney Olympics the number of women's participation reached to around 5,000 which was a huge change in the time of 100 years. Currently, the Olympics held in 2012 at London, number of participants were around 11,000 out of which around 5,600 were women. Saina Nehwal, M.C Mary Kom secured Bronze medal for India. Now, there are many women from our country having a good name at the higher levels. Some of the examples are: Sania Mirza, Mithali Raj, Saina Nehwal and many more. In the 2016 Rio Olympics, shuttler PV Sindhu became the first Indian women to win a silver medal; Sakshi Malik first Indian female wrestler to win a medal (bronze), gymnast Dipa Karmarkar became the first Indian women to feature in a gymnastics final, finishing fourth in the vault, and Lalita Babar became the first Indian women to enter a 3,000 m steeplechase final, finishing 10^{th}. Eighteen- years old Aditi Ashok - the youngest golfer from India-also entered the final round of the women's individual golf eve.
- **Reasons for less Participation of Women in Sports :**
  - **(i)** Lack of fitness
  - **(ii)** Lack of legislation
  - **(iii)** Lack of education among women
  - **(iv)** Lack of interest among spectators
  - **(v)** Less number of women coaches
  - **(vi)** Male dominated culture
  - **(vii)** Lack of personal safety
  - **(viii)** Less facilities for women

- **Primary Areas of Differences in Gender :** Includes physique (body size), body composition, strength, energy system, cardiovascular endurance capacity, motor skill development, athletic abilities.
- **Effect of Physique and Body Composition on Sports Performance :**
  In the high jump, long jump and triple jump, height is also an important factor because the centre of gravity of the body is higher in men in comparison to women.
- **Motor Skills and Athletic Ability :** Males are considered to be stronger, possess greater muscular and cardiovascular endurance and more proficient in almost all motor skills. The number of anatomical, physiological and mechanical reasons are the reasons for low performance in females.

TOPIC-2
Special Consideration (Menarche, Menstrual Dysfunction)

Quick Review

- **Menarche :** Menarche is a young woman's first menstrual cycle and bleed. Throughout history, menarche has been an important social rite, making a girl's passage to adulthood. However, it happens during a time of physical activity or sexual maturation when as a girl usually has her first period between the ages of 9 to 15. In 5 percent of cases, menarche occurs between the ages of 16 to 18.
- **Menstrual Dysfuntion :** It is defined as abnormal bleeding in the absence of intra cavitary or uterine pathology. Menstrual dysfuntion in athletes may include primary amenorrhea, secondary amenorrhea, oligomenorrhea and luteal phase deficiency.
  In adolescence it is considered to have delayed puberty when breast development has not begun by 13.5 years of age.

TOPIC-3
Female Athletes Triad (Anaemia, Osteoporosis Amenorrhea)

Quick Review

- **Female Athletes Triad:** The 'female athlete triad' is a syndrome of three related conditions generally seen in teenage or adult female athletes who aren't meeting their energy requirements, which ultimately leaves them undernourished.
- **Disordered Eating :** Most girls with female athlete triad try to loose weight as a way to improve their athletic performance. The disordered eating that accompanies female athlete triad can range from not eating enough calories to keep up with energy demands to avoiding certain types of food the athlete thinks are 'Bad' (such as foods containing fat) to serious eating disorders like anorexia nervosa or bulimia nervosa.
- **Anaemia :** It is usually defined as a decrease in the amount of Red Blood Cells (RBC's) or haemiglobin in the blood.
- **Osteoporosis:** Estrogen is lower in girls with female athlete triad. Low estrogen levels and poor nutrition, especially low calcium intake, can lead to osteoporosis, the third aspect of the triad. Osteoporosis is weakening of the bones due to less of bone density and improper bone formation. This condition can ruin a female athlete's career because it may lead to stress, fractures and other injuries.
- **Amenorrhea:** It is a menstrual disorder or illness in females in which females of 18 years old and above either never begin menstruating or there is absence of menstruation for 3 months or more.

TOPIC-4
Eating Disorders

Quick Review

- **Eating Disorders :** When an individual starts eating in excessive amounts or starts eating in very small amounts it is called eating disorders. There are two major eating disorders viz. anorexia nervosa and bulimia nervosa.
- **Anorexia Nervosa :** Anorexia means lack of appetite. It is an eating disorder with food restriction and irrational fear of gaining weight as well as a disorted body self perception.

- **Physical signs and symptoms of Anorexia Nervosa :**
  - **(i)** Extreme weight loss
  - **(ii)** Thin appearance
  - **(iii)** Abnormal blood counts
  - **(iv)** Fatigue
  - **(v)** Insomnia
  - **(vi)** Dry skin
  - **(vii)** Dehydration
  - **(viii)** Low blood pressure
  - **(ix)** Fainting
  - **(x)** Osteoporosis
  - **(xi)** Swelling of arms and legs
  - **(xii)** Intolerance of cold
  - **(xiii)** Irregular heart rhythms
  - **(xiv)** Constipation
  - **(xv)** Soft, downy hair covering the body
  - **(xvi)** Hair fall
  - **(xvii)** Discolouration of fingers
  - **(xviii)** Absence of menstruation
- **Psychological symptoms of Nervosa Anorexia :**
  - **(i)** Denial of hunger
  - **(ii)** Afraid of gaining weight
  - **(iii)** Refusal to eat
  - **(iv)** Excessive exercise
  - **(v)** Depression
  - **(vi)** Irritability
  - **(vii)** Preoccupation with food
  - **(viii)** Lack of emotion
  - **(ix)** Social withdrawal
- **Causes of Anorexia Nervosa**
  - **(i)** Excessive worrying and feeling scared or doubtful about the future.
  - **(ii)** A tendency towards depression and anxiety.
  - **(iii)** Finding hard to handle stress.
  - **(iv)** Being very emotionally restrained.
  - **(v)** Difficult family relationships.
  - **(vi)** Pressures and stress at school, such as exams and bullying, particularly teasing about body weight and shape.
  - **(vii)** Occupations or hobbies as being thin is seen as an ideal, such as dancing or athletics.
  - **(viii)** A stressful life event, such as losing a job, breakdown of a relationship or bereavement.
- **Prevention of Anorexia Nervosa**
  - **(i)** Likewise, don't allow anyone in the family to tease about other's appearance. Even so-called playful teasing can produce powerful negative consequences.
  - **(ii)** Don't try to diet ever. Rather, stick to a healthy routine of nutritions diet and fitness promoting exercises.
- **Bulimia Nervosa :** It is an eating disorder characterised by binging and purging. During binging, a person consumes a large amount of food rapidly or in a short amount of time.
- **Physical Symptoms of Bulimia Nervosa :**
  - **(i)** Frequent changes in weight (loss or gain).
  - **(ii)** Feeling tired and not sleeping well.
  - **(iii)** Feeling constipated or developing intolerance of food.
  - **(iv)** Loss of a disturbance of menstrual periods in girls and women.
- **Psychological Symptoms of Bulimia Nervosa :**
  - **(i)** Extreme body dissatisfaction.
  - **(ii)** Obsession with food and need for control.
  - **(iii)** Low self-esteem and feeling of shame.
  - **(iv)** Sensitivity to comments relating to food, weight, body shape or exercise.
- **Causes of Bulimia Nervosa**
  - **(i) Genetics :** The experts in this field say that individuals with a family history of eating disorder have a higher risk of developing bulimia nervosa.
  - **(ii) Being bullied :** Children who have been bullied at school are more likely to develop bulimia as compared to other kids.
  - **(iii) Having mental health problems :** Bulimia is frequently associated with other psychological problems, such as personality disorders, anxiety disorders, obsessive disorders etc.
  - **(iv) Low self esteem :** After successful treatment many patients says that they had low opinion of themselves and saw their bulimia behaviours as a way of enhancing their self worth.
- **Prevention of Bulimia Nervosa :**
  - **(i)** Maintenance of good mental health.
  - **(ii)** Education about awareness of the disorder and associated risk factor.
  - **(iii)** Knowledge and maintenance of healthy eating habits.
  - **(iv)** Have healthy approach to exercising.
  - **(v)** Balancing social work and life.
  - **(vi)** Cultivation of a positive self-image of the body.

TOPIC-5
Psychological Aspect of Women Athletes and Sociological Aspects of Sports Participation

Quick Review

- **Psychological Aspect of Women Athlete :** Psychological aspect focuses on how females learn through interpersonal communication. Other psychological aspects are aim, attitude, self-presentation etc.
  It is the obligation of coaches to take an increasing interest in the field of women sports psychology and in particular in the area of competitive anxiety. That interest has to be focused on techniques that athletes can use in the competitive environment to maintain control and optimise their performance. Once these techniques are learned by athletes, they can easily handle a competitive environment.
- **Sociological Aspect of Sports Participation :** A large area of study within the sociology of sports in gender, including gender inequality and the role that gender has played in sports throughout history. *For example,* during the nineteenth century, participation of women in sports was discouraged or banned and it was not until 1850 that physical education for women was introduced in colleges. However, the last fifty years have seen tremendous change in this area and now women's participation in sports is approaching men's, though differences are still present.

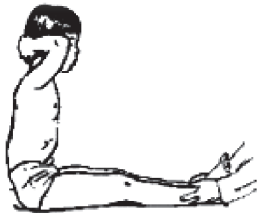
❑❑

Chapter - 7 : Test and Measurement in Sports

TOPIC-1
Measurement of Muscular Strength—Kraus Weber Test

Quick Review

- **Test :** A form of assessment used to quantify gained and retained by the trainee.
- **Measurement :** Various tools and techniques which are used to collect data along with a numeric value are called measurement.
  According to Barrow & MeGee, measurement is a technique of evaluation that is used to give result to qualitative data.
- **Muscular Strength :** The ability of a muscle to exert maximum force. Muscular strength is measured with the maximum amount of weight that a given muscle can move for one repetition. Strength is needed by positive muscles because these help to protect the joints. The strength also makes these joints less prone to sprains, strains and other injuries.
- **Kraus Weber Test :** It is the test of minimum muscular fitness. It comprises of six different sub-tests or components. These sub-tests are supposed to measure the minimum muscular strength of an individual. In fact, these measure the level of strength and flexibility of certain key muscle groups before which the functioning of the whole body as a healthy individual seems to be endangered.
  These tests are graded on pass-fail basis. But partial movements on each test can be scored from 0 to 10.
  The six items of the Kraus Weber muscular strength test are given below.
  Test 1 : Abdominal Plus Psoas (hip flexing) Muscles:
  The subject lies in supine position i.e. flat on his back and hand behind the neck. The feet are held by the examiner. On command, the subject rolls up into a sitting position.
  This is a test of the strength of abdominal and psoas muscles.

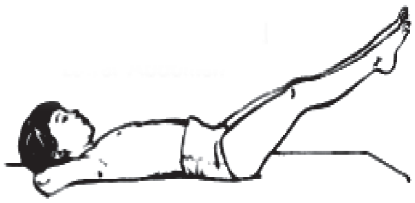


Test 2 : Strength of abdominal minus Psoas muscles:

The lying position for this test remains same i.e. in supine position except that his knees are bent and ankle remains in touch with buttocks. The subject is asked to perform one sit up. If the subject is able to perform full sit up, the test is passed. It the subject is unable to raise his shoulders from ground he gets zero.

Test 3 : Strength of Psoas and lower abdominal muscles:

The subject lies supine, the neck and legs extended. On command, the feet are lifted 25 cms (10 inches) above the ground and maintained for ten seconds. The passes this test if the position is hold for ten seconds.



Test 4 : Strength of upper back muscles:

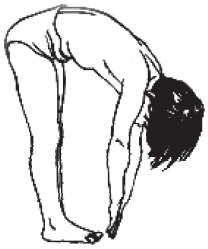
The subject lies in prone position i.e. on the stomach with a pillow under the lower abdomen and the hands behind the neck. The examiner holds the feet down. The subject is asked to raise the chest, head and shoulders while the examiner counts to 10 seconds. The test is passed if the same position is held for ten seconds.

Test 5 : Strength of lower back muscles:

The subject's position remains the same, but the examiner holds the chest down. The subject is asked to raise the feet. The knees should be straight. The examiner counts to 10 seconds. The test is passed is the same position is held for ten seconds.

Test 6 : Floor Touch Test:

It measures the flexibility of trunk. The subject stands erect, bare footed, hands at sides end feet together. The subjects is asked to lean down slowly to touch the floor with fingertips for 3 seconds. In this test bouncing and jerking is not allowed. The examiner hold the knees in order to prevent any bend, if it occurs.



TOPIC-2
Motor Fitness Test—AAHPERD

Quick Review

- **Motor Fitness:** It is the capability of an athlete to perform effectively during sports or other physical fitness. The motor fitness of an athlete is a combination of five different components each of which is essential for high levels of performance. The components of motor fitness test are:
  (i) Agility **(ii)** Balance
  (iii) Coordination **(iv)** Reaction time
  (v) Power which entails speed and strength.
- **AAHPERD (American Alliance for Health Physical Education, Recreation and Dance) :** In 1965, AAHPERD led to collection of wide ranging records or data and revision of the national norms. The following test items are included in this test battery.
  (i) Pull-ups (for boys) or flexed arm hangs (for girls).
  (ii) Sit ups to a maximum of 50 (for girls) and 100 (for boys).
  (iii) Shuttle Run **(iv)** Standing Broad Jump.
  (v) 50 yard dash **(vi)** Six hundred yard run/walk
  (vii) Softball throw for distance

  In 1976, AAHPERD Youth Fitness Test was again revised and the following changes were made:
  (i) The softball throw test item was deleted.
  (ii) Fixed number of straight leg sit ups test was changed to bent knee sit-ups performed in 60 seconds.
  (iii) 600 yard run/walk was made optional and the individuals could opt for their 600 yard run/walk or 9 minute run/walk or 1-mile (for ages 10-12) run/walk i.e., 12 minute run/walk (for ages 13 and above)

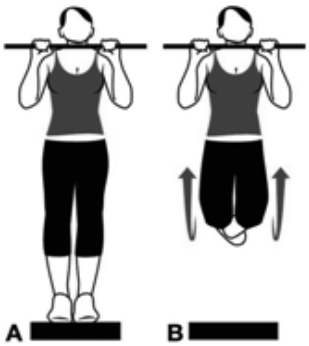
  After the revision of AAHPERD Youth fitness test in 1976 or 1.5 mile run/walk following items were finalized in this test battery.
  (i) Pull ups (for boys) flexed arm hang (for girls)
  (ii) Bent knee sit ups **(iii)** Shuttle run
  (iv) Standing board jump. **(v)** 50 yard dash
  (vi) 600 yard or 9 min run/walk.

1. (a) Pull ups (for Boys)

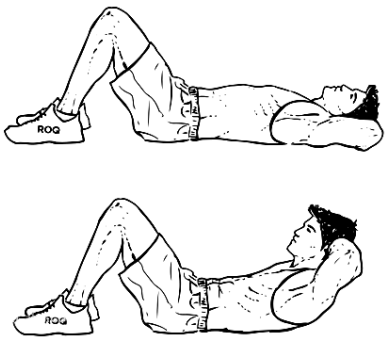
- **Purpose :** To measure arm and shoulder strength
- **Procedure :** In this test, the bar is adjusted according to the height of the boy. The boy is required to hold the bar with the palms facing him. After tightening the grip, the boy is required to raise his body so that the chin and the bar are at the same level. One point for each pull up is awarded. One trial is given before the start of the test.

(b) Flexed Arm Hang (for girls)

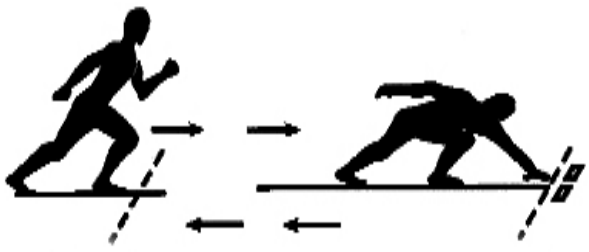
- **Purpose :** To measure arm and shoulder strength.
- **Procedure :** In this test, the bar is adjusted according to the standing height of the girl. The girl is required to hold the bar. After tightening the grip, she is required to lift her body up so that the chin and the bar are at the same level. For this purpose, she can take assistance of a co-trainee or the person taking the test.



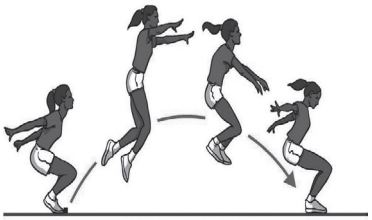
2. **Flexed leg sit ups :**
   - **Purpose :** To measure abdominal strength and endurance.
   - **Procedure :** The trainee is required to lie down on the floor supine position. The knees are bent in a way to form an angle as close as possible 90°. A co-trainee or the person taking the test holds the feet, while the trainee puts hand behind the head and interlocks the fingers. The trainee is then asked to curl up to touch the elbows to the knees. The maximum number of curl-ups or sit-ups in 60 seconds is awarded as score to the trainee.



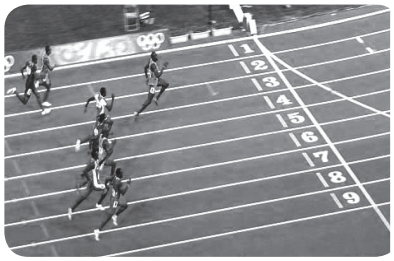
3. **Shuttle Run :**
   - **Purpose :** To measure speed and agility
   - **Procedure :** In shuttle run, two parallel lines are marked at a distance of 30 feet from each other. The training stands behind one of the lines while wooden blocks are placed behind the other line in such a way that both the lines are between the trainee and the wooden block. At the signal from the person taking the test, the trainee runs from the starting position towards the wooden blocks, picks up one of the blocks and returns to starting position. The wooden block is left there while the trainee runs back to repeat the process with the other block. One point is awarded for completing the shuttle run within 30 seconds.



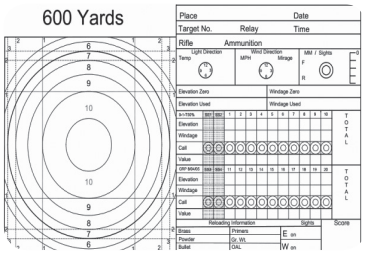
4. **Standing Broad Jump :**
   - **Purpose :** To measure power
   - **Procedure :** In this test, the trainee is required to stand behind a line with away from each other. The arms must be in swinging motion. The trainee is then asked to jump from the standing position to a place in front. The point at which the trainee lands with both heels together is noted and the distance measured from the starting position. The process is repeated thrice and the maximum distance is taken as the score.



5. **50 yard dash :**
   - **Purpose :** To measure speed
   - **Procedure :** The trainee is required to run 50 yards and the time is recorded nearest to one-tenths of a second.



6. **600 yard run/walk :**
   - **Purpose :** To measure endurance
   - **Procedure :** The trainee is required to run/walk for 600 yards and the time is recorded in minutes and seconds.



TOPIC-3
Measurement of Cardiovascular Fitness - Harvard Step Test/Rockport Test

Quick Review

- **Cardio Vascular Fitness :** It refers to ability of our heart, lungs and organs to consume, transport and utilize oxygen. The maximum value of oxygen our body can consume and use is our VO_2 max.
- **Harvard Step Test :** In 1943, Brouhafor, measuring cardiovascular endurance, constructed a very simple and easy test by means of easily obtainable and economical equipment. This is possibly the most widespread test of cardiovascular endurance used in India as well as all over the world. Since this is a strenuous test, it should not be implemented on aged/older persons.

There are two forms of this test:

(i) Long Form : In this, the pulse is counted for 30 seconds on three occasions: 1 minute after exercise (1 to 1.5 minutes), 2 minutes after exercise (2 to 2.5 minutes) and 3 minutes after exercise (3 to 3.5).

Scoring : A Physical Efficiency Index (PEI) is computed within the formula :

$$\text{PEI} = \frac{\text{Duration of exercise in seconds} \times 100}{2 \times \text{sum of pulse counts in recovery}}$$

The PEI standards for the long form are as follows.

Below 55	–	poor
55 to 64	–	low average
65 to 79	–	high average
80 to 89	–	good.
above 89	–	excellent

For individuals who do not complete the 5 minutes test, the following scorecard standards may be used.

Less than 2 minutes	–	25
From 2 to 3 minutes	–	38
From 3 to 3.5 minutes	–	48
From 3.5 to 4 minutes	–	52
From 4 to 4.5 minutes	–	55
From 4.5 to 5 minutes	–	59

(ii) Short Form : In this the pulse is counted for only 30 seconds i.e., 1 minute after exercise (1 to 1.5 minutes).
Scoring : PEI = duration of exercise in seconds × 0.55 × pulse count for 1 to 1.5 minutes exercise.

PEI stands for Physical Exercise Index. The PEI standards for the short form are :

Below 50	–	Poor
50 to 80	–	Average
Above 80	–	Good

- **Rock Port One Mile Test :** The objective of this test is to monitor the development of the athletes VO_2 max i.e. maximum value of oxygen. Requirements are:

(i) 400 m track **(ii)** Stopwatch

(iii) Weighing scale and Assistant

The aim of the test is to walk one mile (1609 meter) as fast as possible.

TOPIC-4
Measurement of Flexibility: Sit and Reach Test

Quick Review

- **Flexibility :** It is the range of motion around a joint as determined by elasticity of the muscles, tendons and ligaments with the muscles and the joint.

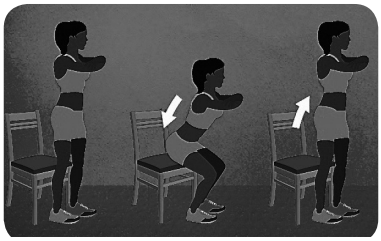
TOPIC-5
Rikli and Jones : Senior Citizen Fitness Test

Quick Review

- Rikli and Jones prepared various physical fitness tests for senior citizens. Senior citizens can't do exhaustive workouts, that is why easy tests prepared for different body parts are given as:
  - Chair Stand test for lower body strength.
  - Arm Curl Test for upper body strength endurance.
  - Chair sit and reach test for lower body flexibility.
  - Back scratch test for upper body flexibility.
  - Eight foot up and go test for coordination and agility.
  - Six minute walk test for aerobic fitness and endurance.

➢ **Chair Stand Test for Lower Body strength :**

- **Purpose :** This test assesses leg strength and endurance of senior citizens.
- **Equipment Required:** A straight or folding chair without arm rests (seat 17 inches or 44 cm high) and a stopwatch.



- **Procedure :** Put a chair against a wall to keep it from moving or causing accidental fall. The subject is to sit on the chair with both feet away from each other at a length of own shoulder. The wrists are held in a crossed position and held close to the chest. At the signal of the person taking the test, the subject stands up completely and then sit back completely. The process is repeated for 30 seconds. One complete cycle means standing up completely and sitting back. The number of completed cycles in 30 seconds are awarded as final score.

Age	Below average	Average	Above average
60-64	< 14	14 to 19	> 19
65-69	< 12	12 to 18	> 18
70-74	< 12	12 to 17	> 17
75-79	< 11	11 to 17	> 17
80-84	< 10	10 to 15	> 15
85-89	< 8	8 to 14	> 14
90-94	< 7	7 to 12	> 12

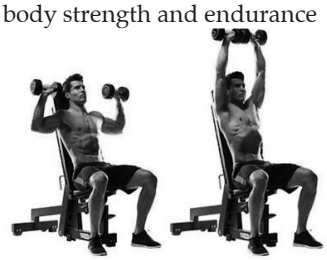
Norms for Men

Age	Below average	Average	Above average
60-64	< 12	12 to 17	> 17
65-69	< 11	11 to 16	> 16
70-74	< 10	10 to 15	> 15
75-79	< 10	10 to 15	> 15
80-84	< 9	9 to 14	> 14
85-89	< 8	8 to 13	> 13
90-94	< 4	4 to 11	> 11

Norms for Women

➢ **Arm Curl Test for Upper Body Strength:**

- **Purpose :** This measures upper body strength and endurance



- **Equipment Required :** 5 pound weight for women, 8 pound weight for men, a chair rests, stopwatch.
- **Procedure :** In this test, the subject require to sit on a chair. The subject then holds the weight in the dominant arm in the vertical down position form the shoulder. The other arm is raised in vertical up position above the shoulder which is kept there stationary either on own effort or with help of the support from the person taking the test. The dominant arm carrying the weight is then required to be curled upto shoulder height and returned back to the starting position. The number of completed curl-ups in 30 seconds is awarded as the final score.

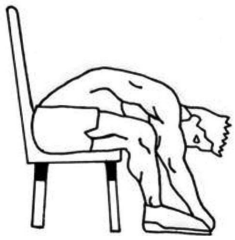
Age	Below average	Average	Above average
60-64	< 16	16 to 22	> 22
65-69	< 15	15 to 21	> 21
70-74	< 14	14 to 21	> 21
75-79	< 13	13 to 19	> 19
80-84	< 13	13 to 19	> 19
85-89	< 11	11 to 17	> 17
90-94	< 10	10 to 14	> 14

Norms for Men

Age	Below average	Average	Above average
60-64	< 13	13 to 19	> 19
65-69	< 12	12 to 18	> 18
70-74	< 12	12 to 17	> 17
75-79	< 11	11 to 17	> 17
80-84	< 10	10 to 16	> 16
85-89	< 10	10 to 15	> 15
90-94	< 8	8 to 13	> 13

Norms for Women

- **Chair Sit and Reach Test for lower body flexibility:**
  - **Purpose:** This measures lower body flexibility.
  - **Equipment Required:** Ruler, straight back or folding chair (seat 17 inch/44 cm high)



  - **Procedure:** In the test, the subject is require to sit on the edge of a chair and the feet flat on the floor. Place the hands on top of each other in a way that both middle fingers are on top of each other and the tips are touching. The subject is then required to exhale and bend towards the toes keeping the straight back and head up. The subject is not allowed to bounce or jerk the body. The position is maintained for 2 seconds and score awarded on the basis of the following table showing distance between the middle finger tips and the toes.

Age	Below average	Average	Above average
60-64	< – 2·5	– 2·5 to 4.0	> 4.0
65-69	< – 3·0	– 3·0 to 3.0	> 3.0
70-74	< – 3·5	– 3·5 to 2.5	> 2.5
75-79	< – 4·0	– 4·0 to 2.0	> 2.0
80-84	< – 5·5	– 5·5 to 1.5	> 1.5
85-89	< – 5·5	– 5·5 to 0.5	> 0.5
90-94	< – 6·5	– 6·5 to –0.5	> 0.5

Norms for Men

Age	Below average	Average	Above average
60-64	< – 0·5	– 0·5 to 5.0	> 5.0
65-69	< – 0·5	– 0·5 to 4.5	> 4.5
70-74	< – 1·0	– 1·0 to 4.0	> 4.0
75-79	< – 1·5	– 1·5 to 3.5	> 3.5
80-84	< – 2·0	– 2·0 to 3.0	> 3.0
85-89	< – 2·5	– 2·5 to 2.5	> 2.5
90-94	< – 4·5	– 4·5 to 1.5	> 1.0

Norms for Women

- **Back Scratch test for Upper Body Flexibility:**
  - **Purpose :** This test measures upper arm and shoulder girdle flexibility
  - **Equipment Required :** NONE

- **Procedure :** In this test, the subject is required to stand. One hand is put behind the head and down the back with the palm facing the body. The other hand is put at the back from the bottom side with the palm facing away from the body. The subject is then required to try and touch the fingers. The process is reported for both the shoulders.

Age	Below average	Average	Above average
60-64	> 6.5	6.5 to 0	< 0
65-69	> 7.5	7.5 to – 1.0	< – 1.0
70-74	> 8.0	8.0 to – 1.0	< – 1.0
75-79	> 9.0	9.0 to – 2.0	< – 2.0
80-84	> 9.5	9.5 to – 2.0	< – 2.0
85-89	> 10.0	10.0 to – 3.0	< – 3.0
90-94	> 10.5	10.5 to – 4.0	< – 4.0

Norms for Men

Age	Below average	Average	Above average
60-64	> 3.0	3.0 to 1.5	< 1.5
65-69	> 3.5	3.5 to 1.5	< 1.0
70-74	> 4.0	4.0 to 1.0	< 1.0
75-79	> 5.0	5.0 to 0.5	< 0.5
80-84	> 5.5	5.5 to 0	< 0
85-89	> 7.0	7.0 to – 1.0	< – 1.0
90-94	> 8.5	8.5 to – 1.0	< – 1.0

Norms for Women

➢ **Eight foot up and Go test for Agility**

- **Purpose :** This test measures speed agility and balance while moving
- **Equipment Required :** Stopwatch, straight back or folding chair (seat 17 inches/44 cm high) cone marker, measuring tape, area clear of obstacles.

- **Procedure :** Place the chair next to a wall for safety and the marker eight feet in front of the chair. Clear the path between the chair and the marker. The subject starts fully seated, hands resting on the knees and feet flat on the ground. On the command 'Go' the stopwatch is started and the subject stands and walks (no running) as quickly as possible to and around the cone, retuning to the chair to sit down.

Age	Below average	Average	Above average
60-64	> 6·0	6·0 to 4·4	< 4·4
65-69	> 6·4	6·4 to 4·8	< 4·8
70-74	> 7·1	7·1 to 4·9	< 4·9
75-79	> 7·4	7·4 to 5·2	< 5·2
80-84	> 8·7	8·7 to 5·7	< 5·7
85-89	> 9·6	9·6 to 6·2	< 6·2
90-94	> 11·5	11·5 to 7·3	< 7·3

Norms for Women

➢ **Six Minute Walk test for aerobic endurance :**

- **Purpose :** This test measures aerobic fitness.
- **Equipment Required :** Measuring tape to mark out the track distances, stop watch and chairs positioned for testing.
- **Procedure :** The walking course is laid out in a 50 yard 45.7 metres rectangular area (dimension 45× 5 yards) with cones placed at regular intervals to indicate distance walked. The aim of this test is to walk as quickly as possible for six minutes to cover as much ground as possible.

TOPIC-6
General Motor Ability Test: Barrow Items (Standing Board Jump, Zig Zag Run, Medicine Ball Put)

Quick Review

- **Standing Board Jump:** The distance in the Standing Board Jump is measured in inches and feet. For the standing time a piece of tape is placed on the floor and perpendicular to the jumping area. Each person is permitted one practice and three trial. The distance of the best trial is recorded and the correct number of points are given. The jump is disqualified if the athlete's toe touches in front of the standing line on his take off.

TABLE I

NORM'S USED FOR STANDING BOARD JUMP

Distance in feet and inches	Score	Distance in feet and inches	Score	Distance in feet and inches	Score
11' 1"	100	8' 9"	68	6' 5"	33
11' 0"	99	8' 8"	66	6' 4"	31
10' 11"	98	8' 7"	65	6' 3"	30
10' 10"	97	8' 6"	64	6' 2"	29
10' 9"	96	8' 5"	63	6' 1"	28
10' 8"	95	8' 4"	61	6' 0"	26
10' 7"	94	8' 3"	60	5' 11"	25
10' 6"	93	8' 2"	59	5' 10"	24
10' 5"	92	8' 1"	58	5' 9"	23
10' 4"	91	8' 0"	56	5' 8"	22
10' 3"	90	7' 11"	55	5' 7"	20
10' 2"	89	7' 10"	54	5' 6"	19
10' 1"	87	7' 9"	53	5' 5"	18
10' 0"	86	7' 8"	51	5' 4"	16
9' 11"	85	7' 7"	50	5' 3"	15
9' 10"	84	7' 6"	49	5' 2"	14
9' 9"	83	7' 5"	48	5' 1"	13
9' 8"	82	7' 4"	47	5' 0"	11
9' 7"	81	7' 3"	45	4' 11"	10
9' 6"	80	7' 2"	44	4' 10"	9
9' 5"	79	7' 1"	43	4' 9"	8
9' 4"	77	7' 0"	41	4' 8"	6
9' 3"	75	6' 11"	40	4' 7"	5
9' 2"	74	6' 10"	39	4'6"	4
9' 1"	73	6' 9"	38	4' 5"	3
9' 0"	71	6' 8"	36	4' 4"	1
8' 11"	70	6' 7"	35		
8' 10"	69	6' 6"	34		

- **Zig Zag Run:** The course used is set up in rectangular form 16 by 10 feet. Bowling pins can be used as centre and covers obstacles. Each athlete is allowed a trial run. He has to start from the point X (given in the below figure) and run the prescribed figure three times around. The time is recorded to the nearest tenth of a second with stopwatch.

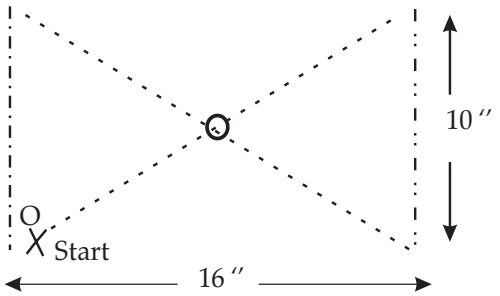


TABLE II
NORM'S USED FOR ZIGZAG RUN

Time in seconds	Score	Time in seconds	Score	Time in seconds	Score	Time in seconds	Score
17.5	100	21.3	75	25.1-25.2	50	29.0-29.1	25
17.6	99	21.4-21.5	74	25.3-25.4	49	29.2	24
17.7-17.8	98	21.6	73	25.5	48	29.3-29.4	23
17.9	97	21.7-21.8	72	25.6-21.7	47	29.5	22
18.0-18.1	96	21.9	71	25.8	46	29.6-29.7	21
18.2	95	22.0-22.1	70	25.9-26.0	45	29.8-29.9	20
18.3-18.4	94	22.2	69	26.1	44	30.0	19
18.5	93	22.3-22.4	68	26.2-26.3	43	30.1-30.2	18
18.6-18.7	92	22.5-22.6	67	26.4	42	30.1-30.2	17
18.8	91	22.7	66	26.5-26.6	41	30.3	16
18.9-19.0	90	22.8-22.9	65	26.7	40	30.4-30.5	15
19.1	89	23.0	64	26.8-26.9	39	30.6	14
19.2-19.3	88	23.1-23.2	63	27.0-27.1	38	30.7-30.8	13
19.4	87	23.3	62	27.2	37	30.9	12
19.5-19.6	86	23.4-23.5	61	27.3-27.4	36	31.0-31.1	11
19.7	85	23.6	60	27.5	35	30.2	10
19.8-19.9	84	23.7-23.8	59	27.6-27.7	34	31.3-31.4	9
20.0-20.1	83	23.9	58	27.8	33	31.5	8
20.2	82	24.0-24.1	57	27.9-28.0	32	31.6-31.7	7
20.3-20.4	81	24.2	56	28.1	31	31.8	6
20.5	80	24.3-24.4	55	28.2-28.3	30	31.9-32.0	5
20.6-20.7	79	24.5-24.6	54	28.4-28.5	29	32.1	4
20.8-20.9	78	24.7	53	28.6	28	32.2-32.3	3
21.0	77	24.8-24.9	52	28.7-28.8	27	32.4-32.5	2
21.1-21.2	76	25.0	51	28.9	26	32.6-32.7	1

- **Medicine Ball Put:** The medicine ball put has length of 70 feet, marked off in half foot intervals. Two lines, a standing and a finishing are marked off perpendicular to the measurement for the throwing area. The two lines should be 15 feet apart. Each athlete is permitted one practice and three trial puts. The distance of the best trial is recorded.

  NOTE: For boys the medicine ball weight is 3 Kg

  For girls the medicine ball weight is 1 Kg.

TABLE III
NORM'S USED FOR MEDICINE BALL PUT

Distance in feet	Score	Distance in feet	Score	Distance in feet	Score	Distance in feet	Score
72	100	56-56.5	75	40	50	23.5	25
71.5	99	55.5	74	39.5	49	22.5-23	24
70.5-71	98	55	73	38.5-39	48	22	23
70	97	54.5	72	38	47	21.5	22
69.5	96	53.5-54	71	37.5	46	21	21
69	95	53	70	37	45	20-20.5	20
68-68.5	94	52.5	69	36-36.5	44	19.5	19
67.5	93	51.5-52	68	35.5	43	19	18
67	92	51	67	35	42	18.5	17
66.5	91	50.5	66	34.5	41	17.5-18	16
65.5-66	90	50	65	33.5-34	40	17	15
65	89	49-49.5	64	32.5	39	16.5	14
64.5	88	48.5	63	32	38	15.5-16	13
64	87	48	62	31-31.5	37	15	12
63-63.5	86	47-47.5	61	30.5	36	14.5	11
62.5	85	46.5	60	30	35	14	10
62	84	46	59	29-29.5	34	13.5	9
61.5	83	45.5	58	28.5	33	12.5-13	8
60.5-61	82	44.5-45	57	28	32	12	7
60	81	44	56	27.5	31	11.5	6
59.5	80	43.5	55	26.5-27	30	10.5-11	5
59	79	42.5-43	54	26	29	10	4
58-58.5	78	42	53	25.5	28	9.5	3
57.5	77	41.5	52	24.5-25	27	9	2
57	76	40.5-41	51	24	26	8.5	1

❑❑

Chapter - 8 : Physiology and Sports

TOPIC-1
Gender Differences in Physical and Physiological Parameters

Quick Review

- The physiological differences between men and women are remarkably so great that influential male and female athletes hardly ever compete with each other. These differences give men a competitive frame in sports that is absolute strength and speed. The differences among male and female are given below:

MALE	FEMALE
1. Prior to adolescence, boys grow slowly and after the age of 14-16 years, they grow faster	1. Up to the age of early adolescence, girls grow faster and slow down after the age of 14 years.

MALE	FEMALE
2. Height and maturity comes in later stage and they are normally taller in size.	2. They attain maturity and height in early age; Girls are smaller in size.
3. Males perform better in running events as they have narrow pelvis (hips).	3. Because of broader and shallow pelvis, females have difficulty in running.
4. Males have shorter trunk and long legs. They have unstable position as centre of gravity is high. They are extra frequent in jumping exercises but have poor balancing ability.	4. Females have large body and shorter limbs; centre of gravity is low as well. They are good in balancing events such as Gymnastics and jumping.
5. Males can perform any activity as they do not have biological constraints. (eg: Mensuration).	5. Hard training should be avoided as women undergo a biological activity (mensuration) which is more psychological than physiological.
6. Males generally continue to grow until age of about 20 to 23 years.	6. Around the age of 18 to 20 females stop growing in height.
7. With strong bones and cartilages males have broader and strong shoulders performing better in throwing events, rope climbing, pole vault and on Roman rings in Gymnastics.	7. Female's shoulders are weaker in strength, bones and cartilages are weak resulting as disadvantage in throwing events and lifting activities.
8. Due to their muscle structure, males have more muscular power having better ability in performing pushing, striking, kicking activities.	8. Because of different structure of muscles their muscular strength is less and thus cannot perform better in pulling, pushing, punching activities.

TOPIC-2
Physiological Factors Determining the Components of Physical Fitness

Quick Review

- The components of Physical Fitness like strength, speed, endurance and flexibility etc., can be determined with the help of various physiological factors.

I. Physiological Factors Determining Strength:

(i) Muscle Size: The size of the muscle is largely responsible to the strength of the muscle. It is an acknowledged actuality that more force can be produced by bigger and larger muscles. In males and females, the similar size of muscle produces the similar force even though males are found to be stronger in comparison to females for the reason that they have larger and bigger muscles.

(ii) Body Weight: Body weight determines the strength of an individual as well. It is known that the heavier individuals are stronger in comparison to the lighter individuals. Among international weight lifters, there is a positive correlation involving body weight and strength as because of this, the heavier weight lifters lift heavy weight.

(iii) Muscle Composition: It can be said that the proportion of the fibres determines the strength. Fundamentally each muscle consists of two types of muscle fibres i.e., white fibres (fast twitch fibres) and red fibres (slow

twitch fibres). The fast twitch fibres produce more force as they can contract faster. On the other hand, the slow twitch fibres are capable to contract for a longer duration as they do not contract faster. The muscles which can produce more strength have more percentage of fast twitch fibres.

II. Physiological Factors Determining Speed:

(i) Explosive Strength: Explosive strength is essential for all rapid and explosive movements. Explosive strength depends on the muscle composition, size, co-ordination and on the metabolic process as well. Apart from muscle composition, the left behind factors can be developed in the course of training which eventually increases the speed upto limited extent.

(ii) Flexibility: Flexibility enables complete utilization of explosive strength as well. To some point, flexibility determines the speed as well. Actually, flexibility allows utmost range of movement with not much of internal resistance.

(iii) Bio-Chemical Reserves and Metabolic Power: The muscles need more quantity of energy at an extremely high rate of utilization for maximum speed performance and for this reason the phosphogen ATP and CP stores in the muscles should be sufficient. The muscles contraction due to inadequate energy supply turnout to be slow after a short time, if ATP and CP is less in contracting muscles. The energy supply depends on definite enzymes which incise the metabolic power. Training can enhance the amount of ATP and CP.

III. Physiological Factors Determining Endurance:

(i) Aerobic Capacity: The muscles require energy to perform an activity continuously which can be supplied in the presence of oxygen. Therefore, for endurance performance, the ability to uphold the sufficient supply of oxygen to the working muscles for energy liberation is vital.

(ii) Lactic Acid Tolerance: The ability to tolerate higher concentration of lactic acid can help in improving endurance performance and is a vital factor in determining anaerobic capacity. For activities that last for about 40 seconds or more, the lactic acid tolerance is important.

(iii) Movement Economy: For significant endurance performance, the movements performed should be economical. With less energy expenditure, a runner can run at a set speed for longer duration. In endurance sports a good technique can save energy.

IV. Physiological Factors Determining Flexibility:

(i) Muscle strength: To make the movement possible especially against gravity or external force, the muscles should have a bare minimum level of strength. In reality, for achieving the higher range of movement feeble muscles can become a limiting factor. Strength of muscles is extremely trainable, hence, it can improve the flexibility.

(ii) Joint structure: In human body, there are numerous types of joints. A number of joints intrinsically have a larger range of motion in comparison to others. For instance, the ball and socket joint of the shoulder has the maximum range of motion in contrast to knee joint.

(iii) Previous Injury: Thickening or fibrosing on the affected spot may result in injuries to connective tissues and muscles. Since, fibrous tissues are less elastic, it can direct to limb shortening and eventually reduce flexibility.

TOPIC-3
Effect of Exercise on Cardio Vascular System

Quick Review

➢ **Immediate Effects of Exercises :**

1. **Heart Rate Increases:** In healthy adults, resting heart rate ranges from 60-80 beats per minute. It may be high as 100 beats per minute in sedentary middle aged individuals. It has been recorded that in elite endurance athletes, the heart rate is as low as 20-40 beats per minute. The heart rate increases in expantancy even before exercise begins, this is acknowledged as the anticipatory response which occurs through the release of neurotransmitter called epinephrine and nor-epinephrine. Subsequently to the early anticipatory response, until the maximum heart rate is reached, heart rate increases in the direct amount to intensity of the exercise. Maximum heart rate is calculated with method of deducting age from the beats at the time of birth (220 - Age). The only direct method is to exercise at increasing intensities for determining maximum heart rate until a plateau in heart rate is found inspite of the increasing rate of work.
2. **Cardiac Output Increases:** Cardiac output increases if either of heart rate or stroke volume increases. With the response of heart rate and stroke volume to activity, cardiac output increases proportionately with intensity of exercise as well. At resting condition the cardiac output is about 5 liters/min whereas, during intense exercise it may increase to 20-40 litres/min.
3. **Blood Flow Increases:** The vascular system is capable of redistributing blood to the tissues with the maximum instant demand for oxygen and away from the areas that have less demand. During rest, skeletal muscles are supplied with 15-20% of the circulating blood. Through dynamic or vigorous exercises it increases up to 80-85% of cardiac output. Blood is carried away from major organs i.e. the kidneys, liver, stomach and intestines.

4. **Stroke Volume Increases:** With exercise intensity there is proportionate increase in the stroke volume. At rest, stroke volume in untrained individuals ranges from 50-70 ml/beat rising up to 110-130 ml/beat in intense physical activity. Resting stroke volume range from 90-110 ml/beat rising to the extent of 150-220 ml/beat in elite athletes. With the onset of exercise, the stroke volume increases because the left ventricle fills up totally, stretching it more, producing a more forceful contraction with the elastic recoil, this phenomenon is known as the Frank Starling Mechanism.

➢ **Long term Effects of Exercises:**

1. **Heart Size Increases:** The size of the heart and the strength of the cardiac muscle increases due to regular exercises as to the maximum extent the left ventricle adapts. The walls of the heart develop into stronger and thicker as shown in recent studies and the thickness of myocardial wall increases as well.
2. **Resting Heart Rate Decreases:** The resting heart rate decreases due to regular exercises. After duration of 10 week training programme, the resting heart rate may reduce upto 10 beats per minute from the normal of 72 beats per minute. The heart becomes more efficient due to regular exercises. In highly conditioned athletes, the resting heart rate decreases to 30 beats/minute.
3. **Blood Flow Increases:** The body increases its number of capillaries to the requirement of supplying more oxygen during exercise to the muscles. The existing capillaries open wider as well. Further, the redistribution of blood becomes efficient and effectual. As a matter of fact, blood circulation in the body increases.
4. **Cardiac Output Increases:** The cardiac output tends to increase as a result of regular exercise. At resting conditions in untrained individuals the cardiac output can possibly be 14 to 20 litres/minute, in trained individuals 25 to 35 litres/minute and cardiac output can be as high as 40 liters/minute in elite athletes.
5. **Risk of Heart Disease Reduces:** Stress related hormones progressively get reduced from circulating in the blood due to regular exercises. This increases the blood vessel pathway, which consecutively reduces the risk for the increase of plaque that leads to coronary heart disease. Therefore, the risk of heart diseases reduces due to exercises.
6. **Blood Volume Increases:** The blood volume increases due to the regular exercise. Actually, as the blood volume enhances, there is an increases in plasma volume. Additionally, during heavy exercise, in order to keep the muscle supplied with oxygen, the body produces a greater number of red blood cells.

TOPIC-4
Effect of Exercise on Respiratory System

Quick Review

➢ **Lungs Volume:** The lungs' volume and capacity increase with endurance training. After endurance training, vital capacity is increased i.e. maximal volume of air forcefully expired out subsequent to a maximal inspiration. The trained athlete may have vital capacity of 5-6 litres but, vital capacity of untrained individual is of 3-4 litres.

➢ **Breathing frequency:** Breathing rate is the number of breaths per minute. Breathing frequency decreases after training. In resting condition, normal untrained individual's breathing frequency is about 12-20 breaths/minute. In trained athlete's or individuals', it reduces down to 7-8 breaths/minute. Exercise reduces respiratory rate that reflects superior respiratory efficiency.

➢ **Maximum minute ventilation:** The amount of air which is inspired or expired in one minute is called minute ventilation. Maximum minute ventilation gets increased subsequent to training. In untrained individual, maximum minute ventilation is about 100 litres/minute, while it is increases to more than 150-160 litres/minute in trained athlete.

➢ **Pulmonary Diffusion:** The exchange of gases that takes place in small air sacks of lungs (alveoli) is called pulmonary diffusion. For diffusion, more alveoli become active at the time of maximal level of exercise. The alveoli size increases as well which gives more space to diffusion of oxygen (O_2) and carbon dioxide (CO_2).

➢ **Ventilatory Efficiency:** The trained person gets the similar amount of oxygen (O_2) from less amount of air. Generally, 15 litres of air is required to obtain one litre of oxygen, however, trained individual gets the similar quantity of oxygen from 12 litres of air. Training or physical exercises, especially endurance training, increases the ventilatory efficiency.

TOPIC-5
Effect of Exercise on Muscular System

Quick Review

➢ In our body there are 650 muscles producing a particular movement. Muscles with the help of bones help our body to move. The cardiac muscles producing a particular movement help to pump blood throughout our body. These are most important muscle contractions *i.e.*

(i) Isotonic Contraction **(ii)** Isometric Contraction **(iii)** Isokinetic Contraction

(i) **Isotonic contraction:** It is a type of muscle contraction in which while lifting a constant load the muscle shortens with different tensions.

(ii) **Isometric contraction:** It is a muscle contraction in which there is no change in the length of the muscle though the tension is developed.

(iii) **Isokinetic contraction:** It is a muscle contraction performed at an unvarying pace. Moreover in such a way, that muscle tension develops while shortening in maximal more than the complete range of joint motion.

- **Muscle Hypertrophy:** Hypertrophy is an increase in width of individual muscle fibre. The size of the muscle fibre is usually responsible for gain in strength and muscular endurance. Weight training causes the hypertrophy of muscles.
- **Biochemical Changes in Muscles:**
- **Alteration in Aerobic Capacity:**

(i) Amount of mitochondria increases consequently, producing more muscular energy.

(ii) Breakdown of carbohydrates and fat increases.

(iii) Oxygen binding compound called Myoglobin content found in muscle tissue increases.

(iv) Quantity of glycogen store increases consequently because of training which is vital for energy production in the muscles.

- **Alterations in Anaerobic Capacity:**

(i) ATP + CP System capacity increases in a way releasing more energy.

(ii) As a result of training, glycolytic capacity increases as well.

- **Body Composition Changes:**

(i) The body composition changes significantly whereas in case of majority of individual weight training produces little or no change in the total body weight.

(ii) The muscle mass increases.

(iii) Alteration in muscle and joint motion occurs.

(iv) Flexibility increases subsequent to training, enhancing the performance and preventing serious muscle injury.

(v) There can be noteworthy loss of relative and absolute body fat.

TOPIC-6

Physiological Changes due to Ageing and Role of Physical Activity Maintaining Functional Fitness in Aged Population

Quick Review

- **Ageing:** Ageing is an inevitable and extremely complex multi-factorial process. It is characterised by the progressive degeneration of organ systems and tissues. It is largely determined by genetics and influenced by a wide range of environmental factors such as diet, exercise, exposure to micro-organism's pollutants and radiation etc.

Physiological changes due to ageing:

- **Outward signs of ageing:**
- **Skin:** Over time, the skin loses underlying fat layers and oil glands, causing wrinkles and reduced elasticity. Other contributing factors are nutrition, exposure to the sun, heredity and hormones.
- **Hair:** The hair loses its pigmentation and turns gray. Thinning or hair loss is a part of the ageing process too.
- **Nails:** The nails become thicker due to reduced blood flow to the connective tissues.
- **Inward signs of Ageing:**
- **Changes in Cardiovascular System:** For person with disabilities, changes in the cardiovascular system may appear earlier than in individuals without disabilities. Individuals who have decreased activity that is accompanied by weight gain are much more likely to experience cardiovascular problems than those who are able to remain active and mobile in their ageing years. People who are ageing experience significant changes by reduced blood flow to the body, which typically becomes serious in the eighth decade. This results from a number of factors including:

(a) Calcification of heart valves. **(b)** Lesser of elasticity in artery walls.

(c) Intra-Artery deposits.

The reduced blood flow results in less strength since:

(a) Less oxygen is being exchanged. **(b)** Less cellular nourishment.

(c) Reduced kidney and liver function.

Other consequences of these cardiovascular changes are:

(a) Hypertension with an increased risk of stroke.

(b) Heart attack

(c) Congestive heart failure

- **Changes in the respiratory system:** Respiratory problems in people with disabilities are common. For individuals with spinal cord injury, as pneumonia. This is specially true for individuals who have experienced high level injuries.

  As with the cardiovascular system, there is also a reduction in the efficiency of the respiratory system in later life. The airways and lung tissue becomes less elastic with reduced cilia activity, resulting in decreased oxygen uptake and exchange.

  The muscles of the rib cage also atrophy, further reducing the ability to:

  (a) Breathe Deeply **(b)** Cough **(c)** Expel Carbon Dioxide.

  These changes worsen if the individual smokes or lives in a polluted environment. The result of these changes can include lower stamina with the shortness of breath and fatigue, which in turn may impair one's ability to perform activities of daily life. Lack of oxygen can also increase activity.
- **Changes in musculature :** A generalized withering of all muscles is normal in later years accompanied by a replacement of some muscle tissue by fat deposits. This results in some loss of muscle tone and strength.

  Some specific implications are:

  (a) Reduced ability to breathe deeply.

  (b) Bladder incontinence, particularly in women.

  (c) Reduced gastrointestinal activity which can lead to constipation.
- **Changes in Bone Density:** With the advancement of age, the body bone density decreases. It means that elderly persons especially those over 40 years of age, are more prone to bone injury than younger persons. In fact, it is due to decrease in various minerals such as calcium and phosphorus, found in bones. The bone becomes less dense and more porous. Less bone density can result in Osteoporosis and reduction of weight bearing capacity which may lead to fracture.
- **Changes in Urinary System:** As we age, the mass of the kidneys decreases. This leads to reduction in the rate of blood filtration by the kidneys. The capacity of bladder decreases and there is an increase in residual urine. These changes increase the chance of urinary infection. With increasing age, it takes a long time for kidneys to get rid of waste products.
- **Changes in Flexibility:** The elasticity of tendons, ligaments and joint capsules is decreased with ageing. The elderly person lose 8-10 cm of lower back and hip flexibility according to a research study. The range of movement is restricted as the age increases.
- **Changes in nervous system:** A number of researches indicated that reaction time and movement time slows down with increasing age. The brain's weight, the size of its networks and its blood flow decreases with increasing age. To recall memories becomes slow which is an effect on the nervous system.

Role of Physical Activity in Maintaining Functional Fitness in Aged Population

➢ It is a well known fact that regular exercise is the supplement to delay the ageing process. Regular exercise is capable of protecting the individual against a number of chronic diseases of old age. For ageing person, the exercise direction should include muscle strengthening, aerobic and flexibility workouts. In the beginning, intensity of physical exercise should be low. In slowing the ageing process, regular exercise plays an effective role in the following ways:

- **Reduces loss of muscle mass:** With advancing age the muscle mass decreases. The accumulation of fats reduces due to exercise. Ageing has a depressing consequence on metabolism. Regular exercises results in dropping the metabolic rate and decreases the loss of lean body mass.
- **Maintains Bone Density:** Physical exercises helps in maintaining bone mass and prevent osteoporosis. Bone growth gets stimulated with resistance exercises. With the help of regular exercise, the aged persons can increase their bone density as depicted by several research studies.
- **Improves Lungs Capacity:** Oxygen uptake and exchange increases lung capacity due to regular exercise. In maintenance of strong lungs, it plays a prominent role and reduces the loss of elasticity of lungs and chest wall.
- **Decreases the risk of age related diseases:** The risk of a number of health problems faced by many ageing persons reduces due to exercises. The risk of diseases reduces due to exercise such as heart diseases, obesity, type 2 diabetes, hypertension, etc. Regular exercise reduces blood sugar level, decreases bad cholesterol, increases good cholesterol, decreases blood pressure and reduces blood vessels stiffness.

5. **Enhances muscular strength:** Actually, the size of muscles gets increased as a result of which, eventually muscular strength increases as well. The process of ageing does not hamper the individual's capability to improve muscle strength. The strength of muscle increases owing to regular exercise.

❑❑

Chapter - 9 : Sports Medicine

TOPIC-1
Concept and Definition

Quick Review

- **Concept:** Sport medicine bridges the space connecting science and sports practice with the support of exercise and fitness, and in the logical evaluation, assists studying and understanding the sports performance. Standard features take account of : prevention and treatment of sports injury; fitness exercise; drugs in sports and guideline for training and nutrition. Sports medicine encircles the series of study keen on medicine of the people exercising. The subject involves the management and assessment of people participating in sports, by application of sports science facts preventing the injury.
- **Definition:**

  "Medical knowledge applied to sport with the aim of preserving the health of the athlete while improving the athlete's performance".

  → *Dr. La Cava.*

'The scientific and medical aspects of exercise and athletics. More specifically, sports medicine is the study of physiological, biomechanical, psychosocial, pathological phenomena associated with exercise and athletics and the clinical application of the knowledge gained from the study to the improvement and maintenance of functional capacities or physical labour, exercise and athletics and to the prevention and treatment of disease and injuries related to exercise and athletics." → *Dr. David R. Lamb*

TOPIC-2
Aim and Scope of Sports Medicine

Quick Review

- **Aim :** It is clean from the definition of sports medicine that the major aim of sports medicine is maintaining physical fitness of sports person. It also aims at treating and preventing sports related injuries and rapid recovery of patients.

  There are three specific aims of sports medicine i.e.

- **Scientific promotion of Sports and Games :**
  It includes
  (i) Scientific planning of training programme
  (ii) Evaluation of training
  (iii) Selective diagnosis
  (iv) Prevention of injuries
  (v) Psychological guidance and counselling
- **Developing preventive healthcare :**
  It includes
  (i) Functional evaluation
  (ii) Detection of disorders
  (iii) Maintenance of fitness
  (iv) Prevention of ageing
  (v) Health education
- **Sports Medical extension services :**
  It includes
  (i) Treating musculoskeletal and neurological problems
  (ii) Prevention of obesity
  (iii) Cardiac health.
  (iv) Prevention of ageing
  (v) Diabetes prevention and control

➢ **Scope :** The scope of sports medicine is very wide. It is not single area of speciality. It is an area that involves healthcare professionals, researchers and educators from a wide variety of disciplines.

Therefore, sports medicine is concerned with

(i) Prevention and treatment of sports related injuries
(ii) Ageing and sports performance
(iii) Athletic nutrition
(iv) Fitness for sports and games
(v) Specific fitness regimes
(vi) Conditioning Exercises
(vii) Medical supervision of athletes
(viii) Use and abuse of drugs

Problems related with women's participation in sports

(i) Psychological aspects of sports performance
(ii) Adaptive physical education
(iii) Preventive and Curative exercises
(iv) Illness caused by environmental, physiological and psychological disturbances.

TOPIC-3
Sports Injuries : Classification, Causes and Prevention

Quick Review

➢ **Classification of Sport Injuries**

Injuries among athletes may be classified into two categories :

1. Acute injuries, and **2.** Overuse injuries

1. **Acute Injuries :** Acute injuries are caused by an unexpected shock. Common acute injuries among young sports athletes include sprains i.e. an incomplete or absolute tear of ligament, strains i.e. a partial or complete tear of a muscle or tendon.
2. **Overuse Injuries :** Not all injures are sourced by a single, sudden twist, fall or collision. A sequence of small injuries to undeveloped bodies can cause minor fractures, minimal muscle tears or progressive bone deformities which are known as overuse activities.

➢ **Common Sports Injuries :**

1. Sprain **2.** Strain
3. Dislocation **4.** Contusion
5. Fracture **6.** Abrasion

Causes of Sports Injuries :

(1) Falls : In addition to obvious breaks that can happen from a fall, wrist sprains are common. Any athlete can fall in the middle of an activity. To break the fall, the natural instinct is to put the hands down while falling.

(2) Poor Warm Up : Warm up delivers blood and oxygen to various muscles allowing them to work more efficiently. Improper warm up initiates muscle cramping and pulls, which results from jumping into an activity without properly preparing the muscles for it.

(3) Improper Equipment : Shoes that may not provide enough support may cause an injury to a runner. The inflammation of arch's shock absorber called plantar fascists is common when shoes do not fit suitably or gives proper support.

(4) Overuse : Repetitive movements or overuse may be the most serious cause of sports injuries. Runners, swimmers and tennis players are chiefly prone to overuse injuries, including tennis elbow, skin splints, tendinitis, etc.

(5) Unilateral Movements : Lower back pain threatens golfers and tennis players since these activities require certain movements by only one side of the body. This can result in weaker muscles on the less active side of the body.

(6) Fatigue : Resting between activities is essential to prevent muscle pulls as tired muscles are a common cause of muscle pulls.

(7) Technique or Posture : Spasms and pulls are often the product of something as easy as moving the head clumsily to see a ball or an opponent. After riding with racking handlebars, cyclists may experience neck pain. The position one must take to use the handlebars and still see where you're going tightens the neck muscles and causes a spasm.

➢ **Prevention of Sports Injuries :**

There are preventive aspects of some sports injuries :

- **Athlete's Medical Check-Up :** Prior to the start of the activity or seasonal practice, a pre-participation physical and medical checkup should be done of all athletes, which must comprise :

(i) A meticulous medical history
(ii) Few major lab tests should be done.
(iii) Medical check of circulo-respiratory components, abdominal, pelvis check etc.
(iv) Body Measurement such as height, weight and blood pressure etc. should be checked.
(v) Orthopaedic examination comprising of body structure, posture, flexibility, fat percentage and maturation should be collected.

- **Stay Hydrated :** When we are active and exercising, water is essential to keep the body going. It is specially important to keep hydrated if we are exercising in heat or sunny weather, as dehydration can considerably decrease mental and physical fitness.
- **Balanced Diet :** Balanced diet is also essential to prevent sports injuries because the lack of essential minerals and vitamins such as calcium, phosphorus and vitamin 'D' etc. makes bones weak. Weak bones usually lead to sports injuries.
- **Obeying the Rules :** During practice or competition, if the athletes obey the rules of games/sports properly, sports injuries such as tendinitis and stress fractures could be prevented.
- **Use of Protective Equipments:** It is an easy and the best way to prevent sports injuries. These protective equipments protect the sports person from getting injured. It is only due to this reason the protective equipments are essential in sports.
- **Proper cooling down :** Cooling down is basically lowering down the pace of workout by performing stretching exercise and deep breathing relaxation exercise. Cooling down exercises prevent the post soarness and stiffness which make exchange of blood easier.
- **Avoid Overtraining :** Doing overtraining i.e. allowing body to work more than its normal resisting capacity, which may lead to over stretching of muscles and sprains in the muscles.

TOPIC-4
Management of Injuries

Quick Review

- It is observed that only a single type of injury does not occur in sports. The injuries that take place may be in muscles, bones, joints etc.
  Likewise, sports injuries may be divided into various types. They are
  1. Soft tissue injury **2.** Bone injury
  3. Joint injury
- **Soft Tissue Injury :** The damage in the muscles, ligaments, tendons or nerves of the body is known as soft tissue injury. Some of soft tissue injuries are as follows:
  (a) Abrasion **(b)** Contusion
  (c) Laceration **(d)** Incision
  (e) Sprain **(f)** Strain

(a) Abrasion : It is a wound caused by superficial damage to the skin, no deeper than the epidermis. It is less severe than a laceration and bleeding. Mild abrasion do not scar or bleed but, deep abrasion may lead to formation of scar tissue.
Abrasion injuries most commonly occur when exposed skin comes into a moving contact with a surface, causing a grinding or rubbing away of the upper layers of the epidermis.


Abrasion

Management :
(1) A topical antibiotic (such as Neosprin) should be applied to prevent infection and to keep the wound moist.
(2) Dressing the wound is optional but helps to keep the wound drying out which interferes with healing.
(3) The abrasion should be cleaned and debris should be removed.

(b) Contusion: Contusion is a medical name for a bruise that refers to an area of skin discolouration (typically black and blue) occurs when blood vessels are damaged or broken after the skin takes a hard hit or bumps. Bruises are classified as:

- **Subcutaneous :** A bruise beneath the skin
- **Intramuscular :** A bruise within a muscle
- **Periosteal :** A bruise to a bone.

Management :

- As soon as injury happens, follow RICE; Rest, Ice, Compression, and Elevation for the first 24 to 48 hours. Remember not to keep ice on the injury for more than 15 to 20 minutes at a time which may result in frostbite.
- After the first day or two, switch from ice to heat (still no longer than 20 minutes at a time), continue to elevate the injury when convenient.
- Take acetaminophen or ibuprofen. They are good for the pain.

(c) Laceration : A laceration is a wound that occurs when skin, tissue and muscle are torn or cut open. These may be deep, shallow, wide or narrow. Most lacerations are the result of the skin hitting an object, or an object hitting the skin with force.

Management :

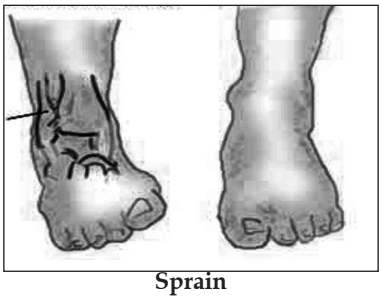
- As is the first step in most injuries to the skin, cleaning the wound is of utmost importance as to stave off infection.
- For mild laceration, the use of a topical ointment, such as Neosprin, is recommended, as the application of basic knowledge.
- For deeper wounds, as in those that affect the tissue beneath the skin and experience heavier bleeding, attention from medical professional should be required as the wound will likely need to be closed with stitches, staples or even sutures.

(d) Incision : It is a cut especially by a scalpel or similar medical tool in the context of surgical operation.

Management :

- While changing and removing the dressing of the wound, an aseptic, non-touch technique should be used.
- For cleaning of the wound sterile saline solution should be used upto 48 hours after surgery.
- If the wound has been separated or been surgically opened to drain pus, tap water can be used for cleaning after 48 hours.
- Patients can take shower safely after 48 hours of injury.

(e) Sprain : A type of injury that involves damage to one or more ligaments in a joint, often caused by trauma to a joint (the space between bones). Twisting or forces overstretch the ligaments and can cause mild or severe tears in the ligament tissue mild or severe.

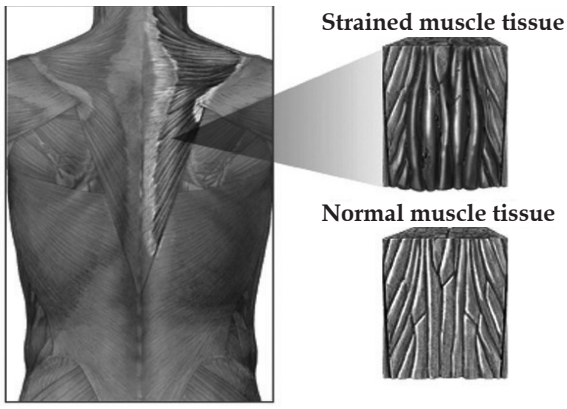


Sprain

Management : The acronym RICE is used in treating of sprain.

- **Rest:** The sprain should be rested. No additional force should be applied on site of the sprain.
- **Ice:** Ice should be applied immediately to the sprain to reduce swelling and pain. It can be 10-15 minutes longer and 3-4 times a day.
- **Compression :** Dressing or Bandages, should be used to immobilize the sprain and provide support. Compression should not cut off the circulation of the limb.
- **Elevation :** Sprained joint should be kept elevated as it helps in minimizing swelling.

(f) Strain : A strain involves stretching or tearing of muscle tendon that connects muscles to bones. Strains often occurs in the lower back and in the hamstring muscle at the back of the thigh.



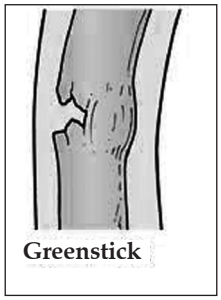
Strain

Management :

- Ice the injured area to reduce swelling.
- Rest the injured muscle.
- Compress the muscle with an elastic bandage.
- Elevate the injured area.

➢ **Bone Injuries and their Management**

- **Green stick fracture :** A green stick fracture involves bending of bone and cracks, instead of breaking completely into separate pieces. This type of broken bone is in children because their bones are softer and more flexible than the bones of adults.



Greenstick

Management: Greenstick fractures management requires fracture reducing. This is done by:

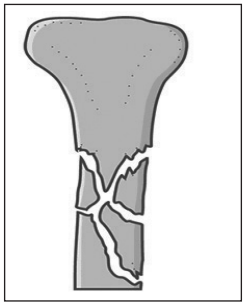
(1) Slightly pulling the bone apart and putting it into place to straighten it. To make sure that fracture will heal correctly, it is needed to be immobilized.

(2) Physical therapy is also directed to regain mobility and movement of the affected limb. If there are some instances that these measures do not take effect, surgery is advised to correct the fracture.

(3) When surgery is done, post-operative traction may be used to straighten the hard fracture.

(4) In order to reduce swelling on the affected site, anti-inflammatory drugs can be given.

- **Comminuted Fracture :** A fracture in which the bone is broken into several pieces or is shattered, creating numerous fragments is called comminuted fracture.



Comminuted

Management :

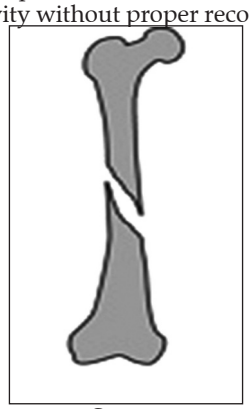
(1) The shattered pieces are lined up in a procedure labelled as reduction.

(2) Above and below the area fibre glass cast, plasters and sprints are used to maintain the immobilization.

(3) For managing of pain, ibuprofen can be used which is in similar effective to the combined acetaminophen and codeine.

(4) If bone infection arises, meticulous antiseptic measures and antibiotics are mandatory.

- **Stress Fracture :** A small crack that takes place in the bone due to overusing of certain part of the body that commonly results due to increase in activity without proper recovery is called a stress fracture.



Stress

Management :

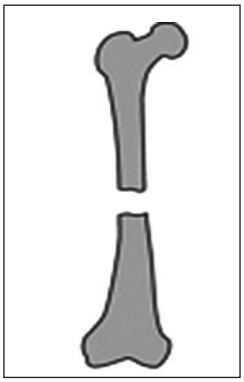
(1) The initial management for a stress fracture is to elevate the extremity and rest while the bone heals itself.

(2) Icing is recommended in the affected area for 24 to 48 hours and reducing the activity.

(3) When the swelling gets decreased, seeing the skin creases, partial weights can be applied on the area.

(4) Avoiding the activity that caused stress fracture till it is completely pain free.

- **Transverse fracture :** Type of fracture that involves breaking part of bone in a spine and the part gets extended from the main body of bone. Thoracic spine (the upper part and the middle part of the back) and lumbar spine is the part where this type of injury mainly occurs.



Transverse

Most of this type of injuries occurs as a result of a variety of accidents such as:

(i) Falls

(ii) Motor vehicle accidents

(iii) Recreational activities

(iv) Parachuting incidents

(v) Gunshot wounds

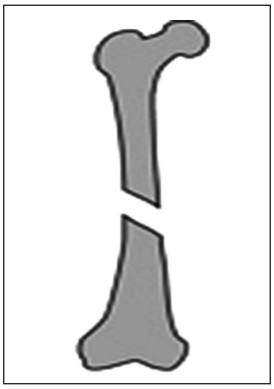
Management :

(1) If the injury is not serious, then it is not necessary to have hospital care.

(2) Bed rest, medications for relieving pain, back bracing and avoidance in the activity is required until complete rehabilitation.

(3) Operation may be required in case of severe cases like multiple fracture spine.

- **Oblique fracture :** When the breaking of bone has a curved or sloped pattern, it is said to be oblique fracture. It mainly occurs when the bone gets trapped and another bone twists over it.



Oblique

Management :

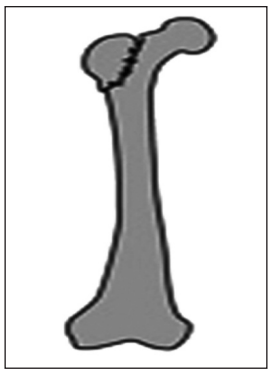
(1) Anti-inflammatory medications and pain relief may be required for handling pains.

(2) Reduction may be required to perform, which is the process of resetting the bone.

(3) Mobility may need to restrict for several weeks by placing the bone in a brace, sling or clyt.

(4) Sometimes surgery is required to insert nails, screws, wires or other devices to help the bone to heal.

- **Impacted Fracture :** It is a type of fracture in which the bones breaks into multiple fragments and gets driven into each other. It is caused mainly when someone falls from height with a great impact.



Impacted

Management :

(1) It often requires the use of plates, rods and screws to realign the bone.

(2) Severe impacted fracture may require surgery.

(3) It is necessary to restrict movements while treatment is going on.

(4) It is required to severely limit mobility until it is fully healed.

(5) It is important to take good care of fractured part

- **Joint Injuries**

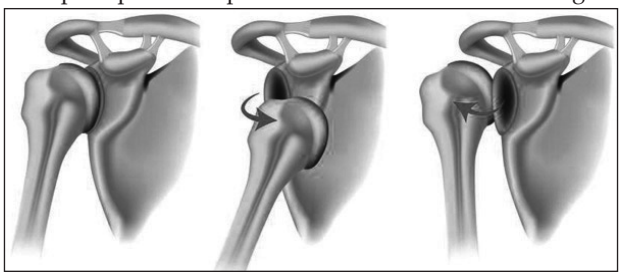
Dislocation : A type of injury to a joint, where bones in the joint gets forced out from its normal positions resting with immobilization of joints. Dislocation takes place in different location of joints like:

(a) Dislocation of shoulder joint.

(b) Dislocation of lower jaw

(c) Dislocation of hip joint.

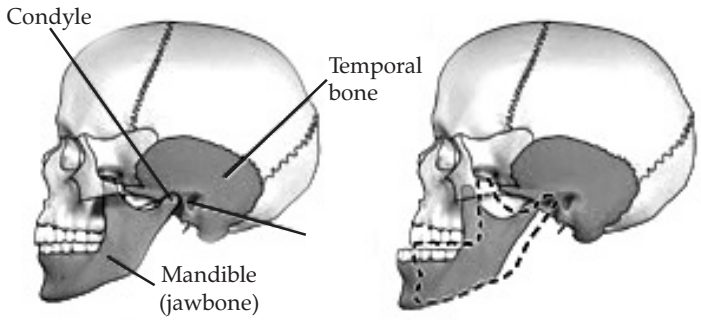
(a) Dislocation of shoulder joint : The shoulder joint is called a ball and socket joint as the rounded top of the bone in the upper arm (Humerus) gets fit into the socket. Shoulder joint is said to be dislocated when the top of the humerus moves out of the cup shaped outer part of the shoulder blade leading to immobilization of joint.



Normal anatomy **Anterior dislocation** **Posterior dislocation**

Shoulder Dislocation

(b) Dislocation of lower jaw : An injury to the jaw joints that join the lower jaw bone to the skull called the temporomandibular joints, and when the bones of these joint lie out from the skull it results in dislocation of lower jaw.

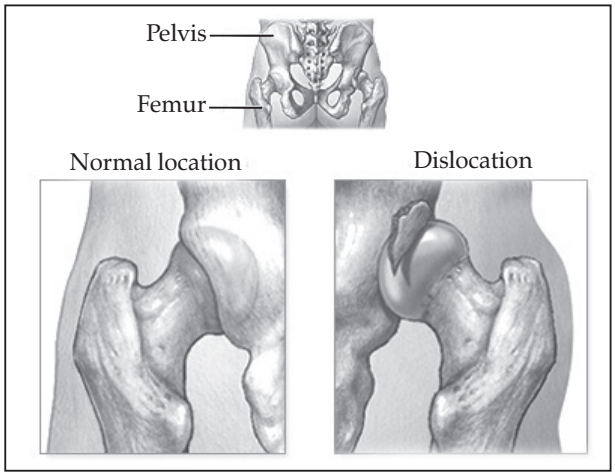


Normal **Dislocated**

Dislocation of Jaw

(c) Dislocation of hip joint : Dislocation of hip joint is a common injury to the hip joint. Dislocation occurs when the

ball-shaped head of the femur comes out of the cup shaped acetabulum set in the pelvis.



Dislocation of Hip Joint

Management of Dislocation :

(1) Apply cold pack around the dislocated area to relieve the pain.

(2) Do not apply ice or cold packs directly to the skin. It may result in damage to the skin.

(3) Splint the injured area to keep it immobilized until professional dislocation treatment is given.

(4) In case of severe pain, patient can be provided with ibuprofen or acetaminophen to get relief.

(5) Once the doctor has placed the bones back into proper alignment, the joint needs to be immobilized for a number of days or weeks to allow time to the joint for healing.

❑❑

Chapter - 10 : Kinesiology Biomechanics and Sports

TOPIC-1
Introduction

Quick Review

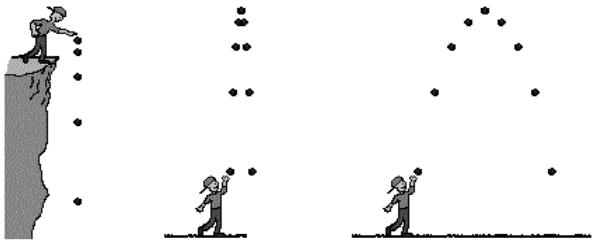
- Biomechanics is the field in sport science that applies laws of mechanics and physics to human performance, in order to gain a greater understanding of performance in athletic events through modelling, simulation and measurement. It is also necessary to have a good understanding of the applications of the physics in sport, as principle of physics such as motion, resistance, momentum and friction have their application in most sporting events. The general role of biomechanics is to understand the mechanical cause effect relationships that determine the motions of living organisms
- **Biomechanics :** It focuses on the application of the scientific principles of mechanical physics to understand movements and actions of human bodies, and its different parts (eg. a tennis racket)
- **Kinematics :** It analyses motion in terms of time, displacement, velocity or acceleration.
- **Kinetics :** It is that aspect of dynamics which considers the force or forces which cause object or bodies to move.
- **Force :** It is a pull or push by one body acting upon another. It tends to change body's state of rest or motion.

TOPIC-2
Projectile and Factors Affecting Projectile Trajectory

Quick Review

- **Projectile:** Projectile motion refers to the motion of an object that is thrown, or projected into the air at an angle. The motion of a projectile is determined only by the object's initial velocity and gravity. The path of object is parabolic in shape and the motion is called projectile motion and the object is called projectile.

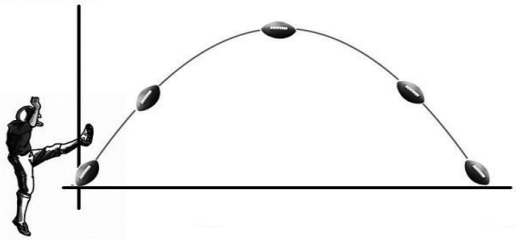
Eg : An object dropped from height is a projectile. An object which is thrown vertically upward is also a projectile.



Types of projectiles

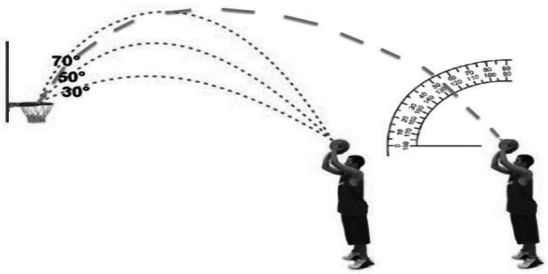
Projectiles involve anything that is shot (or projected). A projectile may be a stone shot off a cliff, a kicked football or a bullet exiting from a gun.

- **Projectile Motion :** It is a combination of horizontal motion and vertical motion. The horizontal motion of a projectile is constant because no gravitational force acts horizontally.



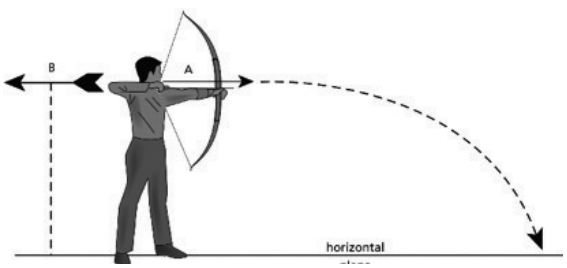
The vertical motion of a projectile is nothing more then free fall with a constant downward acceleration.

- **Crucial Aspect :** Both of these directions must be treated separately when problem solving. There are two forces, which act on a projectile. Gravitational and air resistance. The path of a projectile is called its trajectory. The trajectory of a projectile in a free fall is parabola.
  A few examples are a baseball thrown, an athlete long jumping. A classic example is a soccer ball, which becomes a projectile when kicked by a player.



- **Types of Projectile**

1. **Horizontal Projectile :** A horizontal projectile is simply an object that is initially shot horizontally, or parallel to the ground, with an initial horizontal velocity (VJ and no initial vertical velocity (VJY = 0)). The moment the projectile is freed from the device that provided its original impulse, the force due to Earth's gravity accelerates the object downward.

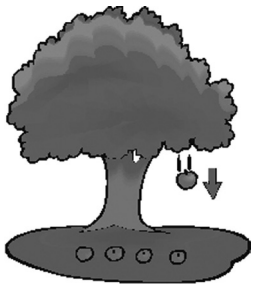


2. **Oblique Projectile :** An oblique projectile is an object which is projected at a certain angle relative to the horizontal, such as kicked football, a batted baseball, a hit on golf ball. Even though an oblique projectile also travels in two directions (x and y), during the first part of its trajectory, the object slows as it ascends (as a result of the downward pull of gravity, g). At the peak (A), it momentarily stops (where NY = 0) and then descends, speeding up as it does.

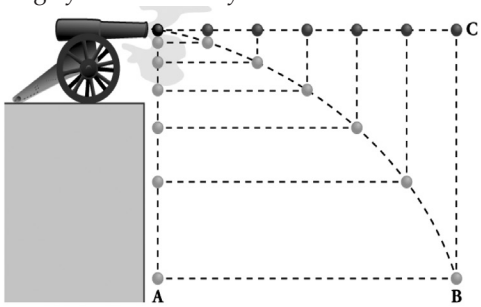
➢ **Factors Affecting Projectile Trajectory :**

1.	Gravity	**2.**	Speed of Release
3.	Height of Release	**4.**	Spin
5.	Air resistance	**6.**	Angle of Release

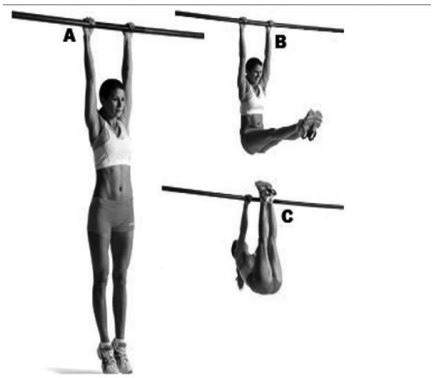
1. **Gravity :** Gravity, or gravitation is a natural phenomenon by which all physical bodies attract each other. It is most commonly recognized and experienced as the agent that gives weight to physical objects. It is the force of attraction exerted by earth towards its centre on a body or an object. Gravity affects the projectile as it decreases the height a projectile can obtain. The force of gravity acts on the object to stop its upward movement and pulls it back to earth.



2. **Speed of Release :** The distance covered by an object depends on the initial velocity of the projectile. If the initial velocity is more, the object covers more distance. This refers to how fast the object is released (thrown or hit). A projectile's speed of release is largely determined by the muscle force. Greater the speed, greater the distance.



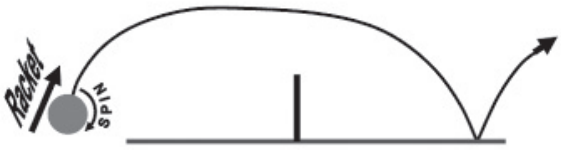
3. **Height of Release :** This refers to how high above the ground an object is released at. Increasing the height of release improves the horizontal distance objects can cover. If the height of the projection and the landing surface is equal, then release the object at an angle of 45 degrees. If the level of landing surface is more than the height of projection, increases in angle, means above 45 degrees. If the level of landing surface is less than height of projection, decrease the angle of projection. So the horizontal distance of an object depends on the relevancy of projection height and landing surface.



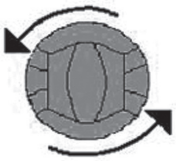
4. **Spin :** When applying force to a projectile below, above or side of the Centre of Gravity (CoG) you will impart spin onto the projectile. This helps the projectile to maintain its course and can cause it to change height or direction. Spin happens, as a ball moving through the air will move in the direction of least air pressure.

There are mainly four types of spin:

(i) Top Spin : This is where you hit over the ball. Top spin creates a downward force on the ball causing the ball to drop.



(ii) Back Spin : This is where you hit under or slice the ball. Backspin creates an upward force that lifts the ball causing the ball to rise.



Backspin

(iii) Clockwise Spin : This is when you hit ball on the left side of the CoG. It causes the ball to swing to the right.

(iv) Anti-Clockwise Spin: This is where you hit the ball on the right side of the CoG. It causes the ball to swing to the left.

5. **Air Resistance :** When a projectile moves through the air, it is slowed down by air resistance. Air resistance decreases the horizontal component of a projectile. The effect of air resistance is very small, but it needs to be taken into consideration, if you want to increase the horizontal components of a projectile.
6. **Angle of Release :** This refers to the angle that the object is thrown at or hit into the air. In activities such as shooting a basketball, an angle above 45 degrees is required. In activities such as tennis a lower around 3 to 15 degrees of angle is required. Any object when projected at different angles covers different distances. When it is projected or released at the angle of 30 degrees, making a parabolic path, it covers less distance. Scientifically, it can be said that the angle of 45 degrees is the best for an object to achieve the maximum distance.

TOPIC-3
Newton's Laws of Motion and Their Applications in Sports

Quick Review

- **Law of Inertia:** It is the first law of motion. According to this law, " A body at rest will remain at rest and a body in motion will remain in motion at the same speed and in the same direction unless acted on by an external force."
- **Law of Acceleration :** It is the second law of motion. According to this law, " A change in acceleration of an object is directly proportional to the force producing it and inversely proportional to its mass." If two unequal forces are applied to the objects of equal mass, the object that has greater force applied will move faster. Conversely, if two equal forces are applied to objects of different masses, the higher mass will travel at faster speed.
- **Law of Reaction :** It is the third law of motion. According to this law, " For every action there is equal and opposite reaction."

TOPIC-4
Aerodynamics

Quick Review

- **Aerodynamics:** It refers to the study of motion in air. Some examples of motion in air are swing, spin, break, etc.
- **Aerodynamics and Projectile:** Aerodynamics is related to the flow of air around a projectile, which can influence the speed and direction of the object.
- **Role of the air:** The air flow around a ball thrown through the air differs greatly depending on whether it has a smooth surface or a rough surface (e.g. stitches on a cricket ball, damping on a goal ball).
  - **(i)** In the flight of a smooth ball, the air molecules travel around the ball to back where they meet and mix and combine to push the ball forward. The pressure behind the ball is less than the pressure in front.
  - **(ii)** When the has uneven surface, disturbance occur as the air flows over the ball. This disturbance cause the air to stick to the ball just a little longer and increases the speed of the ball and changes its direction.
- **Athletics:** A 5000 metre runners uses 90% of the total energy expenditure during a race simply in overcoming air resistance.

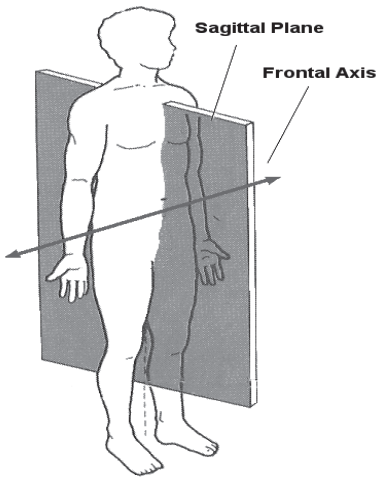
TOPIC-5
Introduction to Axis and Planes and Types of Movements

Quick Review

- **Axis/Axis of rotation :** An axis is a straight line around which an object rotates. Movement at a joint takes place in a plane around an axis . There are three types of axis:

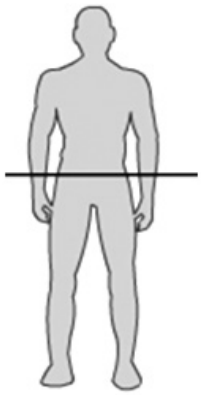
  (A) Frontal **(B)** Transverse **(C)** Longitudinal

  (A) **Frontal Axis :** Runs horizontally from the front to back of your body and is formed by the intersection of sagittal and transverse planes.



Frontal Axis

  (B) **Transverse Axis :** Passes horizontally from left to right and is formed by the intersection of frontal and transverse planes.

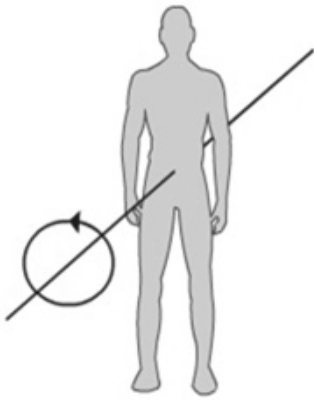


Transverse Axis

(C) Longitudinal Axis : Passes vertically from the top to the bottom of your body and is formed by the intersection of the sagittal and frontal planes.

Longitudinal Axis

- **Planes/Planes of movements :** Three basic planes used in the anatomy are:
  (A) Frontal **(B)** Transverse **(C)** Sagittal
  (A) Frontal : The frontal plane (sometimes called coronal plane) is perpendicular to the ground and divides the body into back (or posterior) and front (or anterior) portions. Movements in this plane are sideways movements called abduction and adduction.
  (B) Transverse : The transverse plane (also known as an axial plane or cross-section), divides the body into top and bottom. Movements in this plane are rotational in nature, such as internal and external rotation, prenotion and supination .
  (C) Sagittal : The sagittal plane passes through body front to back, so dividing it into left and right. Movements in this plane are the up and down movements of flexion and extension.



Sagittal

Types of Movements :These are of four types :

(i) Flexion **(ii)** Extension **(iii)** Abduction **(iv)** Adduction

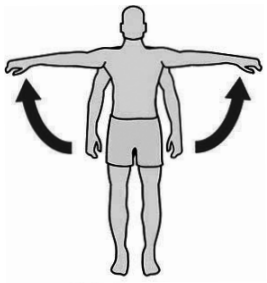
(i) Flexion : Flexion refers to a movement that decreases the angle between two body parts. Flexion at the elbow is decreasing the angle between the ulna and the humerus. When the knee flexes, the ankle moves closer to the buttock, and the angle between the femur and tibla gets smaller.

Flexion

(ii) Extension : It refers to a movement that increase the angle between two body parts. Extension at the elbow is increasing the angle between the ulna and the humerus. Extension of the knee straightens the lower limits.

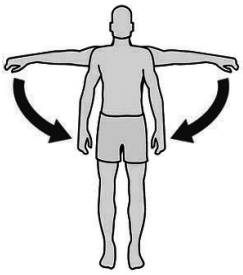
Extension

(iii) Abduction : Abduction is a movement away from midline – just as abducting someone is to take them away. For example, abduction of the shoulder raises the arms out to the side of the body



Abduction

(iv) Adduction : It is a movement towards the midline. Adduction of the hip squeezes the legs towards each other.

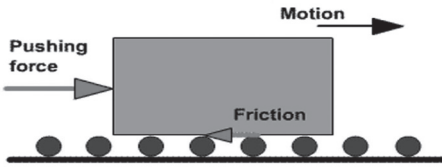


Adduction

TOPIC-6
Friction and Sports

Quick Review

- The force acting along two surfaces in contact, which opposes the motion of one body over the other is called the force of friction. It is very important in sports. The larger the area of contact between the surfaces, the greater the force of friction. When both the surfaces are smooth, the force of friction reduces almost to zero. Generally there are two causes of friction.
  (i) the roughness or irregularities of surface
  (ii) the strong atomic or molecular forces of attraction between the two surfaces at the point of actual contact.



- **Characteristics of friction :**

1. Friction is the force resisting the relative motion of solid surfaces, fluid layers and material elements sliding against each other.
2. Friction is a force that is created whenever two surfaces move or try to move across each other.
3. Friction always opposes the motion or attempted motion of one surface area across another surface
4. Friction is also dependent on the amount of contact force pushing the two surfaces together.

- **Types of Friction:**
  There are generally two types of friction:
  1. Static Friction
  2. Dynamic Friction

1. **Static Friction :** Static friction is when a force is applied to an object but it does not cause it to move. Example: Pushing a wall. Static friction comes into play when a body is forced to move along a surface but movement does not start. The magnitude of static friction remains equal to three applied external forces and true direction of motion. The magnitude of static friction depends upon coefficient of static friction and N (Net normal reaction of the body).
2. **Dynamic Friction :** Dynamic friction is a divergent force that comes into action when one body is in reality moving over the surface of one more body. Additionally, dynamic friction is of two types i.e., sliding friction and rolling friction. These are :
   (i) Sliding friction : Sliding friction is the divergent force that comes into action as the body is in reality, sliding over the surface of the other body. For instance, ice skating and in pole vault, planting the pole.
   (ii) Rolling Friction : Rolling friction occurs when an object rolls over another (something with wheels or circular like a ball). Example riding a motorcycle. Rolling frictional force is a force that slows down the motion of a rolling object. Basically it is a combination of various types of frictional forces at the point of contact of wheel and ground or surface. When a hard object moves along a hard surface then static and molecular friction force retard its motion. When soft object moves over a hard surface then its distortion makes it to slow down.

TOPIC-7
Major Muscles Involved in Running, Jumping, Throwing

Quick Review

- **Muscles involved in running:**

1. **The Quadriceps :** The muscles on the front of the thigh are called the quadriceps. They consists of the vastus medialis, vastus intermedius, rectus femoris, and vastus lateralis. Each of these muscles get build whenever you extend your knees. During running, this takes place when your lower legs move from a bent to straight position.
2. **The Hamstrings :** The back of the thigh contain the Hamstrings, which include the bicep femoris, semitendinosus and semi membranous. These muscles flex the knees, causing your lower legs to move back toward your butt.
3. **Hip Flexors :** The hip get worked when your thighs move toward your stomach. You experience this motion after your foot leaves the ground behind you and your thigh comes upward before the next foot plant. The three major part of hip flexors are:
   (a) Major **(b)** Minor **(c)** Iliacus

- **Major muscles involved in Jumping:**

  (i) **The Quadriceps :** The quadriceps rest on the front of the thighs and they have four components: the vastus medialis, vastus lateralis, rectus femoris, vastus intermedius. During a jump, you perform hip flexion and knee extension, which both activates the quadriceps. Hip flexion takes place when you move your thigh toward your stomach ; knee extension takes place when you straighten your leg.

  (ii) **Hip Flexors :** The hip flexors run from the lower stomach to the top of the thighs. They consists of the psoas major and minor, iliacus and because of this, they are often referred to as illiopsoas. Although, these muscles are small, they are important for explosive motions like jumping.

  (iii) **Calves:** The calves has two parts – the gastrocnemius and soleus. The gastrocnemius has a lateral head and medical head it is easily seen on the back of the leg right below knee. The soleus sits anterior, or in front of the gastrocnemius. Both parts function to plant as – flex the foot. This motion occurs when you jump off the ground and point your toes groundward. A tuck jump involves a major roles of calves muscles.

- **Major muscles involved in Throwing:**

  There are five phases of throwing a ball, each phase having a different muscle involvement.

1. **Phase Stride :**

Stride (Phase 1)

Abduction of the shoulder (Detoid) muscles raises the elbow to prepare for cooking motion.

2. **Phase Cocking :**

Arm (Phase 2)

Maximal external rotation of the shoulder. Infraspinatus and teres minor muscles stabilizes humerus rotation.

3. **Acceleration :**

Stride Acceleration (Phase 3)

Extensor (Tricep) muscles allow for rapid forearm extension to generate more power.

4. **Arm Deceleration :** Supraspinatus muscles (shoulder muscles, arm muscles) contracts to decelerate internal rotation).

Arm Deceleration (Phase 4)

5. **Follow Through :** Knee muscles and calves muscles for making the more stabilized and generate maximum ground strength to throw.

Follow through (Phase 5)

❑❑

Chapter - 11 : Psychology and Sports

TOPIC-1
Understanding Stress, Anxiety and Its Management

Quick Review

- **Stress:** Stressors are any agent that causes stress to an organism Stress is a physiological response to one's mental activities and how one perceives the situation. It is a state of internal imbalance between sympathetic and para-sympathetic activity. The word 'stress' originates from the French word 'retsecis' meaning narrowness, a contriction on the limiting factor of power. Stress is experienced when individuals feel that they cannot cope with a situation with which they are presented. If athletes are in stressful situation then their athletic performance, whether this be in competition or in training will be affected. The coach can limit the effect on performance of competitive anxiety by assisting the athletes to identify an appropriate coping strategy.
- **Stressors:** Stressors can be as simple as background noise in our environment or as complex as a social situation such as going out on a date. Stressors involve a physical treat such as a car speeding towards you or an emotional treat such as being rejected by someone.
- **Causes of Stress:** Things that can cause stress are:
  (i) Family Problems
  (ii) Health Problems
  (iii) Improper Time Management
  (iv) Financial Issues
  (v) Addiction to Tobacco/Alcohol
  (vi) Being a victim of a crime (Chronic Stress)
  (vii) Spending time in jail
  (viii) Menopause (for Women)
  (ix) Losing a family member
  (x) Accident of someone close.
  (xi) Death of a pet.
  (xii) Watching a painful death
  These are some daily life reasons which can lead a person to a situation of stress.
- **Symptoms of stress:** Stress occurs due to countless reasons and is observed by many physical, behavioral and emotional symptoms. These are:

  (i) Physical symptoms:

  (a) Back and muscle ache
  (b) Neck and stomach pains
  (c) Dry mouth or throat
  (d) Indigestion
  (e) Vomiting
  (f) Excessive sweating

  (ii) Emotional and Behavioral Symptoms:

  (a) Moodiness
  (b) Nail biting
  (c) Increased Smoking and Alcohol consumption
  (d) Depression
  (e) Frustration
  (f) Restlessness
  (g) Lack of concentration
  (h) Unusual aggressiveness
  (i) Grinding teeth
  (j) Sudden change in social habits.

- **Methods of Stress Management:**
  - **(i) Exercise:** Exercise can be a key and a central method to compensate for stresses. Physical exercise not only promotes overall fitness, but it helps you to manage emotional stress and tension as well. Exercise can also aid in relaxation and improved sleep. For one thing, exercise can emotionally remove one temporarily from a stressful environment or situation. Being fit and healthy also increases your ability to deal with stress as it arises.
  - **(ii) Eat Healthy:** Ensure that you are getting adequate vitamins and minerals in your diet. One recommendation that very few of us manage to follow is to eat 5 servings of fruit and vegetable everyday.
  - **(iii) Get Enough sleep:** Make sure you are getting enough sleep. People need varying amounts ranging from 6 hours to 8 hours a night. By trial and error, you will know how much sleep you need to perform at your best.
  - **(iv) Set ten Realistic Goals:** Learn to think clearly and set yourself realistic goals and objectives. Work through one problem at a time in a logical way.
  - **(v) Use Imagination:** Practice positive visualisation. Think about a time or a place when you were relaxed and at peace. It could have been on a holiday or a day off. Try to recreate the situation again in your mind, thinking about the sights, sounds and smells you experienced. You will find that after 5 to 10 minutes you feel much more relaxed. Some people call it day dreaming but visualisation is a very powerful tool in reducing stress and anxiety.
  - **(vi) Take a break:** Take time out for yourself. Make sure you are doing some things in your life because they are important to you, rather than because you ought to or you should do them.
  - **(vii) Say no:** Say no to tasks and projects you cannot take up. People will not think bad of you.
- **Anxiety:** Anxiety means a disturbed state of mind which is accompanied by emotional reactivity, physiological arousal, nervousness and an unpleasant state of mind. Anxiety is an essential ingredient of any competitive situation and without a certain level of anxiety there cannot be competition performance. Neither too high, nor too low level of anxiety is conducive to sports performance. Adequate level of anxiety produces best results. According to:
  - **(i) Frend:** Anxiety is general feeling of messiness that is experienced before any activity regarding failure or success.
  - **(ii) Pikumas:** Anxiety is an unrealistic and unpleasant state of body and mind.
  - **(iii) Symond:** Anxiety is a driving force for a large number of subsequent adjustments.
- **Classification of Anxiety**

  Anxiety is usually classified in two ways:
  - **(i) Trait Anxiety:** The athlete's emotional state at any given time, which varies from situation to situation.
  - **(ii) State Anxiety:** An emotional response to a specific situation. It results in feeling of fear, tension or apprehension.
- **Causes of Anxiety:**
  - **(i)** Over-confidence
  - **(ii)** Injury
  - **(iii)** Lack of means of safety
  - **(iv)** Panic reaction
  - **(v)** Danger of risky activities
  - **(vi)** Disturbance
  - **(vii)** Low level of fitness
  - **(viii)** Tension
  - **(ix)** Overstress
  - **(x)** Lack of Awareness
  - **(xi)** Restlessness
  - **(xii)** Heredity
- **Symptoms of Anxiety:** There are three types of symptoms of anxiety:
  - **(i) General Symptoms:**
    - **(a)** Lack of Confidence
    - **(b)** Fear of Public Place
    - **(c)** Headaches
    - **(d)** Diarrhoea
    - **(e)** Inability to relax
    - **(f)** Low self- esteem
    - **(g)** Fear of socialising
    - **(h)** Excessive crying
    - **(i)** Regular Nightmares
    - **(j)** Tiredness/Exhaustion
  - **(ii) Emotional Symptoms:**
    - **(a)** Feeling tense or jumpy
    - **(b)** Irritability
    - **(c)** Watching for signs of danger.
    - **(d)** Trouble concentrating
    - **(e)** Restlessness
    - **(f)** Anticipating the worst
    - **(g)** Feeling like mind has gone blank
    - **(h)** Feeling of dread.

(iii) Physical Symptoms:

(a) Muscle tension
(b) Pounding heart
(c) Shortness of breath
(d) Sweating
(e) Headache
(f) Insomnia
(g) Tremors
(h) Frequent Urination
(i) Fatigue
(j) Dizziness

- **Management of Anxiety:**

Anxiety can be managed through various techniques such as:

(i) Hypnosis: While you are in a state of deep relaxation, the hypnotherapist uses different therapeutic techniques to help you face your fears and look at them in new ways.

(ii) Focus on Target: A person should focus on his/her target. Do not get distracted due to unrelated or non - required things.

(iii) Deep Breathing: Anxiety level can be controlled through deep breathing. Even Yoga Pranayam's like 'Anulom- vilom' and 'Kapal Bhati' are effective.

(iv) Drink water: Drink water when anxiety is high, as it controls anxiety level.

(v) Warming - up: Perform warming up before any stressful activity, as it prepares the individual physically and mentally for the activity.

(vi) Follow advice: Follow the advice of experts and take their suggestions and guidance. Avoid multi suggestions from those who are not experts.

(vii) No Criticism: One should not criticise anyone or anything before performing stressful activity. Criticism leads to aggressive and varied anxiety.

(viii) Encouragement: A person should be motivated and encouraged by people who are close to him / her, this stabilises anxiety level.

TOPIC-2
Coping Strategies

Quick Review

- **Coping :** In psychology, coping is expending conscious effort to solve personal and interpersonal problems and seeking to master, minimise or tolerate stress or conflict.
- **Types of Coping Strategies :** Zarus and Folk man, yet considered the following types of coping strategies.

(i) Problem focused Coping Strategies **(ii)** Emotion focused Coping Strategies.

(i) Problem focused Coping Strategies : These strategies deal with finding out the core reason of stress and aim to get better the stressful surroundings, the sportspersons are experiencing. The problem focused coping strategies are intended in altering or eliminating the genuine cause of the stress. The following methods are included in the problem focused coping strategies:

(a) Converse to your coach or teacher : It is better to speak directly to your coach or teacher if at all there are some conflicts with the coach or teacher. The coach/teacher will be the most suitable person to talk to, concerning conflict or training stress as he has the direct influence on stressful circumstances.

(b) Reorganize Your Goals : Goal should be realistic and attainable. If you are incapable to attain it, in that case reorganize the goal which can be actually accomplished.

(c) Enhancing Physical Fitness : It will be better to enhance the level of physical fitness if the stressful condition is linked to the performance and then work hard and give stress on the training to increase the fitness.

(d) Identify Your limits : Don't fight with the state pointlessly if a stressful situation is outside your control. Initial attempt should be made to identify the capacities or limits to and agreeing to the actuality. For instance, it will be worthless to imagine about the world level performance if one has low level of physiological and psychological capacities, the goal should be within the reach of individual's limit.

(e) Anticipate the difficulty : If the difficulty is anticipated well in advance, its stress can be reduced up to some level. Actually, anticipating the difficulty helps to prepare one to deal with the problem in time.

(f) Investigate the stressful circumstances : It is always better to investigate and analyze those stressful circumstances entirely when faced in any situation. Attempt should be made to locate the origin of the stress.

(ii) Emotion focused coping problem : Those coping strategies which make an effort to lesson the negative emotional responses associated with the stress like humiliation, fighting , nervousness, depression, excitement and annoyance are called emotion focused coping strategies. It is a method that attempts to improve upon the way one feels about stress devoid of tackling the real problem. Normally these strategies are used when problem is not in control. The following emotion focused coping strategies are usually used to deal with the stressful situations:

(a) Rejection : Sports persons have to confront numerous stressful situations in their life. For reducing the amount of stressful situations they disagree with the reality. The rejection of the continuation of the risk or difficulty can have harmful result, in the similar manner as not getting the correct medical dealing on a point in time when symptoms start becoming visible.

(b) Release of Emotions : To vent out or release the emotions is a good strategy as well as to decrease or handle the stressful situation. It is a very commonly used technique. The level of stress is reduced in any stressful situation by sharing it with other individuals.

(c) Blame : Sports persons confronting any stressful situation may also use this technique or strategy. At times, they blame themselves and sometimes others. They may also blame the inappropriate surrounding, referee, umpires or equipments etc.

(d) Avoidance : Different types of stressful situations like competition and training stress etc. can be avoided for a shortwhile but not for an extensive time. In sports this approach can be used whenever there is a lot of stress. An individual should avoid competition in huge stress.

(e) Brooding : Generally, for the duration of the competition or training, they do not reuse or they don't object to the verdicts of coaches or referees but afterwards the sports persons brood over the verdict. They keep on complaining and referring to be unfail.

TOPIC-3

Personality, Its Dimension and Types; Role of Sports in Personality Development

Quick Review

- **Meaning of Personality :** The word personality has been derived from the latin word PERSONA. In the beginning the word PERSONA was used as the mask worn by the actors to change their appearance but later on it began to be used for the actors themselves. This common notion of personality is very much usual from the concept of psychologists. Personality includes the totality of one's behaviour that should be taken into consideration.
- **Definitions of Personality:**
  - **(i) According to Allport ,"** Personality is a dynamic organization within the individual of those psychophysical systems that determine his unique adjustments to his environment."
  - **(ii) According to Morton Prince,** "Personality is the sum total of activities, tendencies, appetites, instincts of the individuals and the dispositions and tendencies required by experience."
  - **(iii) According to Watson,** "Personality is the sum of activities that can be discovered by actual observation over a long enough period of time to give reliable information."
- **Dimensions of Personality:**
  - **(i) Physical Dimension :** The primary feature or dimension of human personality is the physical body structure or in short is the physique and all other dimensions are meek to it. For the development of this aspect of personality, heredity has a very significant role but proper environment is also needed for development of physical aspects of personality. A lone environment cannot take the credit of molding a personality as genetic support forms the base of personality development. It has been usually seen that individuals having frail, pale and malformed physique are not certain of themselves in comparison to individuals possessing tall, healthy and muscular built which contribute to effective appearance. There is a positive relationship between good physique and health.
  - **(ii) Mental and intellectual dimension :** A well built individual, lacking in mental and intellectual abilities, is just similar to a statue without life. The human beings have been bestowed with higher mental and intellectual abilities. Human personality loses its significance without mind and intellect. Well known psychologists, scientists, philosophers, and leaders are recognized for their mental and intellectual abilities.
    Mental and intellectual capabilities of an individuals facilitate him in adjusting to circumstances and life in a more suitable way.
  - **(iii) Social Dimension :** Naturally, by nature man is a social being. He has learnt from the society in which be lives. He will not be able to survive for long if he is isolated completely from the society. Human beings have an innate tendency to get them noticed favourably. Besides fulfilment of his biological needs and values, man fulfils emergent social values such as status, power, affection and goodwill. Each individual is psychologically born with precise innate attitudes,interests, tendencies and capacities. He moulds and modifies his behaviour, learns etiquette's, follows the rules, customs and traditions of the society in order to be an acceptable member of society.
  - **(iv) Emotional Dimension :** Emotion occupies a very high flying place in our everyday life. Life without emotions is dull and unappealing. Our life is made worth living by emotions like love, affection etc. Our life becomes exciting as well as boring, cheerful as well as miserable due to emotions. In all the stages of development and in life of each and every living organism, emotions play a very dominant role. Emotion differ from an individual to individual. A child learns to show different emotions by learning from experiences. As a result of emotions, every person responds to the situations differently. Our body involves many physical and physiological changes in every emotional experience as the energy mobilization in our body increase due to emotions. The outcome of emotions on our body may be positive a negative.

- **Types of Personality :** Personalities of individuals can be classified based on the universal factors that are found as the central part of each type. Human behaviour is a complex issue to understand and often unpredictable in nature. The personality types A,B,C and D are explained in detail in the subsequent part.
  - **(i) Type 'A' personality :** Individuals of this type are of an extremely independent, competitive, ambitious and optimistic in nature. They are self driven and know the significance of positive thinking, motivation and goal setting. These individuals are impatient and have tendency towards rudeness and aggressiveness. Type A personality individuals are adventurous and risk takers and possess the ability of problem solving.
  - **(ii) Type 'B' personality :** Type B personalities are basically the literal contradictory of type A personalities. Even in apparently stressful situations, they are almost not stressed out. They can be described as being happy - go - lucky, who are particularly undisturbed in any circumstances. They are by and large cheerful, light hearted and fun to be around, usually entertaining to be with them. They love to relax and accept things as they approach. Individuals under this type are considered by their lack of urgency, as they do the work on their own pace.
  - **(iii) Type 'C' personality :** This personality type typically include introverts and those concerned with facts. To find a fact they are interesed in, they may perhaps spin heaven and hell upside down or inside out. They are engrossed in finding out how things work precisely. They are extremely sensitive and thoughtful. The type C personalities are of reserved in nature are alert as well.
  - **(iv) Type 'D' personality :** These individuals actually deem in apathy. They have a preference to join to the trampled ways and establish routines over the ambiguity of alteration. These are executors of the direct instructions and supporters of the used up deeds. When it comes to taking risk and responsibility, they have the tendency to back out of the situations. These individuals are afflicted by pessimism such as gloom, worry, irritability and barely self confident. They avoid sharing their negative emotions in order to avoid rejection.

TOPIC-4
Motivation, Its Types and Techniques

Quick Review

- **Meaning :** The word motivation is derived from a latin word 'movere', meaning 'to change, 'to more'. When we say that one is motivated, it means that he is driven or moved by an inner urge or force to achieve the goal. We may refer motivation as a process through which an individual is inspired, stimulated, goaded or coaxed to act in a particular fashion or manner towards particular direction.

  Definitions :
  - **(i) According to Morgan and King,** "Motivation refers to a state within a person or an animal that drives behaviour towards some goal".
  - **(ii) According to Murray,** "Motivation is an internal factor that arouses, directs and integrates a person's "behaviour".
  - **(iii) According to Elizabath Duffy,** "Motivation is the direction and intensity of behaviour".

  Types of Motivations : Motivation is classified into two categories :

  (i) Intrinsic Motivation (ii) Extrinsic Motivation
  - **(i) Intrinsic Motivation :** This category of motivation is straight forwardly connected with the innate instincts, wages and desires of the individual. The individual who is intrinsically motivated performs any work he finds concern in the activity. He is occupied in learning something as he drives gratification within learning of that particular activity.
  - **(ii) Extrinsic Motivation :** In this kind of motivation, the basis of contentment does not stretch out within the assignment or task. The individual for obtaining desired goals or for receiving some external reward does or learn something and not for its own sake.

  Techniques of Motivation :
  - **(i) Teacher as a motivation :** A highly skilled coach or teacher who has himself participated in the sports, capable of demonstrating and explaining the skill more precisely and who can plan the subsequent competition sensibly is a big plus point in motivating the athletes.
  - **(ii) Length of Practice :** The length of practice must be designed very cautiously for motivating young athletes to any activity. As the major reason at this phase is to persuade them for voluntary and informal practice for arousing their interest, formal practice should be comparatively short and led- up games at early stages should be involved.
  - **(iii) Environmental Factors :** The sport environment provided to the athletes, certainly has a very vital role in motivating them. A well ventilated equipped and decorated gymnasium or swimming pool can draw even a reluctant individual. Likewise, well maintained grounds and fields inspire an athlete to carry out his exercises.

(iv) Freedom to beginner : A greater level of freedom should be allowable in order to motivate beginners in the early attempts. They enjoy the experience more when given freedom on their own, they will knock upon minute adjustments which fit more to their personal physical personality.

(v) Social Pressure : It is currently a well known reality that presence of others has influence on performance and motivational level. Planned sport and physical activity is carried out in the presence of others such as spectators, team mates, coaches, officials. Through competitions in diverse social settings, social exposure to the athletes increase their level of motivation.

(vi) Goal setting : Achieving performance goals is a symbol of competency that affects motivation positively, hence it is essential to set realistic goals based on individual's own ability. The level of motivation gets adversely affected when goals are set up too high or low. Goal setting have been acknowledged as an influential motivational technique as it mobilizes an athlete's hard work and extends his determination.

(vii) Reinforcement : Reinforcement is a vital motivational means it refers to some kind of occurrence that increases or decreases the possibility of a similar reaction taking place in the future. Positive reinforcement enlighten the athlete at what time he is doing something accurate and support the continuance of the activity in the precise direction. Negative reinforcement is in general of slight importance since it simply indicates that the actions are inaccurate devoid of providing information with respect to the accurate reaction or behaviour.

(viii) Role of Media : In motivating athletes, media plays an important role as well. News coverage of their performance and of training session gives them the feeling of pride, prestige and recognition. Such reporting heightens their self confidence and competency and in addition motivates other young athletes to follow their achievement.

TOPIC-5
Exercise Adherence

Quick Review

- **Exercise Adherence :** Maintaining an exercise regime for a sustained period of time after its adoption.
- **Characteristics:**
  - It is voluntary.
  - It is self-regulated.
  - It is a psychological matter.
- **Physical Activity Vs. Exercise :** Physical Activity is any movement in body produced by skeletal muscles. On the other hand, Exercise is a planned, structured and repetitive physical activity with an aim to improve physical fitness.
- **Reasons to Exercise**
  - Improves physiological health
  - Maintains physical fitness
  - Improves physical appearance
  - Improves psychological health
  - Improves social health.
- **Barriers to Exercise**
  - Lack of time
  - Lack of enjoyment
  - Convenience
  - Environmental factors
  - Physical limitations
- **Benefits of Exercise**
  - To skeletal system
  - Develops bone density in young age
  - Retains bone density in old age
  - To muscular system
    - Increases the size of tissues
    - Improves muscular strength
    - Develops endurance
    - Efficient blood flow
  - Overall body
    - Reduces death rate
    - Reduces chances of colon (large intestine) cancer
    - Reduces chances of breast cancer in women
    - Reduces diabetes level
    - Reduces anxiety
    - Cures depression
    - Improves mood
    - Develops self-esteem
    - Improves physical appearance
- **Exercise Adherence Strategies**
  - Self-Control Strategies
  - Relapse Prevention
  - Motivational Strategies

TOPIC-6
Self Esteem and Body Image

Quick Review

- **Self Esteem :** Self esteem is about worth of ourselves; it is how we identify our worth to the human kind and how important we are to others. Self esteem effects nearly all components of our lives, be it our faith in others, our relations or our work. Self-esteem can be positive or low self esteem. It is of two types.
  (i) Positive Self - Esteem **(ii)** Negative (Low) Self - Esteem.
  (i) Positive Self Esteem : Positive self esteem provide us the potency and flexibility that help us to acquire charge of our lives and to grow up from our mistakes with no fright of negative response.
  Signs of positive self esteem
  (a) Self Direction **(b)** Confidence
  (c) Consciousness of personal strengths **(d)** Trustworthy
  (e) Optimism **(f)** Assertive
  (g) Excellent Personal care **(h)** Problem solving ability
  (i) An ability to learn from mistakes **(j)** A self - sufficient and supportive approach.
  (k) Excellent wisdom of personal limitations. **(l)** Openness.
  (ii) Negative (low) Self Esteem : Low self esteem is a state that prevents individuals from enraging their absolute capability. Individual with low self - esteem experiences disappointing concern about him or herself. He/She feels worthless, incompetent and ineffectualness.
  Signs of low self esteem :
  (a) Perfectionist **(b)** Pessimistic
  (c) Unlovable **(d)** Blaming actions
  (e) Fright of taking risks. **(f)** Poor decision making capability
  (g) Fright of being ridiculed **(h)** Distrusting others
- **Steps to improve low self esteem :** Low self esteem is habitual build up over a life span and letting go off inbuilt mind set and behaviours is not a simple job, it possibly takes time, hard work and has no need of proficient psychotherapy. To prevent negative self-talk becomes easy by using affirmations resulting in raising self - esteem in a positive manner. Affirmations are hopeful communications which we can provide ourselves each day until they turn out to be part of our thoughts and values. The following affirmations can help to work towards a positive self image.
  (i) I am confident. **(ii)** I care about myself
  (iii) I accept myself just as I am. **(iv)** I am lovable and likeable.
  (v) I respect myself and others. **(vi)** Life is good, and I like being a part of it .
  (vii) I look great.
- **Body Image :** Body Image is the way you see yourself and imagine how you look having a positive body image means that most of the time, you see yourself accurately, you feel comfortable in your body, and you feel good about the way you look.
  It is common to struggle with body image, no matter who you are. Severe negative body image can lead to serious eating and exercise disorders. Body image includes:-
  (i) What do you believe about your own appearance (including your memories, assumptions and generalisations)?
  (ii) How do you feel about your body, including your height, shape and weight?
  (iii) How do you sense and control your body as you move?
  (iv) How do you feel in your body, not just about your body?
- **Positive Body Image**
  A clear, true perception of your shape. You see the various parts of your body as they really are.
  You celebrate and appreciate your natural body shape and you understand that a person's physical appearance says very little about their character and value as a person.
  You feel proud and accept your unique body. You refuse to spend an unreasonable amount of time worrying about food, weight and calories.
  You feel comfortable and confident in your body.
- **Negative Body Image :**
  You are concerned that only other people are attractive and that your body differently from what they really are.
  A disorted perception of your shape - you perceive parts of your body differently from what they are.
  You feel uncomfortable and awkward in your body. Body image is both the mental picture that you have of yours body, and how you perceive yourself when you look in a mirror. Self - esteem is how you value and respect yourself as a person. It is the real opinion that you have of yourself. Body image and self esteem also directly influence one another if you hate your body, it is not easy to feel good about yourself.

➢ **Factors influencing Body Image:**

- **Puberty and Development :** At the commencement of puberty, the body goes through a lot of changes and in this phase, a number of individual struggle with their body image. The difficulty is not every body grows or develops at the similar time or in the similar way. These changes, collectively with wanting to feel accepted socially allow us to compare ourselves with other.
- **Media Images :** We are constantly exposed to imagery from popular media such as movies, TV, web and magazines. This leads people to form ideas about a certain kind of 'ideal look' that they see as normal and desirable. Comparing yourself with these images may leave you feeling disappointed or not good enough.
- **Family and School :** Sometimes our body images get influenced by our family life. A number of parents or coaches might be excessively paying attention on looking a definite way or "making weight " for a sports team. Family members might struggle with their own body image or disapprove of their kid's appearance. This influences an individual's self esteem, particularly if they're sensitive to other people's remarks.

➢ **Other Influences :**

(a) Ideals that we develop about physical appearance.
(b) The frequency with which we compare ourselves to others.
(c) Exposure to images of idealized versus normal bodies.
(d) The experience of physical activity.
(e) The experience of abuse, including sexual, physical and emotional abuse.
(f) The experience of prejudice and discrimination based on race, religion, ability, gender etc.
(g) Sensory experiences, including pleasure, pain and illness.

Guidelines for Maintaining healthy body image

- **Exercise :** Exercise means to maintain a healthy body image. Exercising for at least 30 minutes a day builds up self confidence and self esteem, helps in cutting the body fat, decreases the stress level and improves sleep.
- **Proper Nutrition :** Consumption of healthy foods facilitates to maintain the weight, prevent disease and heightens the self confidence.
- **Positive and Optimistic attitude :** Positive and optimistic attitude can help out individuals to develop body image and self esteem. Involvement in physical activities increases positive attitude as well which eventually improves body image.
- **Prevent intrinsic negative comments :** Stop the negative comments immediately coming from the core of your heart in order to improve the body image. Humans are multifaceted and steadily varying. It is better to focus on the uniqueness and interesting elements of ourselves as a replacement for the negative comments.
- **Confidence :** Confidence is an extremely essential element of maintaining a healthy body image. No matter what body type one may have, value yourself.

TOPIC-7
Psychological Benefits of Exercise

Quick Review

➢ The studies continue to enlarge supporting chief healthiness benefits of regular physical activity and exercise together with a reduced risk of cardio-vascular disease, hypertension as well as fortification against cancers and osteoporosis. The following are the common psychological benefits gained through exercise:

- **Improved ability to cope with stress :** An amazingly precious tool for stress reduction is exercising, particularly intense and long term exercise. Exercises leave us feeling peaceful, energized and positive. Exercises help in a great way to deal with daily troubles. It can be extremely helpful in reducing physical symptoms and risk and improves sleep.
- **Betterment of mood :** The body feels more relaxed and calm when exercising and lift the mood and improves the emotions. Balance the emotions by finding out some of the reasons and the best exercises to lift the mood. Additionally, a sense of accomplishment and the deeper relaxation of muscles are possible after exercising you easing tension and strain because of the workout.
- **Enhanced body image :** Exercise can help people with body image issues. Exercise is related with better contentment with appearance and professed sign. We all are very concerned about our looks and spend lots of time thinking about the ways of getting an efficient and beautiful body.
- **Reduced level of anxiety :** Exercise leads to notably reduced level of anxiety and less depressive symptoms. To take care of anxiety exercise has been prescribed since generations.
- **Reduced depression related symptoms :** For the treatment of disorders related to depression, countless researches revealed that aerobic exercise with counselling is more effectual than only counselling. Additionally, regular exercises have lesser risk of depression compared to those individuals who are physically inactive.

TOPIC-8
Meaning, Concept and Types of Aggression in Sports

Quick Review

- **Meaning of Aggressions :** Terry and Jackson in 1985 defined aggression in sports as " harm – inducing behaviours bearing no direct relationship to the competitive goals of sports, and relates, therefore, to incidents of uncontrolled aggression outside the rules of sport, rather than highly competitive behaviours within the rule boundaries.
- **Concept of Aggression :** Aggression is any interpersonal behaviour intended to cause physical harm or mental distress to a person or persons. In the sport context, aggression can be defined as an unprovoked physical or verbal assault, and aggressiveness as the intent to commit such an assault. Aggression today is part of any contemporary sport. Over the past twenty years, most sport have been going under drastic changes, and several problem areas have been located and addressed.
- **Types of Aggression :**
- **Direct Aggression :** Where the athlete can abuse face to face directly or hurt somebody by actions or words.
- **Indirect Aggression :** Hurting others by gossips, rumours, internal murmuring etc.
- **Instrumental Aggression :** This is cognitive, where the aggression is intentional and planned but not to hurt someone directly, rather for gaining something like reward, fame, scoring a goal etc.
- **Emotional Aggressions :** It is also called impulsive aggression refers to aggression that occurs with only a small amount of forethought or intent.

❑❑

Chapter - 12 : Training in Sports

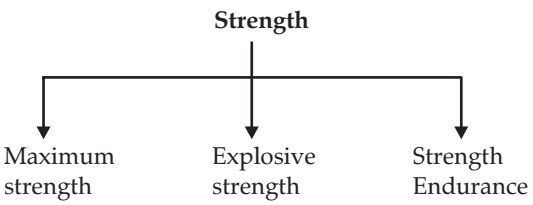
TOPIC-1
Strength

Quick Review

- **Meaning of strength :** Strength is possibly the essential motor ability in sports because it is a direct result of muscle contractions. Strength is a conditional capability which depends mainly on the energy liberation process in the muscles.

  For good posture, general health and for prevention of injuries, the role of strength training if habitually ignored may prove harmful in the long run.
- **Definition :** "Strength is the ability to overcome resistance or to act against resistance. Strength must not be considered as a result of muscular contraction only. It is actually a result of contraction of voluntary muscle caused stimulus of the neuro-muscular system.
- **Types of Strength :**

  Experts have classified strength into three types :



(i) Maximum strength : In a single muscle contraction, it is the ability of muscle to contract over resistance of utmost intensity of stimulus. The most excellent examples are weight lifting and throwing events in track and field.

(ii) Explosive Strength : It can be stated as the ability to prevail over resistance by means of high speed. It combines strength and speed abilities and based on the nature of the blend of strength and speed, the explosive strength can be subdivided further into start strength, power and speed strength.

- **Start Strength :** The ability to build up maximal muscle force is the start strength. For instance, starting a sprint, weight lifting etc.
- **Power :** It is the strength generated during the starting of any muscle contraction activity.
- **Speed Strength :** It is the ability to prevail over lesser resistance by high speed like team games and lower weight categories of combative sports.

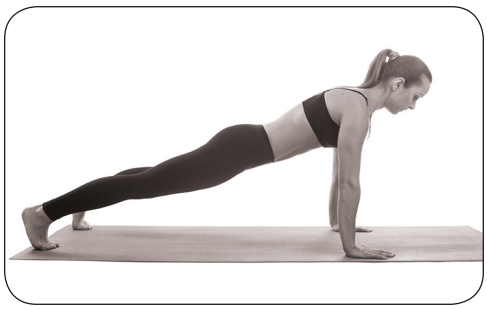
(iii) Strength Endurance : It is the result of two motor abilities as well. Under conditions of fatigue, it is the ability to work against resistance. Depending on the actuality whether the movement is static or dynamic, strength endurance can be there in form of static or dynamic strength.

➢ **Methods of Improving Strength :**

1. **Isometric Exercise :** Since, there are no direct movements, so these are not visible. In these, work is performed, however, it is not seen directly. In these exercises, joint angle and muscle length do not change during contraction. The muscles remain stable even though these do not entirely stay constant. For instance, while pushing a wall, the force is generated in our muscles but the wall does not move from its place, therefore, we consider that work is not done. As work is supposed to be done while the point of application of a force moves, i.e.,

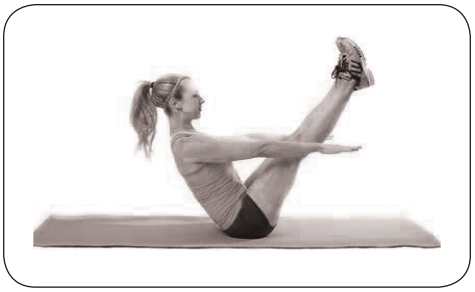
   Work Performed = Force × Distance moved in the course of force

   Some isometric exercises are :



(i)

(ii)



(iii)

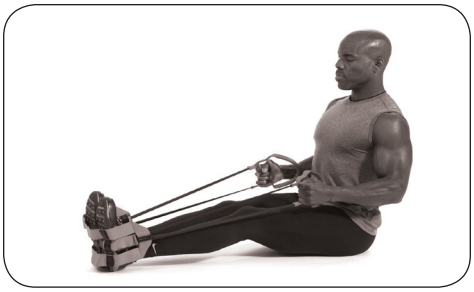
2. **Isotonic exercises :** Isotonic exercises tone up the muscles. Movements can be seen directly and work is done in isotonic exercises. By isotonic exercises, length of muscle can be improved and muscles become flexible. In the field of sports, these exercises have numerous values.

   Exercises with medicine ball, calisthenics exercises, and weight training exercises, running and jumping on the spot are the most appropriate examples of isotonic exercises.

   Some isotonic exercises are :

(i)

(ii)



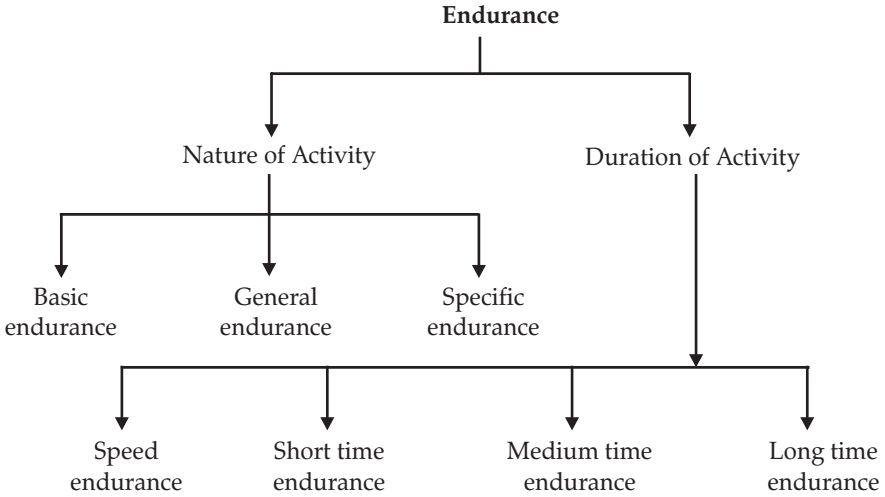
(iii)

3. **Isokinetic Exercises :** These exercises were developed in the year 1968 by Perrine. Isokinetic exercises are done on particularly designed machinery. These exercises engage a definite kind of muscle contraction which is generally not pertinent in sports and games apart from water sports like swimming and rowing. In isokinetic exercises, throughout the full range of movement, contraction of muscle applies maximal force at a particular position of its range of movement only. The speed of contraction can be adjusted according to the individual's capacity. Explosive strength and strength endurance can also be enhanced with the help of these exercises.

TOPIC-2
Endurance

Quick Review

- **Meaning:** Endurance is an imperative ability used in games and sports. Endurance is the result of the entire physical and mental organs and systems. To recover rapidly from training and competition load, it is essential to develop the capacity of endurance. It is ability to continue prolonged workout or resist fatigue for longer duration. The aim of endurance training is to increase the energy production system to fulfill the demand of the event.
- **Definition:** "Endurance is the ability to do sports movement with the desired quality and speed, under the conditions of fatigue".
- **Types of Endurance:**



Experts in this field classify the endurance on the basis of two criteria i.e. on nature of activity and duration of activity.

I. According to the Nature of Activity :

1. **Basic Endurance :** The formation of all types of endurance. It is the ability to carry out movement at reasonable pace for duration more than 30 minutes involving large amount of muscles. eg: Jogging, walking and swimming.
2. **General Endurance :** General Endurance helps a sportsman to perform different types of exercises without getting excessively fatigued. In general, endurance exercises the energy liberation depends on a combination of aerobic and anaerobic metabolism therefore, it can be done with high or low intensity. It is developed all the way through general exercises and is not precise to one sport.
3. **Specific Endurance :** The specific endurance can be basically equated with basic endurance in endurance sports, in which movement are executed at slower speed, however, for lengthy duration, namely in cross-country and marathon. The specific endurance may basically be determined by aerobic or anaerobic metabolism or by combination of both depending on the nature of sport.

II. According to Duration of Activity :

1. **Speed Endurance :** Speed Endurance is the capability to defend against fatigue in activities enduring up to 45 seconds. e.g. 400m sprint. This capability is extremely reliant on the power and glycolytic mechanism capacity of energy production.
2. **Short time endurance :** Short time endurance capability is desirable for cyclic activity enduring as of about 45 seconds to 2 minutes, for instance in 800 m race. In endurance activities of short time, the energy is created by a combination of oxidation and glycolysis.
3. **Medium time endurance :** Medium time endurance is requisite for cyclic activities enduring from 2-11 minutes. eg. 1500 m and 3000 m run. It depends on strength endurance and speed endurance as well, however to a limited extent.
4. **Long time endurance :** The long time endurance is required for cyclic activities with duration more than 11 minutes, as in races of 5000 meters and 10,000 meters.

Methods for Development of Endurance : To develop endurance, the following methods are implemented-
Continuous Training : One of the most excellent methods for improving endurance is continuous training. In this method of training an activity is carried out with no break for an extensive period with low intensity. The suitable example of continuous method is cross-country race. The rate of heart remains in between 140-160 beats per minute in this method and the overall time length of the activity should not be less than 30 minutes.

Advantages of Continuous Training

(i) Glycogen in muscles and liver increases.

(ii) Intensity can be increased for better outcome.

(iii) The number and size of mitochondria increases.

(iv) The efficiency of heart and lungs improves.

(v) Under the condition of fatigue it makes the individual strong minded and improves the determination and self-confidence.

Interval Training : It is a training to the heart through endurance training. In it, you run your heartbeats at a faster rate. Biklia, the famous athletic coach of Finland, introduced this training method in 1920. He stressed the importance of rhythm between work and rest in the method and called it Terrace method. Actually, this training method is based upon "effort oil and recovery". But reducing the recovery period, the load can be increased. For a 400 meter athlete, the following example be related for this training.

(a) 400 m race by 80% speed.

(b) Until the heart rate approximately falls down to 120 to 140 beats, walking or jogging till then.

(c) 400 m race by 180% speed.

Advantages of Interval Training

(i) Both respiratory and circulatory systems can be improved.

(ii) The athlete's improvement can be measured without difficulty.

(iii) Coach can give suggestions regarding any fault during recovery phase to athlete.

(iv) It helps an athlete to achieve the peak performance in a short time.

(v) In short duration move workouts can be performed.

Fartlek Training : Fartlek is a Swedish term which means, 'speed play' and has been used by distance runners for years. Fartlek is a form of road running or cross-country running in which the runner usually changes the pace significantly during the scrum. This training is done to improve performance and lessen the chances of injury, hence proper warm up should be done at the beginning and appropriate cooling down at the end of the training.
A pattern of the Fartlek training schedule is as follows.

(i) Worn up by jogging for 5 to 10 minutes followed by free hand exercise for diverse parts of the body for about 4 to 6 minutes.

(ii) Run at speedy stable speed over a distance of 800 m to 1200 m.

(iii) Fast waking for 5 minutes.

(iv) Perform easy running, separated by 40 to 50 meter sprint, repeating until symptoms of fatigue become visible.

(v) Slow Jogging for about 3 to 5 minutes.

(vi) Run up the hill at full speed over a distance of 80 to 100 meters. Run down the hill at a jogging speed subsequent to every repetition.

(vii) Walk for 5 minutes.

(viii) Run at quick speed for about one minute.

(ix) Jog about 1 to 1.5 km, for cooling down.

(x) Finish with free hand and stretching exercises.

Advantages of Fartlek Training :

(i) Fartlek training allows adding a variety of intervals to the aerobic workouts, which helps to keep one stimulated.

(ii) Fartlek let runners to enhance the aerobic and anaerobic training systems equally.

(iii) Fartlek's can be particularly modified and personalized to fit the requirements of diverse types of athletes and games.

(iv) For people, fartlek's is a grand alternative because the fat burning part makes it an extremely efficient exercise.

(v) Implementing Fartlek's on a regular basis keeps the body physically powerful as much as necessary to uphold the technicalities of racing.

- **Circuit training:** Circuit training is an excellent way to impose mobility, strength and stamina. The training comprises of 6 to 10 strength exercises that are completed one exercise after another. Each exercise is performed for a specified number of repetitions or for a set time before moving on to next exercise. The exercises within each circuit are separated by a short rest period and circuit is separated by a longer rest period.

  Impact of circuit training

  (i) **Improves muscular strength:** Circuit training improves muscular strength or in other words, your ability to produce force. For example strength determines how to many groceries you can carry at one time on the heaviest amount of weight you could lift up during a bench press exercise.

  (ii) **Improves muscular endurance:** Weekly circuit training enhances muscular endurance, or your ability to perform muscular activity at any time. For first muscular endurance dictates how many push ups you can perform consecutively. Performing up to 20 repetitions at your workout stations, with little rest throughout you workout, forces your muscles to work through fatigue and build endurance.

  (iii) **Body composition:** Circuit training can improve your body composition, or the percentage of your total body weight comprised of fat, by burning calories and building muscles. Additionally increased muscles mass boosts the number of calories burned during test and exercise.

- **High Altitude training:** Athletes choose to train at high altitude due to underlying benefits of intermittent hypoxia training in essence where regular exposure to an environment where oxygen availability is reduced due to natural or artificial method. At higher altitude as atmosphere pressure decreases, the air has a reduced partial pressure of oxygen, meaning less oxygen is available in the environment to be used in the body. The consequence of this change in oxygen pressure is for the body to produce greater amounts of (erythropoietin) in the kidneys, which subsequently means an increase in Red Blood Cells produced.
- **Impact of High Altitude Training:** By training at high altitudes, athletes aim to allow their bodies to produce extra red blood cells. Then, they head a competition at lower elevations to take advantage of their changed physiology, which last for approx 10 to 20 days.

TOPIC-3
Speed

Quick Review

- **Meaning :** Speed ability is extremely movement specific. It is the ability to perform motor actions in minimum possible time under certain situations. Speed is a conditional ability as well, similar to strength and endurance, but to a considerable point speed depends on the nervous system unlike the conditional abilities i.e. strength and endurance.
- **Definition :** "Speed is the capacity of an individual to perform successive movements of the same pattern at a fast rate".
- **Types of speed :** Speed is classified into five types.

  (i) Reaction ability **(ii)** Acceleration ability

  (iii) Locomotors ability **(iv)** Movement speed

  (v) Speed endurance

  (i) **Reaction Ability :** In sports, signals/stimulus can be of diverse form eg. visional, tactile, auditory. It is the ability to respond or react efficiently and promptly to a signal. The reaction ability depending on the degree of complexity can be further differentiated in simple or complex.

(ii) Acceleration Ability : To a huge amount, acceleration ability depends on technique, movement frequency and explosive strength. From a slow moving position, it is the ability to attain high pace of locomotion as of a stationary position. In sprint events, performances are determined to a great extent by acceleration ability.

(iii) Locomotors Ability : Capability to sustain the most speed of locomotion for highest possible duration or distance is called locomotor ability. Locomotor ability is imperative in only some sports or events e.g. swimming, rowing etc. In these sports, speed endurance is of high importance since all events last for more than 40 seconds as of this, locomotor ability is not much of significance on the other hand.

(iv) Movement speed : It is the ability to carry out a particular movement in least amount of time. Movement speed is of high bearing in cyclic sports. In cyclic sports, technique and tactical action is very strongly bound with movement speed.

(v) Speed endurance : It is the ability to carry out sports with high speed in the condition of fatigue. It is a growth of speed and endurance abilities. In cyclic and non-cyclic sports, it is of a diverse form. Instead of the rapid fatigue accumulation at some stage in the activity, the speed endurance in cyclic sports is requisite to carry on movements at high speed.

Methods to develop speed :

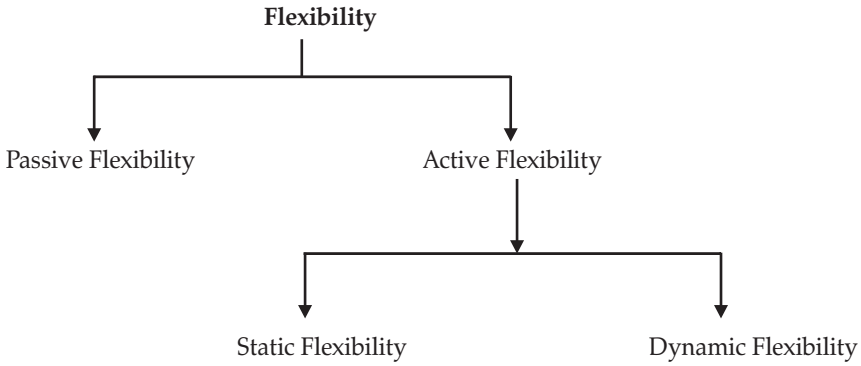
Acceleration Runs : Accelerated runs are usually adopted to develop speed, specially in attaining maximum speed from a stationary position. Before acceleration runs, proper warm up must be done. After every acceleration run, there should be a proper interval so that the athlete may start the next run without any fatigue.

Pace runs : Pace runs mean running the whole distance of a race at a constant speed. In pace races, an athlete runs the race with uniform speed, generally 800 m and above. Very young children can maintain their maximum speed for 15 to 20 m, whereas a well trained athlete can maintain speed for 40 m.

TOPIC-4
Flexibility

Quick Review

- **Meaning :** Flexibility is the ability to perform a joint action through a range of movement.
- **Types of flexibility:**



1. **Passive Flexibility :** Passive flexibility is the base of active flexibility. Passive flexibility is the ability to do movement with greater amplitude by means of external assistance e.g,helping partner doing stretching exercises .
2. **Active flexibility :** Active flexibility is the ability to perform movement with greater range without external help eg : the sportsmen stretches a joint with external help.
   There are two types of active flexibility:
   (a) Static flexibility : While the sportsmen is lying , standing or sitting static flexibility is essential for movements done.
   (b) Dynamic flexibility : Dynamic flexibility is vital for performing movements when the sportsmen is moving with superior amplitude

- **Methods to Improve Flexibility:**
  (i) Ballistic Method : The name ballistic method means stretching movement is done with a swing. Ballistic means a joint is expanded steadily to its utmost range.
  (ii) Slow stretch and fold method : It is the extension of slow stretching method. Here the muscle is stretched to its maximum limit and then the position is held for few seconds.

(iii) Post isometric stretching : This method of flexibility development is based on the principle of proprioceptive neuromuscular facilitation. In this procedure, the muscle is first contracted maximally for 6-8 sec using isometric method

Additional Information for improving flexibility

(i) Additional pressure on flexibility should be given in the period before puberty as it is the most excellent age for the improvement of flexibility.

(ii) During adolescence,if there is a gap in stretching exercises tends to deteriorate.

(iii) Each muscle group must be stretched numerous time for good quality effect.

(iv) The aim of flexibility training should be at optimal flexibility and not maximum flexibility.

TOPIC-5
Co-ordinative Abilities

Quick Review

- **Meaning :** Ability of an individual which assists him to do a variety of inter connected activities correctly is called Coordinative ability.
- **Definition :** "Coordinative abilities are understood as relatively stabilized and generalized patterns of motor control and regulation process. They enable the sportsman to do a group of movement with better quality and effect.

TOPIC-6
Impact of Surfaces and Environment on Athletes

Quick Review

- The surfaces on which the athletes run, can play a large role in determining how well they perform and how likely they are to get injured. It is essential to understand that running is fundamentally a series of collisions between the body and the surface. The softness of a running surface can have a noteworthy effect on the velocity which an athlete can maintain during a workout or competition. Body wise, running can be a high impact sport, and other running related injuries. Many athletes use different methods so as to lessen the impact of continuously striking the surface.

  There are various surfaces used by athletes for training as well as competition purposes.

  The glimpses of various playing surfaces are :

1. **Sand :** Nothing beats a run on the sandy surface particularly on a beach, when its warmth is out. Moreover, sand is one of the most soothing and scenic way to exercise. Running on sand offers a great way to work out little used muscles as well as burn more calories than running on less strenuous surfaces.

   In addition, as sand is soft, athlete can run on the surface without risking impact injuries. Uneven soft sandy surfaces can cause havoc on weak ankles and can lead to sprains and other accident related injuries.
2. **Grass :** Grass is usually rated as one of the best athletic surfaces. For athletes who have impact related running injuries, grass may be a better choice as it is soft and has low impact.

   Grass surfaces may have hidden holes, rocks, twigs and other distractions which may lead to injuries like twisted ankles.
3. **Synthetic surface :** The spongy surface of a synthetic track strikes the accurate balance between soft and sturdy. Long runs can be tedious in the oval and also athlete with calf sprains and IT bond problems should watch out as circling around the track can shorten calf muscles and stress the IT bond.
4. **Concrete :** Concrete surfaces is the most hardest surface to run on, which may cause more stress on joints and muscles. Most running experts recommend limiting the time on concrete surface. There are few studies relating the fact that there is no difference in the amount of stress on the body when running on concrete surfaces. It is advisable not to train on surfaces like these if the athlete is suffering from ankle sprains or knee pains.

- **Impact of Environment on Athletes :** Environment plays an important role in the excellence of athlete's performance. Weather is the one universal variable in sport from unanticipated windstorms in a cycle race, to a faulty air conditioning system that renders a basketball gymnasium intolerable. Athletes in every sport must train and compete in less-than desirable environmental conditions. Environmental conditions involve one or more dissimilar situations, as a condition to be faced in regular training or as an anticipated condition that will be encountered at a prospect time.

  There are general training principles to be in use to balance or to overcome each of these environmental conditions; some factors are present in only certain types of sports and therefore, demand specialized approaches to their resolution.

1. **Variation in temperature :** The major process to regulate the body's temperature is convection, radiation, conduction and evaporation. The temperature by itself is not a precise directory of the physiological stress forced on the athlete. Body temperature is controlled by the hypothalamus unit in the brain.

   Types of changes in temperature are :

   (a) Exercise in the heat : An athlete should acclimatize to heat. The ability of the athlete to successfully perform in the heat depends on the degree of heat, the humidity, the air movement, intensity and duration of effort, and the extent of his previous exposure to similar environmental conditions. The major importance is the athlete's fluid and mineral intake schedules both before, as well as during competition.

   (b) Dehydration : Dehydration is a serious threat to the human beings. Dehydration is one of the greatest problems associated with exercise in heat, particularly under conditions of high humidity. Since sweating is the chief possibility of heat loss when exercising in the heat, the amount of total fluid loss becomes very important as the duration of the activity is extended for a period of time.

   The deep body temperature rises from 0.3 °F to 0.5 °F for every one percent loss in body weight. This rise is the result of the loss in blood volume i.e. a large percent of the water lost in sweating comes from the blood volume.

   (c) Acclimatization : Repeated exposures to hot environments help the athlete to adapt better thus improve the athletic performance. The adaptation requires more than just exposure to hot environment. For teams or individuals that are training in environments cooler than those in which they will be competing, it is important to achieve thermal acclimatization before the competition.

   (d) Exercise in the cold : Exercise in the cold or winter sports and outdoor activities like skiing, hiking, hunting, mountaineering, jogging etc. has increased the risk of cold related problems like abnormally low body temperature. Thermal underclothes are recommended for the arms, legs and torso in extreme cold, but as the temperature rises and metabolic heat builds, a serious heat problem could develop. Gloves, hats or caps and double pair stockings are also helpful. Once the athlete starts to warm up and starts to sweat, he should remove his excess clothing.

2. **Humidity :** An additional factor that is of considerable importance with regard to exercise in the heat is the relative humidity or the degree of moisture in the surrounding air. Sweating contributes to the loss of fluids in body, only if the sweat evaporates from the skin work performance in hot, humid weather is somewhat limited because of the rising body temperature and strain that is placed on the cardiovascular system due to the ineffectiveness of the evaporative mechanisms for heat dissipation. The heart rate and sweat rate are both higher in hot, humid conditions as compared to the hot, dry weather.

3. **Altitude :** An increase of altitude has several practical consequences for the athletes as it reduces the density of the air, a result lowering wind-resistance, which reduces the oxygen presence in the air that is breathed, thus, restricting maximum oxygen transport and it lowers the atmospheric temperature. There is also small decrease in the force of gravity. If the athlete remains at high altitude, physiological adjustments of the body such as reduction in tissue bicarbonate levels, increase in haemoglobin and red cell counts lead to progressive improvement in endurance performance. The main effects of high altitude on physical performance are decrease in total barometric pressure, decrease in partial pressure of oxygen, decrease in density of air, sunburn.

❑❑