

SPORTS GALLERY

Taking part in sports is important as it reduces stress and enhances mood. It builds healthy bones and muscles, increases fitness, improves sleep, helps people socialize, improves cooperation skills and team spirit, boosts self-confidence and lowers the risk of getting obese.

Do you like Sports?

If Yes, visit the Sports gallery at Pushpa Gujral Science City !

SCIENCE OF SPORTS GALLERY

Science of Sports gallery gives basic knowledge and other valuable information regarding various games.

The gallery intends to familiarize the visitors with applications of scientific principles in sports

The gallery is an ideal place to understand science behind various sports through playful and non-formal approach. Several models at the gallery provide information about history of various sports.



CRICKET

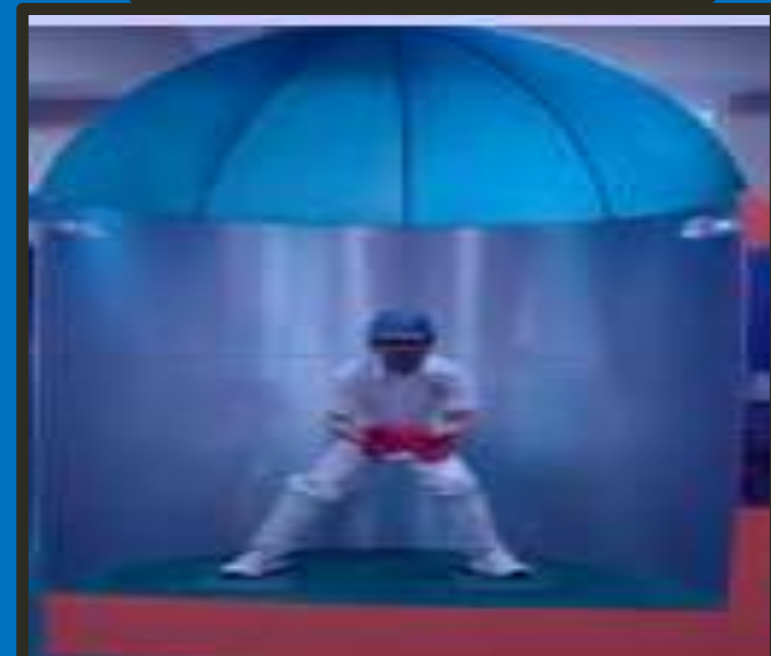
The exhibit demonstrates the history, skills and different aspects of the game of cricket, one of the most popular sport in India and the world.

- **Cricket History:** This game originated in southern England in the 16th Century.
- **18th Century:** Cricket becomes England's national sport.
- **Mid-19th Century:** International matches begin being played.



GENERAL INFORMATION

- **Batting** is the act or skill of hitting the ball with a bat to score runs or prevent the loss of one's wicket.
- **Bowling** is a dynamic, flexible and creative art. The basic bowling techniques are the run-up, leap, right foot contact, left arm motion, etc.
- **Fielding** involves catching the ball by players in the field
- **Cricket Bat** is made from willow wood, specifically from a variety of white willow called 'cricket bat willow'
- **Cricket Ball** is a hard solid ball, consisting of cork covered by leather used to play cricket



MATERIAL SCIENCE OF CRICKET BAT

The bat has two main parts

- **The blade** of a bat is made of special type of willow wood which is soft and fibrous with a “honeycomb” structure .
- **The handle** is made of cane because it is light and springy to absorb the shocks.
- **English Willow**, which is grown in England in wet soil and humid air, is considered to be of the best quality.
- **Kashmir willow**, grown in poor soil, in dry conditions is brittle and prone to cracking.
- Cricket bat willow (*Salix alba* Cerulean) is world famous for making cricket bats



STRUCTURE OF CRICKET BALL

See the inside of a giant cricket ball at PGSC. It has the following components :

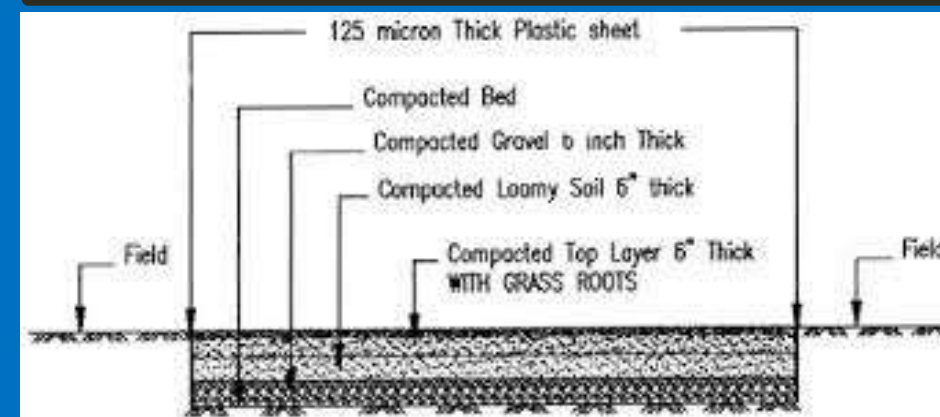
- **Cork:** in the center is lighter and can be compressed easily .
- **Wool:** is wound to compress cork and to get the required shape and bounce.
- **Leather:** the outermost cover is tough & elastic. It is stitched to form primary & secondary seams, which play critical role in creating a turbulence around the ball, and there by, cause swinging of the ball .



CRICKET PITCH

See Inside A Cricket Pitch At PGSC

- In professional cricket specially designed pitches are used comprising layers of compacted bed, geotextiles, gravel, etc.
- The pitch has very specific markings as specified by the Laws of Cricket
- However, in amateur matches, artificial pitches are commonly used. These can be a slab of concrete, overlaid with a coir mat. Sometimes dirt is put over the coir mat to provide an authentic feeling pitch.
- Artificial pitches are used only during exhibition matches or in regions where cricket is not a common sport.



ADDITIONAL INFORMATION

- Cricket is a game which involves many principle of science
- The swinging of ball involves **Bernoulli's principle** as one side of the ball is kept shiny and other side is rough and this makes the difference in speed of air on both sides of ball
- Bowling involves conservation of momentum i.e. **transfer of momentum** from bowler to the ball. Aerodynamics, bouncing and trajectory are other science principles used by bowler.
- **Law of impulse** and reaction time are applicable during wicket keeping and fielding .
- Reaction Time, **force**, **impulse** and **momentum** are used during hitting the ball by the batsman.



MUSCLES USED IN CRICKET

- Lumber stability is necessary for a cricket player for quick movements in the cricket which involves exercising of certain muscles in abdominal areas.
- Main muscle groups involved in cricket are the trapezius, pectoral, biceps, hamstring, quadriceps, gluteus maximus
- The support muscles used are the anterior and posterior deltoids, anterior serratus forearm and the upper abdominals, lower abdominals.



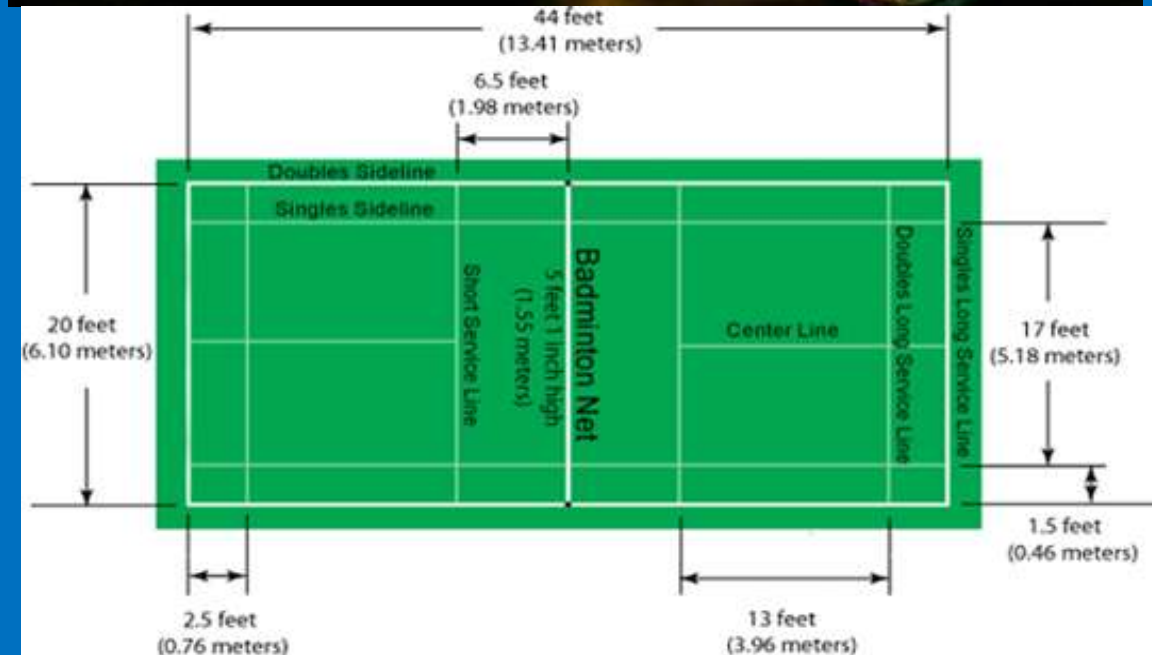
BADMINTON

Introduction :

- This exhibit in PGSC shows the dimensions of a badminton Court, as well as, various aspects like string area, shaft of the game.
- It also provides with information on the types of badminton strings and the significance of the natural strings.

History :

- Badminton was first called as **Poona**.
- In the **mid 1800** the British took this game to England and renamed it as 'Badminton'.
- **Saina Nehwal** won India's First Olympic Medal at the 2012 London Olympics



GENERAL INFORMATION

- Badminton can be played as singles or doubles.
- The object of the game is to hit the shuttlecock over the net. The exhibit shows the dimensions as well as its various parts like string area, shaft, handle throat etc.
- Material science of the badminton provide information on the types of the badminton strings .
- The name **shuttle cock** is often shortened to shuttle. There are **16 feathers** fixed in a cork base
- **Badminton court** exhibit shows the dimensions of the court, net line, short service line for doubles etc. The net line marks the middle of the court where the net is placed.



MUSCLES USED IN BADMINTON

- The muscles of the lower leg; the gastrocnemius, the soleus and the anterior tibialis.
- The muscles of the upper legs and hips; the gluteals, the hamstrings, and the quadriceps.
- The muscles of the hip; the gluteals, the adductors and abductors, the hip flexor.
- The muscles of the shoulder girdle; the latissimus dorsi, the teres major, the pectorals, and the deltoids.
- The core muscles; the rectus abdominus, obliques, and the spinal erectors.
- The muscles of the forearm and upper arm; the wrist flexors and extensors, the biceps and the triceps.

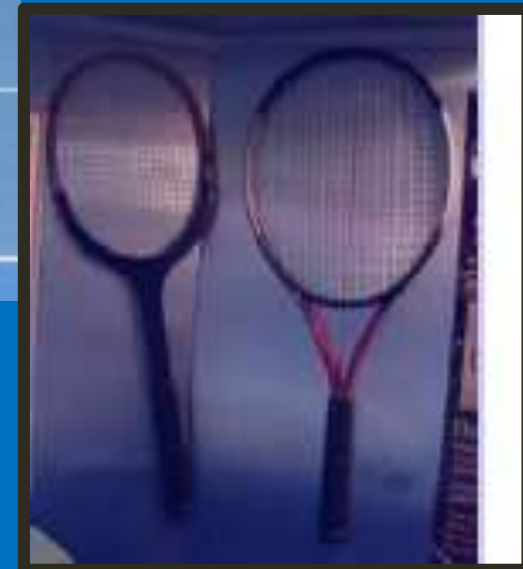


ADDITIONAL INFORMATION

- Various concepts of science are used in badminton
- **Aerodynamics** is the study of forces and resulting motion of objects through the air. Aerodynamics and projectile are used during birdie.
- Momentum, **force**, impulse, **Newton Law of Motion** are other scientific principles involved in this game.
- The tension and the **impulse** are used during strike. For swing of the racquet, the momentum has to be sufficient to overcome drag which is why badminton racquet are thin and light.
- **Tension** of the racquet is crucial in badminton. The elasticity and flexibility of the strings help with speed of the shot.
- **Angular momentum** of the racket is converted into linear momentum of the shuttle cock.

LAWN TENNIS (GENERAL INFORMATION)

- Tennis is a sport usually played between two players or between two teams with two players in each team. Each player uses a racket that is strung to strike a hollow rubber ball .
- The game is believed to have ancient origin and is played **since 12th century**. The modern game of tennis **originated in late 19th century**
- Different grips are the ways of holding a racquet in order to hit shots during a match



MUSCLES USED IN LAWN TENNIS

- Muscles of forearm and upper arm like biceps, triceps, deltoid are used when playing tennis sport during swinging of the racket as an upper body sport .
- In lower body legs muscles including glutes, quadriceps, hamstring and calves, are muscle groups used when playing tennis
- The muscles of abdomen ext. and int. oblique, transverse abdominas are also used while playing tennis .

ADDITIONAL INFORMATION

- **Friction** of the strings of a racquet on a tennis ball allows spin to be imparted on the ball during a hit whereas friction between the ball and the court affects the way the ball bounces .
- **Kinetic friction** is perpendicular to the normal force and opposite in direction to the velocity vector .
- The **force of gravity** helps to bounce the ball and gain acceleration .
- **Newton`s Third Law of motion** explains that the more reaction force arm receives from the racket, the more ball bounces .



BASKETBALL

- Basketball is a sport played by two teams of five players on each side on a rectangle court.
- One of the world`s most popular and widely viewed sports
- A team can score a field goal by shooting the ball through the basket during regular play.
- Canadian American **Dr James Naismith**, a physical education professor invented game of basketball .
- Basket ball was originally played with a **soccer ball**.



GENERAL INFORMATION

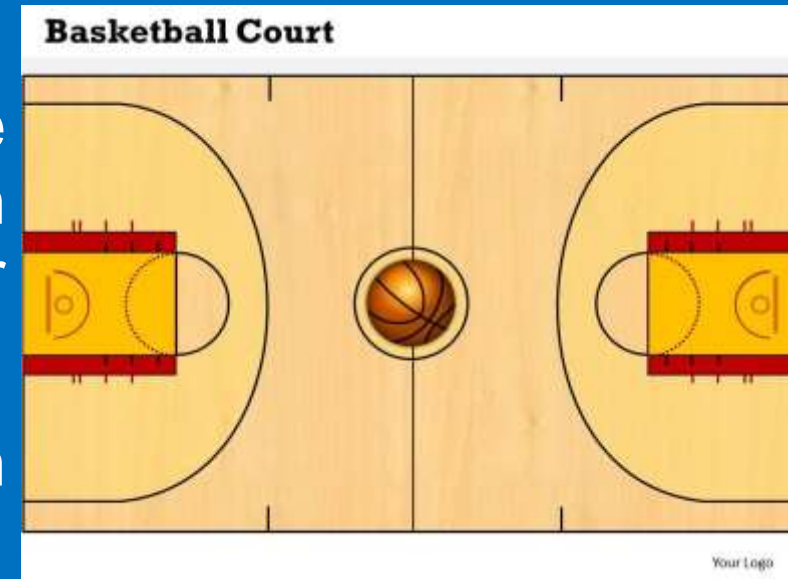
The exhibit in PGSC shows the basketball players in different positions like shooting, defensive, ribbing and in bent position.

It also demonstrates the basketball field layout including dimensions of the playground, position of players at different points.



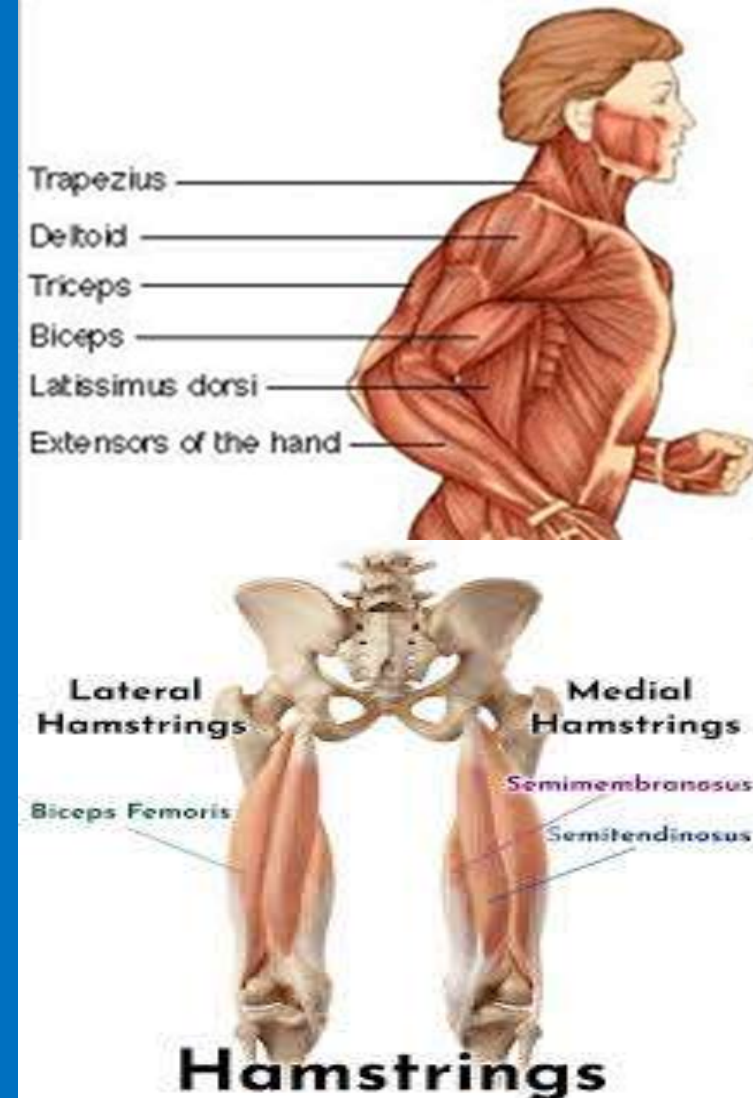
ADDITIONAL INFORMATION

- **Playing Court:** The playing court is flat, hard surface free from obstructions with dimensions of 28 m in length by 15 m in width measured from the inner edge of the boundary line.
- **Lines:** All lines are drawn in white color, 5 cm in width and clearly visible
- **Equipment:** Basketball, game clock, scoreboard, twenty –four second clock
- **Paul Sturgess** - the tallest basketball player (7'8")
- **Sprained Ankle** is the common injury in basketball



MUSCLES USED IN BASKETBALL

- The quadriceps muscles, straighten the knee joint every time you run across the court or jump vertically.
- Your hamstrings are the group of muscles that form the back of your thighs, and bend your knee each time you lift your leg to run across the court or squat down in a defensive position.
- Dribbling involves your deltoids, triceps, biceps and forearm muscles
- Strong deltoids, pectoral and triceps muscles enable you to shoot the ball over an opponent with more force and power.
- The core muscles around your hips, lower back and abdomen stabilize all of your body movements while playing basketball by keeping your spine and hip joints in alignment.



VOLLEYBALL

- Volleyball is an Olympic team sport in which two teams of six players are separated by a net. Each team tries to score points by grounding a ball on the other team's court under organized rules.
- **History:** Volleyball was invented in 1895 by William G. Morgan.
- He developed the game for winter months.
- Original name for the sport was **Mintonette** and later changed to Volleyball.



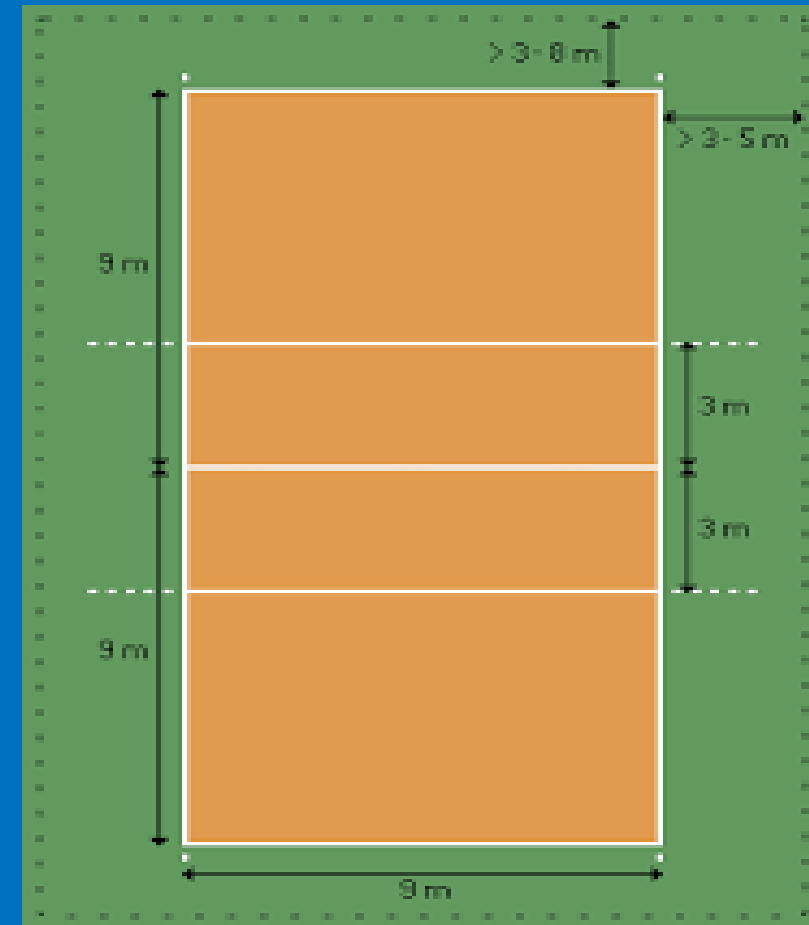
GENERAL INFORMATION

- Different techniques like spiking serving, blocking, bumping and dig are used in this game
- There is service line, center line, attack line, boundary line in the volleyball court .
- The defined positions of the setter, outside hitter etc. play a specific role in winning the match by a team
- The ball is made out of flexible leather or synthetic leather case with a bladder inside made of rubber or similar material



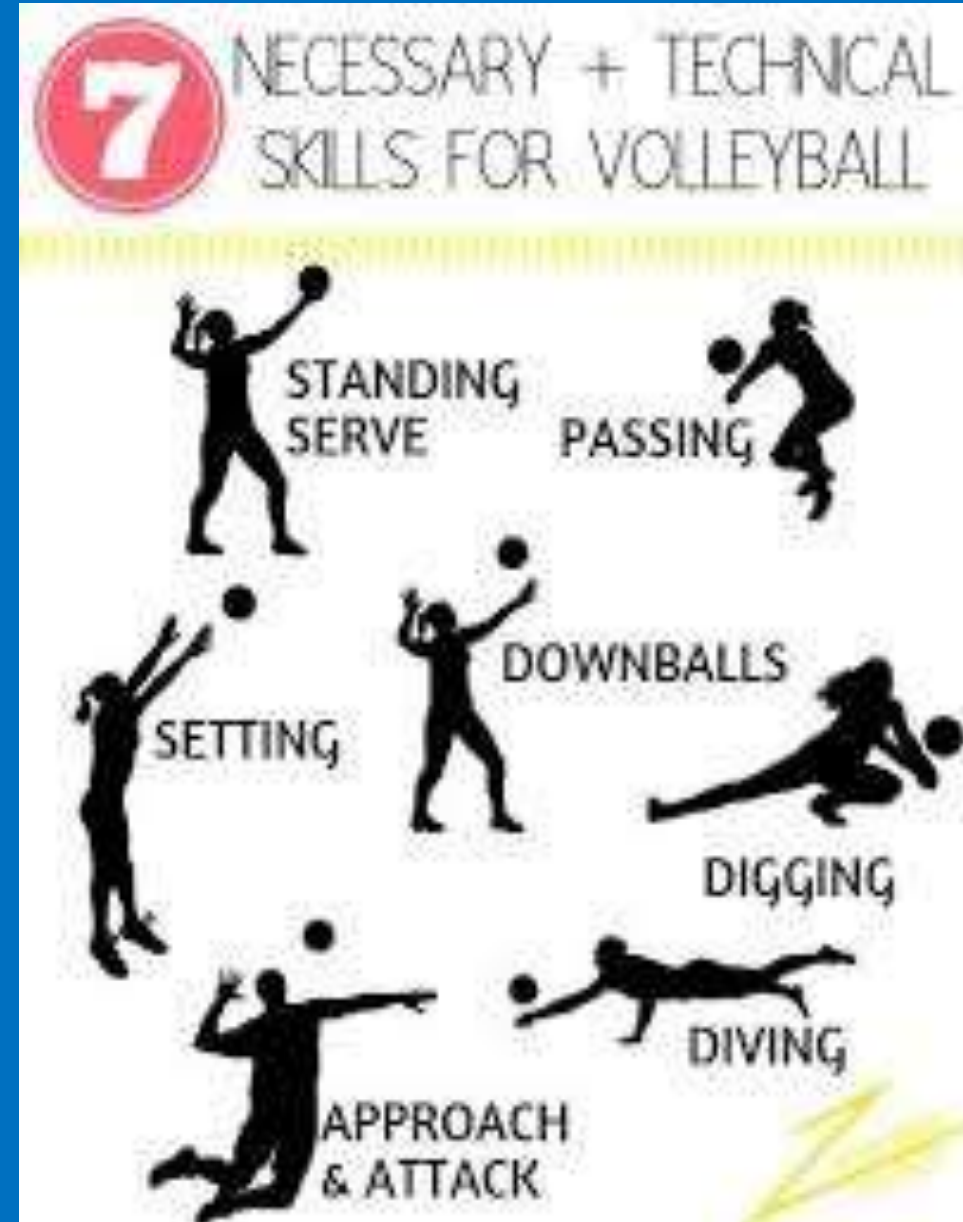
VOLLEYBALL COURT

- A **Volleyball court** is 18 m long and 9 m wide.
- **Length** of the entire court is in play area court. Each side of the court is therefore 30 feet in size .
- **Lines** – all painted in white
- **Referees**- up referee and down referee



SKILLS IN VOLLEYBALL

- **Serve:** Players stand behind the baseline and serve the ball
- **Pass:** Player try to handle the opponents serve or another form of attack e.g. underarm pass, overhead pass
- **Set:** is the second contact that a team makes, generally overhead set
- **Attack:** Usually is the third contact in a team
- **Block:** Blocking refers to the actions taken by the players standing at the net to stop or alter an opponents attack



MUSCLES USED IN VOLLEYBALL

- Upper body muscles biceps, forearms engage to move our arms during ball hitting action like serve or receiving, setting, passing and spiking .
- Our calves, quadriceps, hamstrings, lutes and hip flexors are all essential for running and for quick jumps.
- Strong leg muscles give us the power to elevate our jumps .
- Our strong back muscles, such as the scapular stabilizers around our shoulder blades and the latissimus dorsi muscles are useful moving your body a for stabilizing

ADDITIONAL INFORMATION

Gravity impacts the movement of the volleyball through out the game. Various **techniques** used in the game are :

- A top spin serve done by flicking the wrist, forces the ball downwards
- Spiking is very effective to produce powerful downward force
- Volleyball server exerts upward force on the ball, meanwhile gravity is exerting a downward force on the volleyball
- When a passer is passing a ball an upward and forward force is exerted on to the ball while gravity is pushing the ball down, the ball accelerating.
- Other concepts of science viz. $\text{work} = \text{force} \times \text{displacement}$ are also used in this sport.



FOOTBALL

- Football is a game in which two teams of 11 players play with a spherical ball on a rectangular field using any part of their bodies except their hands and arms. The objective is to score and to get the football into the opposing goal.
- The Cambridge rules, first drawn up at **Cambridge University in 1848**, were particularly influential in the development of subsequent codes of the game including association football.
- **During 1850s**, many clubs unconnected to schools or universities were formed throughout the English-speaking world to play various forms of football.



GENERAL INFORMATION

- Football designs have varied over the years, depending upon the technology and material
- This exhibit shows the model of Football which was used during the FIFA World Cup 2006
- FIFA World Cup football for Germany 2006 matches was made up from 14 curved panels.
- Early footballs were sewn up with laces.
- These days, footballs are made from synthetic leather patches sewn together in a design known as **Buckminster**
- The shape is series of hexagons, pentagons and triangles which can be fitted together to make a round surface.



ADDITIONAL INFORMATION

There are many forces which are involved in the game of football. These are force of **gravity**, force of **friction**, and applied **force**. Force of gravity applies to football when the football is thrown or kicked, when a player jumps in the air to avoid a tackle or catch a ball and is constantly being applied during the game. **Inertia, momentum, impulse, and Newtons laws of motion** are also involved in this game .



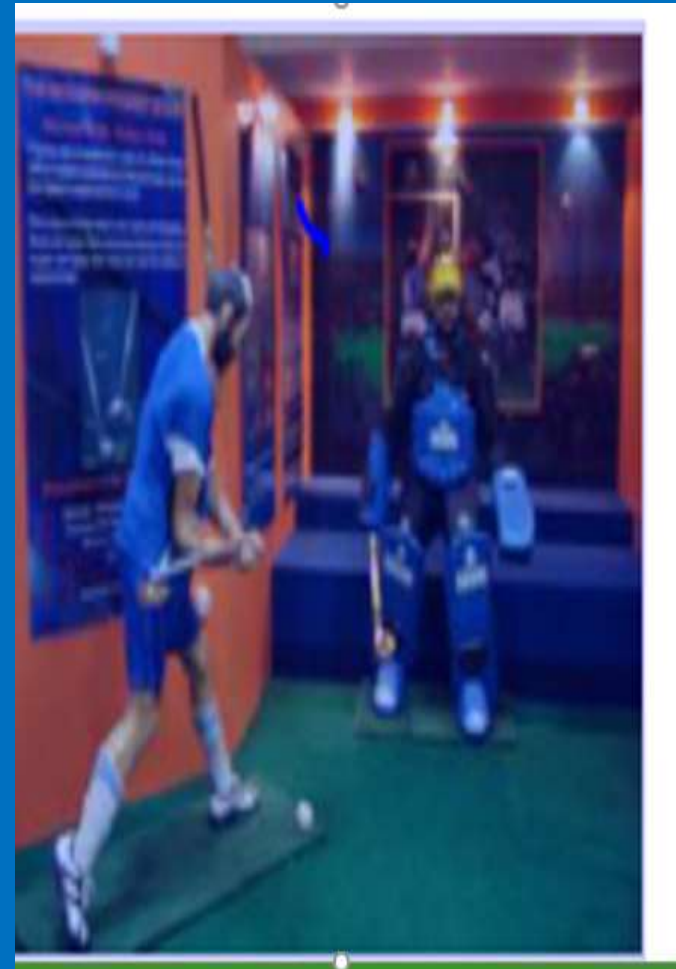
HOCKEY

- **Hockey is the National game of India.**
- It is a family of sports in which two teams play against each other. There are 11 players on each side on a rectangular ground.
- Hockey is said to be the oldest team sport in history. The game's roots can date back to 4000 years ago.
- When it was first played, a cube was used instead of a ball.
- **In 1850** hockey became a popular sport in schools.



GENERAL INFORMATION

- The game of hockey is thousands of years old and has been played on ice since the early 1800s .
- The exhibit demonstrates the assortment of hockey sticks that were being used till date.
- The exhibit also portrays hockey players in different positions wearing protective gears as well as goalkeeper wearing all protective gears.
- India had won Hockey World cup in 1975



MUSCLE TONING FOR HOCKEY

- Various Muscles like gluteus, quadriceps, adductors, hamstrings and calf muscles are used for running in hockey.
- The muscles of arm like biceps brachii, triceps, pectoralis muscles, abdominal recti, deltoid are used for hitting and stopping the ball during play.



ADDITIONAL INFORMATION

Different forces involved in hockey game :

Gravity pulls the players, pucks and referees towards the ice. As soon as the puck is hit and it goes air borne, gravity pulls it down.

Newton`s third law : When hockey stick collides with a puck and the stick bends due to the force on the stick, pucks speed up and stick slow down

Friction force acts on the puck causing it to slow down.

Drag also acts on puck during play .



RURAL SPORTS

- Rural sports of Kila Raipur popularly known as rural Olympics. It is held annually. Competitions are held for major Punjabi rural sports including cart race, athletic events and rope pulling etc.
- Started in 1933 by Inder Singh Grewal
- Held at Ludhiana in the month of February
- More than 4000 sports men and women participate in this event



GENERAL INFORMATION

The popularity of Kila Raipur sports has travelled across all five continents. Kabaddi teams from Canada, USA, England and other European countries make it a point to be at Kila Raipur for the games.

Kabaddi is now the **official state** game of **Punjab**, Tamil Nadu, Maharashtra, Bihar, Andhra Pradesh and Telangana.

The main attractions of Kila Raipur games are :

Bullock cart racing	Kabaddi
Hockey	Motorbike show
Tug of war	Nihang Riding



BALANCING BEAM

Balance is defined as the ability to control the body mass or center of gravity to the base of support in order to maintain an upright posture or a functional equilibrium in dynamic activities

The Sensory factors involved in balancing are :

- Somatosensory inputs (proprioceptors)
- Visual Inputs
- Vestibular Inputs

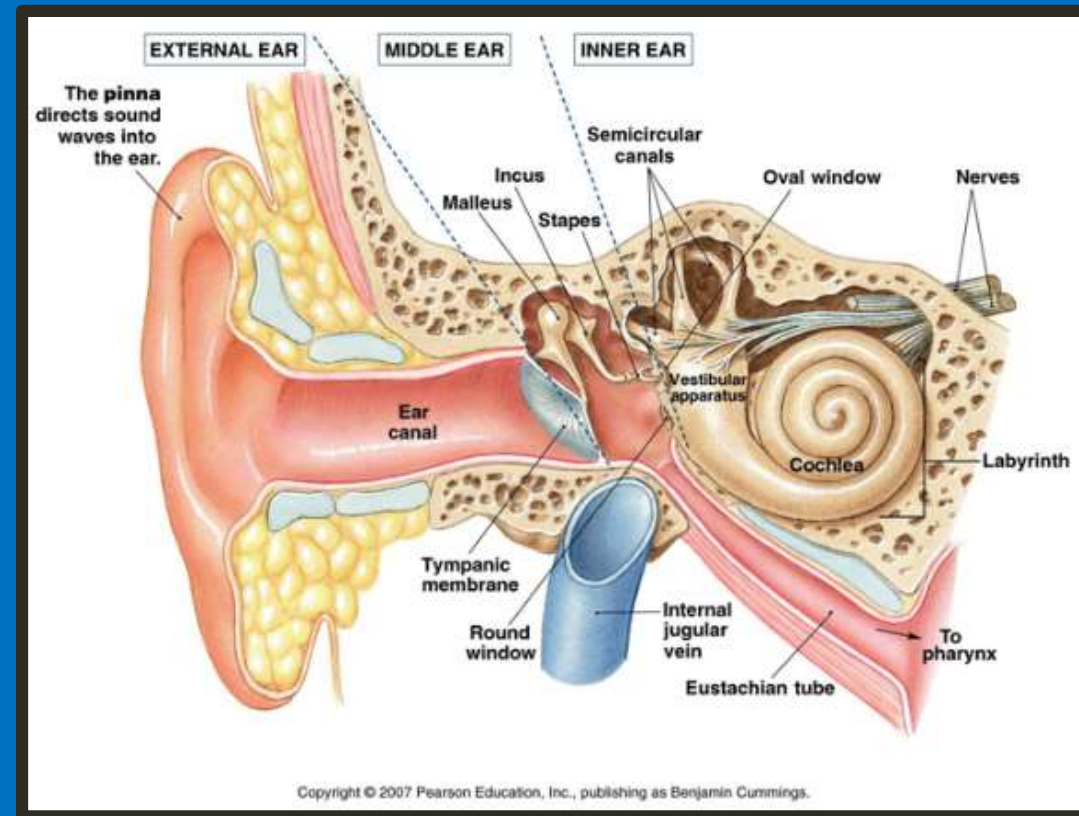


GENERAL INFORMATION

- This exhibit comprising a beam bar and a mirror allows one to test one's balance agility.
- One is supposed to walk carefully on the balancing beam from the front and cover the entire length of the beam without falling down
- After reaching on the other end, one has to walk back to start point watching in the mirror and balancing at the same time.

ADDITIONAL INFORMATION

- Organs responsible for the balance are not legs or hands but vestibular system located in the ear.
- This organ is known as labyrinth which is tubular complex structure filled with fluid called endolymph.
- It helps in maintaining the equilibrium by sending message to the brain to instruct our hands and legs or any other body part to move in such a direction as to keep the balance.



REACTION TEST

Reaction time (RT) is a measure of the response time from arrival of a suddenly presented and unanticipated signal.

(It can judge a person's Motor control)



GENERAL INFORMATION

- This exhibit measures the alertness of a driver when traffic lights are green, red and yellow and displays whether the driver is within or outside the prescribed limit.
- Reaction time is quickest in young adults and gradually slows down with age.
- It can be improved with practice up to a point and declines under conditions of fatigue and distraction .
- Reaction time is considered to be a component of fitness in a sportsman.

ROCK CLIMBING

- Rock climbing wall is an artificially constructed wall with grips for hands and feet
- It is an activity for spending time actively and in a healthy way.
- Schurman rock in Seattle, WA is believed to be the first artificial climbing structure in **United States, in 1939.**
- The modern artificial wall began in **UK, created in 1964 by Don Robinson.**



FITNESS BENEFITS

- There are many benefits of fitness from climbing .
- Components of physical fitness that are enhanced through climbing include muscular strength, muscular endurance, cardio respiratory fitness, and flexibility.
- The muscular strength helps the climber to be able to generate maximal force in a single movement and be better able to make dynamic moves.

FOOD AND NUTRITION FOR ATHLETES

A sports man needs power, speed, agility, strength and recovery speed. Best diet plan for player is as below:

- A Player must eat 4-7 meals in a day
- Meal should be of lean protein .
- Energy intake from fat should comprise 25-35%
- Players should Include:
 - Proteins and Carbohydrates viz. fish, eggs, sweet potatoes, carrots, oranges, apples, potatoes, rice, mostly whole foods and wheat germ.
 - Non-calorific drinks/beverages and green tea.



MACRONUTRIENTS REQUIRED FOR SPORTSMAN

The following percentage of macronutrients in diet help to improve athletic performance of an average sports person

- 55-60% Carbohydrates
- 25-30% Fats
- 10-15% Protein
- Recommended balanced diet for more strenuous athlete is :
- 70% Carbohydrates
- 15-20% Fats
- 10-15% Protein

SPECIAL DIET REQUIRED FOR PLAYERS

- Almonds- Food rich in fats which enables a good player to fatigue less
- Banana- A great source of vitamin B6 and C, manganese, potassium, copper and biotin. Banana has carbohydrates with low glycemic index.
- Salmon - A great way for proteins and healthy fats and valuable calories.
- Poultry lean meat - Muscle building and poultry lean meat has a positive influence on blood, bones cartilage joints and hormones.
- Kale – A source of vitamin A, C, B1, B2, B3, B6 and E. It is also rich with fibers, magnesium, iron phosphorous, calcium, potassium, copper, manganese.
- Chicken Egg- High quality protein which contains around 6 grams of protein.
- Dairy milk- Contains calcium strengthen the bones and teeth.
- Garlic-The blood purifier, prevents heart problem defends against cold and flu.
- Dark Chocolate – A source of instant calories, Potato-the energy booster, Fruit Yogurt, Broccoli- vitamin and energy bomb, brown rice.

Visit PGSC's Sports Gallery and know the Science
behind Sports

Get motivated to be a sportsperson

Thank You