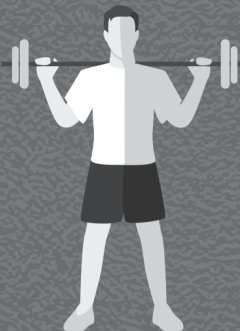


As per the latest CBSE Syllabus

XII



FREE



Saraswati

Health and Physical Education

Supplementary Book



Including Objective
Type Questions


NEW SARASWATI
HOUSE

Dr V K Sharma

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IMPORTANT INFORMATION

You must be aware that CBSE has announced syllabus for academic year 2019-20 on 29th March, 2019. The number of units (10 in total for class 12). While a few Units have NOT changed, a couple units have been Merged and topics modified by the board keeping the syllabus intact. The changes are shown in a comparative chart below and the complete syllabus is shown in the following pages.

Health and Physical Education Class 12				
CURRENT Unit	Unit Name As in Old syllabus	Unit Name As in New Syllabus	DELETED (From EXISTING BOOK)	ADDED / MERGED (In SUPPLEMENT)
UNIT 1	Planning in sports	Planning in Sports	NO CHANGE	NO CHANGE
UNIT 2	Sports & Nutrition	Sports & Nutrition	2 Topics DELETED of OLD SYLLABUS 2.4 Sports Nutrition & Its Effect on Performance (Fluid & Meal Intake, Pre, During & Post Competition) 2.5 Food Supplement for Children	NO CHANGE
UNIT 3	Yoga & Lifestyle	Yoga & Lifestyle	NO CHANGE	NO CHANGE
UNIT 4	Physical Education & Sports for CWSN (Children With Special Needs-Divyang)	Physical Education & Sports for CWSN (Children With Special Needs-Divyang)	NO CHANGE	NO CHANGE
UNIT 5	UNIT 5 Children & Sports	Children & Women in Sports	3 Topics DELETED of OLD SYLLABUS 5.3 Advantages & Disadvantages of Weight Training 5.4 Concept & Advantages of Correct Posture 5.5 Causes of Bad Posture	CHAPTERS MERGED
	UNIT 6 Women & Sports		2 Topics DELETED of OLD SYLLABUS 6.4 Psychological Aspects of Women Athlete 6.5 Sociological Aspects of Sports Participation	
UNIT 6	UNIT 7 Test & Measurement in Sports	Test & Measurement in Sports	3 Topics DELETED of OLD SYLLABUS 7.1 Computation of Fat Percentage – Slaughter-Lohman Children Skinfold Formula: Triceps & Calf Skinfold (Male 6 to 17 yrs - % body fat = (0.735 X sum of skinfold) + 1.0 (Female 6 to 17 yrs - % body fat = (0.610 X sum of skinfold) + 5.0 7.2 Measurement of Muscular Strength – Kraus Weber Test 7.3 Motor Fitness Test: AAHPER	1 Topic MODIFIED 1. Motor Fitness Test – 50 M Standing Start, 600 M Run/Walk, Sit & Reach, Partial Curl Up, Push Ups (Boys), Modified Push Ups (Girls), Standing Broad Jump, Agility – 4x10 M Shuttle Run
UNIT 7	UNIT 8 Physiology & Sports	Physiology & Injuries in Sports	Topics DELETED of OLD SYLLABUS 8.1 Gender Differences in Physical & Physiological Parameters 8.7 Role of Physical Activity Maintaining Functional Fitness in Aged Population	CHAPTERS MERGED
	UNIT 9 Sports Medicine		1 Topic DELETED of OLD SYLLABUS 9.1 Concept, Aims & Scope of Sports Medicine	
UNIT 8	UNIT 10 Kinesiology, Biomechanics & Sports	Biomechanics & Sports	3 Topics DELETED of OLD SYLLABUS 10.1 Introduction to Axes & Planes 10.3 Major Muscles Involved in Running, Jumping & Throwing 10.5 Projectile & Factors Affecting Projectile Trajectory	1 Topic ADDED 1. Meaning and Importance of Biomechanics in Sports
UNIT 9	UNIT 11 Psychology & Sports	Psychology & Sports	1 Topic DELETED of OLD SYLLABUS 11.1 Understanding Stress & Coping Strategies (Problem Focussed & Emotion Focussed)	NO CHANGE
UNIT 10	UNIT 12: Training in Sports	Training in Sports	NO CHANGE	NO CHANGE

Syllabus-XII (2019-2020)

THEORY

Max. Marks 70

Unit-I : Planning in Sports

- Meaning & Objectives Of Planning
- Various Committees & its Responsibilities (pre; during & post)
- Tournament – Knock-Out, League Or Round Robin & Combination
- Procedure To Draw Fixtures – Knock-Out (Bye & Seeding) & League (Staircase & Cyclic)
- Intramural & Extramural – Meaning, Objectives & Its Significance
- Specific Sports Programme (Sports Day, Health Run, Run For Fun, Run For Specific Cause & Run For Unity)

Unit-II : Sports and Nutrition

- Balanced Diet & Nutrition: Macro & Micro Nutrients
- Nutritive & Non-Nutritive Components Of Diet
- Eating For Weight Control – A Healthy Weight, The Pitfalls of Dieting, Food Intolerance & Food Myths

Unit-III : Yoga and Lifestyle

- Asanas as preventive measures
- Obesity: Procedure, Benefits & contraindications for Vajrasana, Hastasana, Trikonasana, Ardh Matsyendrasana
- Diabetes: Procedure, Benefits & contraindications for Bhujangasana, Paschimottasana, Pavan Muktasana, Ardh Matsyendrasana
- Asthema: Procedure, Benefits & contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana
- Hypertension: Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana, Shavasana
- Back Pain: Tadasana, Ardh Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana

Unit-IV : Physical Education and Sports for CWSN (Children With Special Needs-Divyang)

- Concept of Disability & Disorder
- Types of Disability, its causes & nature (cognitive disability, intellectual disability, physical disability)
- Types of Disorder, its cause & nature (ADHD, SPD, ASD, ODD, OCD)
- Disability Etiquettes
- Advantage of Physical Activities for children with special needs
- Strategies to make Physical Activities assessable for children with special need.

Unit V: Children & Women in Sports

- Motor development & factors affecting it
- Exercise Guidelines at different stages of growth & Development
- Common Postural Deformities - Knock Knee; Flat Foot; Round Shoulders; Lordosis, Kyphosis, Bow Legs and Scoliosis and their corrective measures
- Sports participation of women in India
- Special consideration (Menarch & Menstural Disfunction)
- Female Athletes Triad (Oestoperosis, Amenoria, Eating Disorders)

Unit VI: Test & Measurement in Sports

- Motor Fitness Test – 50 M Standing Start, 600 M Run/Walk, Sit & Reach, Partial Curl Up, Push Ups (Boys), Modified Push Ups (Girls), Standing Broad Jump, Agility – 4x10 M Shuttle Run

- General Motor Fitness – Barrow three item general motor ability (Standing Broad Jump, Zig Zag Run, Medicine Ball Put – For Boys: 03 Kg & For Girls: 01 Kg)
- Measurement of Cardio Vascular Fitness – Harvard Step Test/Rockport Test -
Computation of Fitness Index:
$$\frac{\text{Duration of the Exercise in Seconds} \times 100}{5.5 \times \text{Pulse count of 1-1.5 Min after Exercise}}$$
- Rikli & Jones - Senior Citizen Fitness Test
 1. Chair Stand Test for lower body strength
 2. Arm Curl Test for upper body strength
 3. Chair Sit & Reach Test for lower body flexibility
 4. Back Scratch Test for upper body flexibility
 5. Eight Foot Up & Go Test for agility
 6. Six Minute Walk Test for Aerobic Endurance

Unit VII: Physiology & Injuries in Sports

- Physiological factor determining component of Physical Fitness
- Effect of exercise on Cardio Respiratory System
- Effect of exercise on Muscular System
- Physiological changes due to ageing
- Sports injuries: Classification (Soft Tissue Injuries:(Abrasion, Contusion, Laceration, Incision, Sprain & Strain) Bone & Joint Injuries: (Dislocation, Fractures: Stress Fracture, Green Stick, Communated, Transverse Oblique & Impacted) Causes, Prevention & treatment
- First Aid – Aims & Objectives

Unit VIII Biomechanics & Sports

- Meaning and Importance of Biomechanics in Sports
- Types of movements (Flexion, Extension, Abduction & Adduction)
- Newton’s Law of Motion & its application in sports
- Friction & Sports

Unit IX Psychology & Sports

- Personality; its definition & types – Trait & Types (Sheldon & Jung Classification) & Big Five Theory
- Motivation, its type & techniques
- Exercise Adherence; Reasons to Exercise, Benefits of Exercise
- Strategies for Enhancing Adherence to Exercise
- Meaning, Concept & Types of Aggressions in Sports

Unit X Training in Sports

- Strength – Definition, types & methods of improving Strength – Isometric, Isotonic & Isokinetic
- Endurance - Definition, types & methods to develop Endurance – Continuous Training, Interval Training & Fartlek Training
- Speed – Definition, types & methods to develop Speed – Acceleration Run & Pace Run
- Flexibility – Definition, types & methods to improve flexibility
- Coordinative Abilities – Definition & types
- Circuit Training - Introduction & its importance

PRACTICAL

Max. Marks 30

- | | |
|--|-----------|
| 01. Physical Fitness Test | - 6 Marks |
| 02. Proficiency in Games and Sports (Skill of any one Game of choice from the given list*) | - 7 Marks |
| 03. Yogic Practices | - 7 Marks |
| 04. Record File** | - 5 Marks |
| 05. Viva Voce (Health/ Games & Sports/ Yoga) | - 5 Marks |

* Basketball, Football, Kabaddi, Kho-Kho, Volleyball, Handball, Hockey, Cricket, Bocce & Unified Basketball [CWSN (Children With Special Needs - Divyang)]

** Record File shall include:

Practical-1: Fitness tests administration for all items.

Practical-2: Procedure for Asanas, Benefits & Contraindication for any two Asanas for each lifestyle disease.

Practical-3: Procedure for administering Senior Citizen Fitness Test for 5 elderly family members.

Practical-4: Any one game of your choice out of the list above. Labelled diagram of field & equipment (Rules, Terminologies & Skills).

**Suggested Question Paper Design
Physical Education (Code No. 048)
Class XII (2019-20)**

Marks: 70

Duration: 3 hrs.

S.N.	Typology of Questions	Objective Type/ MCQ 1 Mark	Short Answer I 3 Marks	Short Answer II 5 Marks	Marks
1.	Remembering: Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers	5	3	2	24
2.	Understanding: Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas	5	3	1	19
3.	Applying: Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	5	2	1	16
4.	Analysing and Evaluating: Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations. Present and defend opinions by making judgements about information, validity of ideas, or quality of work based on a set of criteria. Creating: Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.	5	2	–	11
	Total	20 × 1 = 20	10 × 3 = 30	4 × 5 = 20	70 (34)

There will be Internal Choice in questions of 1 mark (4 choices), 3 marks (3 choices) and 5 marks (2 choices). In all, total 9 internal choices.

Exercises

Unit-1

Planning in Sports

Objective Type/Multiple Choice Questions Carrying 1 Mark.

Give one word answers.

1. What is the name of the committee that announces the dates and venue of tournament?
2. Which committee is responsible for preparing the grounds or laying out the track and field?
3. What is the formula to calculate the number of matches in a single league tournament?
4. Write down the formula for calculating the number of matches for double league tournament.
5. How many byes are given if 15 teams are participating in a knock-out tournament?

Fill in the blanks.

1. The second bye is given to the team of the upper half.
2. Tabular method is used for fixtures in a tournament.
3. means the activities which are performed within the campus of an institution.

State True or False.

1. League tournament is also called the Berger system. (True/False)
2. Knock-out tournaments are less expensive in comparison to other forms of tournaments. (True/False)

Choose the correct answer.

1. How many byes will be given if 19 teams are participating in a knock-out tournament?
(a) 12 (b) 13 (c) 14 (d) 15
2. How many methods can be used for preparing fixtures in a league tournament?
(a) 2 (b) 4 (c) 3 (d) 5
3. Tournaments are helpful for the development of:
(a) Social qualities (b) Selection of players (c) Sports skills (d) All the above
4. How many teams will be placed in IIIrd quarter if 31 teams are participating in a knock-out tournament?
(a) 6 (b) 7 (c) 8 (d) None
5. Intramurals are significant for:
(a) Physical development (b) Mental development
(c) Social development (d) All the above

Unit-2

Sports and Nutrition

Objective Type/Multiple Choice Questions Carrying 1 Mark.

Give one word answers.

1. Which diet can provide all the essential food constituents necessary for growth and maintenance of the body?

2. Who discovered vitamin 'A'?
3. Which mineral helps iron in the formation of haemoglobin?
4. Which vitamin was discovered by Elmer McCollum?

Fill in the blanks.

1. Our blood contains percent of water.
2. Minerals and are included in micronutrients.
3. The deficiency may cause goitre.

State True or False.

1. A balanced diet must contain all the essential food constituents in adequate amount. (True/False)
2. Carbohydrates contain the elements of carbon, hydrogen and oxygen. (True/False)
3. Glucose, fructose, sucrose and maltose are called complex carbohydrates. (True/False)
4. Fats contain carbon, oxygen and hydrogen in the percentage of 76, 12 and 12. (True/False)

Choose the correct answer.

1. In most of the carbohydrates, the ratio of hydrogen atoms to oxygen atoms is:
 (a) 2 : 1 (b) 1 : 2 (c) 1 : 3 (d) None
2. Trypsin helps in the digestion of:
 (a) Vitamins (b) Fats (c) Protein (d) Carbohydrates
3. Which group of fats usually increases the chances of heart diseases?
 (a) Saturated fats (b) Poly unsaturated fats
 (c) Mono-unsaturated fats (d) None of the above
4. Which one of the following is not the example of macrominerals?
 (a) Sodium (b) Potassium (c) Iron (d) Calcium
5. Which one of the following is an example of water soluble vitamins?
 (a) Vitamin 'D' (b) Vitamin 'C' (c) Vitamin 'A' (d) Vitamin 'E'
6. Which disease is caused by the deficiency of vitamin B₅?
 (a) Beri-beri (b) Pellagra (c) Rickets (d) Nightblindness
7. Which one of the given minerals plays an important role in the formation of haemoglobin?
 (a) Iron (b) Sulphur (c) Phosphorus (d) Sodium
8. Which one of the following is not the non-nutritive component of diet?
 (a) Roughage (b) Colour compounds (c) Protein (d) Flavour compounds

Unit-3

Yoga and Lifestyle

Objective Type/Multiple Choice Questions Carrying 1 Mark.

Give one word answers.

1. Who quoted "Sthiram Sukham Aasanam"?
2. In which disease the airways become blocked or narrowed causing difficulty in breathing?
3. Which type of diabetes is rare among people?

Fill in the blanks.

1. The normal blood pressure of an adult is considered mm/Hg.
2. Type I and Type II are the two types of

State True or False.

1. *Tadasana* is performed in sitting position. (True/False)
2. *Shavasana* is performed in supine position. (True/False)
3. Regular practice of *Tadasana*, *Vakrasana*, *Shalabhasana* and *Bhujangasana* helps in reducing back pain. (True/False)

Choose the correct answer.

1. Which one of the following asana is not a remedial asana for treating obesity?
(a) *Vajrasana* (b) *Trikonasana*
(c) *Chakrasana* (d) *Ardhmatseyendrasana*
2. Which one of the following asanas is not performed in standing position?
(a) *Tadasana* (b) *Ardhchakrasana* (c) *Sukhasana*

Unit-4

Physical Education and Sports for CWSN (Children with Special Needs-Divyang)

Objective Type/Multiple Choice Questions Carrying 1 Mark.

Give one word answers.

1. Which type of disability creates hindrance for an individual to store, process and produce information?
2. Which type of disability can affect individual's ability to read, compute, speak and write?
3. Which type of disability limits an individual's physical functioning, mobility or stamina?
4. In which disorder, children cannot sit, focus and pay attention properly?
5. In which type of disorder the brain has difficulty in receiving and responding to information that comes in through senses?
6. In which disorder children always tend to disrupt those around them?
7. Which disorder causes repeated unwanted thoughts?
8. Give the full form of ADHD.
9. Give the full form of ODD.
10. Give the full form of OCD.
11. Give the full form of SPD.

Fill in the blank.

1. disorder may affect a sense such as touch, sight, taste or movement.

State True or False.

1. Malnutrition is a significant cause of disability. (True/False)
2. Disability may be due to genetic cause. (True/False)

3. Generally, the intellectual disability begins before the age of 18 years. (True/False)
4. Autism spectrum is a disorder that affects the development of an individual. (True/False)
5. Always avoid asking personal questions to an individual who is differently-abled. (True/False)

Choose the correct answer.

1. Which is the cause of Sensory Processing Disorder?
 (a) Genetic (b) Low birth weight (c) Environmental factor (d) All the above

Unit-5

Children and Women in Sports

Objective Type/Multiple Choice Questions Carrying 1 Mark.

Give one word answers.

1. Name the eating disorder in which a female athlete eats excessive amount of food and then vomits it in order not to gain weight.
2. In which disorder, the female athletes think only about food, dieting and body weight all the time?
3. In which Olympics, there was no participation of women?
4. Name the first Indian woman who secured a bronze medal in Olympic games.
5. Vinesh Phogat, Babita Kumari and Shakshi Malik are related to which sports?
6. Mithali Raj is related to which game?

State True or False.

1. Seema Antil is related to athletics. (True/False)
2. Krishna Poonia is related to athletics. (True/False)
3. If a women athlete takes less number of calories persistently for a long time, she may not suffer from amenorrhoea. (True/False)
4. Biological factors and environmental factors do not affect the motor development of children. (True/False)

Choose the correct answer.

1. Which one of the fibres' percentage depends upon biological or heredity factors?
 (a) Fast twitch fibres (b) Slow twitch fibres (c) Both types of fibres (d) None of them
2. Which one of the following is not related with spinal curvature deformities?
 (a) Kyphosis (b) Bow legs (c) Lordosis (d) Scoliosis
3. In which Olympics did women participate for the first time?
 (a) 1896 (b) 1900 (c) 1904 (d) 1908
4. In which Olympic games, Saina Nehwal and M.C. Mary Kom secured one bronze medal each?
 (a) 2008 Olympics (b) 2012 Olympics (c) 2016 Olympics (d) None of the above
5. In which Olympics P.T. Usha secured 4th place in 400 m hurdle race?
 (a) 1980 Olympics (b) 1984 Olympics (c) 1988 Olympics (d) 1992 Olympics
6. Which one of the following factors leads to osteoporosis among women athletes?
 (a) Insufficient calcium in diet (b) Amenorrhoea
 (c) Eating disorders (d) All the above

Unit-6

Test and Measurement in Sports

6.1 MOTOR FITNESS TEST

Meaning of Motor Fitness

Motor fitness refers to the capability of an athlete to take part effectively in his/her particular sport. It can also be said that motor fitness is a person's ability to do physical activities. There are following items/tests to know the motor fitness of an athlete.

- (i) 50 m Standing Start or 50 m Dash
- (ii) 600 m Run/Walk
- (iii) Sit and Reach
- (iv) Partial Curl Up
- (v) Push Ups (Boys)
- (vi) Modified Push Ups (Girls)
- (vii) Standing Broad Jump
- (viii) Agility-4 × 10 m Shuttle Run

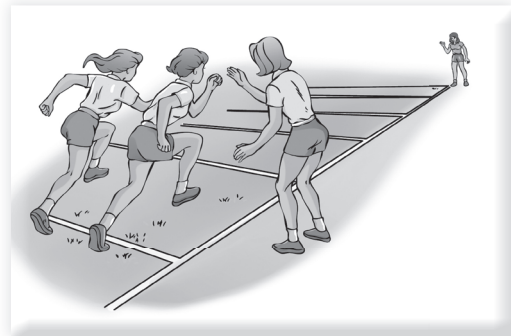
The explanation for the aforementioned tests is given below:

50 m Standing Start or 50 m Dash

Purpose: The purpose of this test is to determine or measure speed.

Equipment Required: Measuring tape or marked track, 2 stopwatches.

Procedure: An area of 50 m is marked on a track. Two parallel lines are drawn 50 m apart considering one as starting line. The subject takes the starting position behind the starting line. The starter commands, "Are you ready?" and "Go". The word 'Go' is accompanied by a downward sweep of the starter's arm as a signal to the timer. Two subjects can run at the same time if there are two stopwatches. The score is recorded in seconds to the nearest 10th of a second.



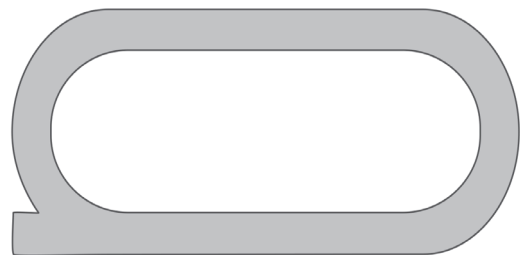
50 m dash

600 m Run/Walk

Purpose: To measure endurance.

Equipment Required: 600 m track and stop watches.

Procedure: The subject takes the position of standing right behind the starting line. At the signal of "Ready" and "Go" the subject starts running 600-yard distance. During the course of running he may walk. In this test, many students can run at the same time. Time is recorded in minutes and seconds.

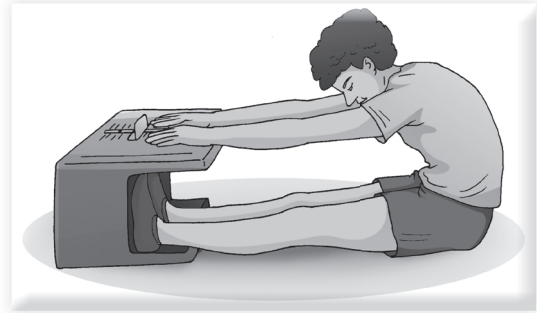


Track of 400 m for 600 m run

Sit and Reach

The sit-and-reach test was first propounded by **Wells and Dillon** in 1952. This test is widely used as a normal test to assess flexibility.

Purpose: The sit-and-reach test is a significant test to measure the flexibility of hip region including the lower back and hamstring muscles. Generally, it is noted that owing to the lack of flexibility in this region, there is a greater risk of injury. It is also entangled with lumbar lordosis and lower back pain.



Sit-and-reach test

Equipment Required: Sit-and-reach box or a makeshift ruler and a box may be used in which the zero mark can be adjusted for each individual according to their sitting reach level because there is a variation of lengths of individual's arms and legs.

Procedure: First of all, shoes and socks should be removed. Then sit down on the floor with legs stretched out straight ahead. The soles of the feet should be kept flat against the box. Both the knees should be locked and pressed flat to the floor. An assistant may hold the knees down. Palms should be facing downwards. Hands should be on the top of each other or side by side. The individual, whose flexibility is to be measured tries to extend his both hands forward along the measuring line on the box as far as he can extend. His fingertips of both hands should remain equal and at the same level. He should not jerk or bounce to reach maximum distance. He should hold the full reach position for two seconds and the score (distance) should be recorded. Generally, in such test, warm-up is not allowed, however, the best results can be attained after suitable warm-up. In case of a sliding ruler or a makeshift ruler, the zero mark should be at the fingertips. If it is not available or simple marking is there then zero mark should be 9 inches before the feet.

Scoring: The score is recorded to the nearest centimetre or half inch based on the distance reached by the fingertips of both hands.

Advantages

1. It is a simple test to know the flexibility.
2. It is an easy test to perform.

Disadvantages: This test is good for flexibility of joints of lower back and hamstrings and not related to the flexibility of other joints of the body.

Partial Curl Up

Purpose: To test the strength and endurance of abdominal muscles. In fact, strong abdominal muscles are significant for maintaining good posture, hip alignment and in preventing low back pain.

Equipment Required: A flat clean and cushioned surface, recording sheet and pen.

Procedure: First of all, the complete test procedure is explained to the subject. After that the subject lies in supine position on cushioned surface. The knees should be flexed and feet should be 12 inches from the buttocks. Both the feet should be slightly apart. The arms are extended and are rested on thighs. The head should be in neutral position. This is the

starting position. Then, the subject curls up with a slow controlled movement, until his/her shoulders come off the cushioned surface or mat two inches then back down again. One complete curl-up is completed every three seconds. These are continued until the subject feels unable to maintain the rhythm. There should not be any pause in the up or down position. It should be a continuous process.

Scoring: Record the total number of partial curl ups. Curl up should not be counted if the shoulders are not raised up by 2 inches.

Advantages

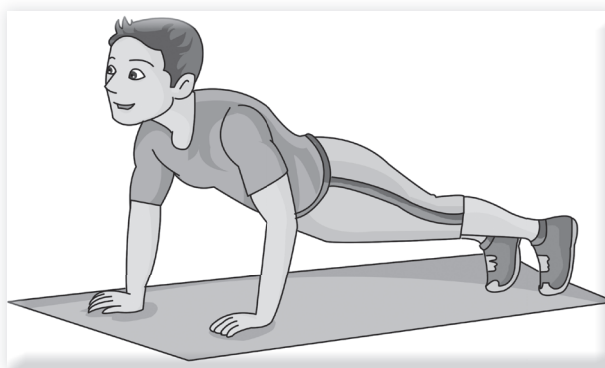
1. This test is simple and quick to perform.
2. It requires minimum equipment.
3. A number of subjects/students may be tested at a time.

Push Ups (Boys)

Purpose: To test or measure the upper body strength and endurance.

Equipment Required: A floor mat and a paper to record basic information such as age, gender and total number of push ups performed.

Procedure: After proper warming up, ask the subject to take position. In a push up position hands and toes should touch the mat/floor. Hands should be shoulder-width apart. The upper body and legs should be in a straight line. Elbows



Push Ups

should be fully extended keeping the back and the knees straight, the subject lowers the upper body so that elbows may bend to 90 degrees or chest may touch the mat/floor, then returns back to the starting position with the arms extended. This is one repetition. The same action is repeated and the test continues until exhaustion or until the subject can do more in rhythm. Count the total number of push ups performed.

Modified Push Ups (Girls)

A modified version of the test is used for girls.

Purpose: To measure the upper body strength and endurance.

Equipment Required: A mat and paper to record the basic information such as age, gender and a total number of push ups performed.

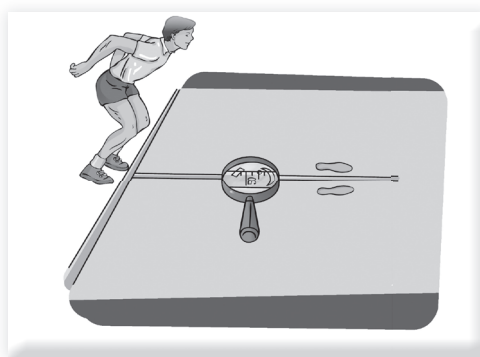
Procedure: After proper warming up, the subject is asked to take starting position for modified push ups. In a modified push up position, hands and knees should touch the mat/floor. Both the hands should be shoulder-width apart and elbows fully extended. The body from the knees, to the hips and to the shoulders should be in a straight line. While keeping this position, the subject should lower her upper body, so that elbows may bend to 90 degrees. Then the subject returns back to the starting position. This is one repetition. The same action is repeated and the test continues until exhaustion or until she can do no more in rhythm. Count the total number of modified push ups for record.

Standing Broad Jump

Purpose: To measure the explosive power of legs.

Equipment Required: A sandy long jump pit and a measuring steel tape.

Procedure: A take-off line is marked on the ground. Subject stands just behind the take-off line with the feet several inches apart. The subject swings the arms and bends the knees to take a jump in the long jump pit. Three trials are given to the subject. The distance is measured from the take-off line to the heel or other part of the body that touches the ground nearest to the take-off line. All jumps are measured and the best one is recorded. The measurement is noted in feet and inches.



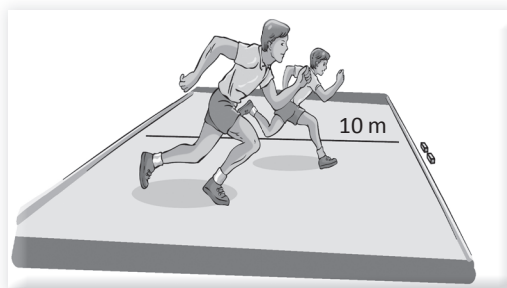
Sandy pit for standing broad jump

4 × 10 m Shuttle Run

Purpose: To measure agility (ability to change direction).

Equipment Required: Two wooden blocks (each block should measure 10 × 5 × 5 cm), marker cones, measuring tape, stopwatch and a flat surface with two lines 10 m apart.

Procedure: Mark two parallel lines 3 meters in length, 10 meters apart using marking tape or cones, considering one line as starting line. The subject stands at starting line or point. The two wooden blocks are placed in the edge of the other line. On the signal 'go' the subject runs to the wooden blocks, lifts one block, returns to the starting line and places the block behind the line. Then the subject returns to the second block, lifts it and then runs across the starting line on the way back. Two trials are given.



4 × 10 m Shuttle run

Scoring: Record the best time to complete the test in seconds to the nearest decimal place.

Exercises

Objective Type/Multiple Choice Questions Carrying 1 Mark.

Give one word answers.

1. Which test is used to measure the flexibility of individuals?
2. Which test is used to measure agility?
3. Which test can be used to measure leg strength?
4. What can be measured by using the following formula?
$$132.853 - (0.0769 \times \text{Body weight}) - (0.3877 \times \text{Age} + (6.135 \times \text{Gender}) - 3.2649 \times \text{Time}) - (0.1565 \times \text{Heart Rate})$$
5. Who developed Fullerton Functional Test?
6. In which year, the Rikli and Jones developed the Senior Citizen Fitness Test?
7. In which year the Harvard Step Test was developed?

8. Which test is used to measure flexibility?
9. Which test is used to measure the upper body strength and endurance of girls?

State True or False.

1. 4 × 10 m shuttle run is used to measure agility. (True/False)
2. Modified push up test can be used to measure the strength and endurance of the upper body of men. (True/False)
3. 50 m dash can be used to measure speed. (True/False)
4. Standing broad jump can be used to measure the leg strength. (True/False)
5. Zig-zag run is used to measure agility and speed. (True/False)
6. Medicine Ball Put is used to measure arm and shoulder strength. (True/False)
7. Harvard step test is used to measure cardiovascular fitness/aerobic fitness. (True/False)
8. Cardiovascular fitness is necessary to perform aerobic activities. (True/False)

Unit-7

Physiology and Injuries in Sports

7.2 EFFECTS OF EXERCISES ON CARDIO-RESPIRATORY SYSTEM

After doing exercises for a long time, certain adaptations take place in our Cardio-respiratory system. The various effects of exercises are stated below.

1. **Increase in the Size of Heart:** When we perform regular exercise, the muscles of the heart increase in size and strength. In fact, the left ventricle adapts to the greatest extent. The heart walls grow stronger and thicker. Recent studies show that the myocardial wall thickness also increases.
2. **Decrease in Resting Heart Rate:** Regular exercise decreases the resting heart rate. If a 10-week training programme is given to an individual whose initial resting heart rate is 72 beats per minute, after this training time, his resting heart rate may be reduced up to 10 beats per minute. After regular exercise, the heart finally becomes more efficient. It does not require to beat so quickly to supply blood to the body at rest. It has been noted that highly conditioned athletes can have their resting heart rates in the 30s.
3. **Stroke Volume Increases at Rest:** Regular exercise helps in increasing the stroke volume at rest. The stroke volume at rest remains up to 50–70 ml/beat in untrained individuals, 70–90 ml/beat in trained individuals and 90–110 ml/beat in the best endurance athletes.
4. **Increase in Cardiac Output:** Regular exercise tends to increase the cardiac output. The cardiac output in untrained individuals may be 14–20 litre/minute and 25–35 litre/minute in trained individuals and in the best athletes, the cardiac output can be as high as 40 litre/minute at rest.
5. **Increased Blood Flow:** In response to the need to supply the muscles with more oxygen during exercise, the body increases its number of capillaries. The existing capillaries also open wider. The blood redistribution becomes more efficient and effective. As a result of above-mentioned facts there is an increased blood circulation in the body.

6. **Decrease in Blood Pressure:** Regular exercise decreases the blood pressure (systolic and diastolic blood pressure) by up to 10 mmHg at rest.
7. **Increase in Blood Volume:** Regular exercises also increase the blood volume. In fact, there is an increase in plasma volume which in turn enhances the blood volume. In addition, the body produces a greater number of red blood cells in order to keep the muscles supplied with oxygen during heavy exercise.
8. **Quicker Recovery Rate:** Regular exercise quickens the recovery rate. A trained athlete's heart rate becomes normal quickly than in a beginner. Rate of respiration also becomes normal rapidly. Therefore, the recovery becomes fast.
9. **Increase in Tidal Air Capacity:** Tidal air is the amount of air that flows in and out of the lungs in each quiet respiratory movement. But tidal air capacity is the amount of air that can be breathed in and breathed out, over and above the tidal air by the deepest possible inspiration/expiration, respectively. It is estimated at about 500 to 800 cc. After doing regular exercise, it has been noted that this tidal air capacity can be increased.
10. **Decrease in Rate of Respiration:** It is certain that when a beginner starts to exercise, his rate of respiration increases. But when the same individual performs exercise on a daily basis, his/her rate of respiration at rest decreases in comparison to the earlier stage.
11. **Unused Alveoles become Active:** Regular exercise activates the unused alveoles, because much amount of O₂ is required in vigorous and prolonged exercises. The passive alveoles also become active.
12. **Increase in Endurance:** If exercise is performed regularly and for a longer period, it increases endurance. An activity can be done for a longer period without taking any rest. Those who do not perform exercise, have less endurance. They cannot continue exercise for a long duration. Hence, it can be alluded that exercise increases the endurance of an individual.
13. **Increase in Residual Air Volume:** Residual air is that amount of air, which is left in the lungs after exhalation. If an individual performs regular exercise, his/her residual air capacity increases in comparison to an individual who does not perform regular exercise.
14. **Increase Lung Efficiency to Deliver Oxygen and Remove Waste Products and Gaseous Exchange:** Improvement in lung efficiency cause oxygen to be delivered more readily to working muscles and remove waste products from the body. The number of alveoli in the lungs increase to enable more gas exchange to occur. More capillaries are formed in the lungs over time allowing more blood to flow out of the lungs. This improves the uptake of oxygen as there is greater surface area for blood to bind with haemoglobin.
15. **Increase in Vital Air Capacity:** It is the amount of air which an individual can inhale and exhale with maximum effort. Its capacity varies from 3500 cc to 4500 cc in a normal adult. It is the sum of tidal volume, inspiratory reserve volume and expiratory reserve volume. With regular exercise, a person's capacity may increase up to 5500 cc.
16. **Increase in Maximum Oxygen Uptake (VO₂ Max):** Athletes need a constant supply of oxygen to muscles. This is known as oxygen uptake (VO₂). The maximum oxygen uptake in a minute is called VO₂ Max. Regular exercise increases VO₂ Max.

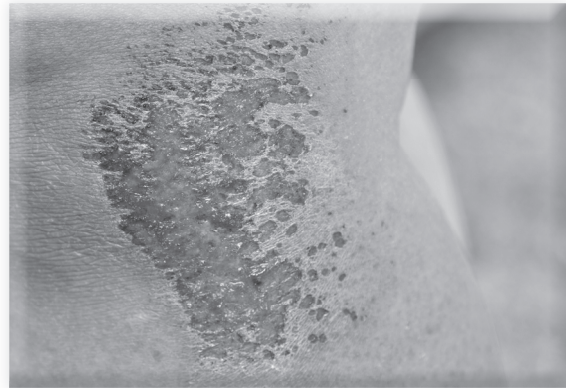
7.5 TREATMENT OF INJURIES

Treatment of soft tissue injuries, bone and joint injuries are mentioned below.

Treatment of Soft Tissue Injuries

(1) Abrasion

Abrasion is a skin injury. Abrasion usually occurs due to friction with certain equipment or a fall over the area where the bone is very close to the skin. It occurs at the upper part of the skin.



Abrasion

Treatment of Abrasion

1. First of all, clean the affected part with freshwater. Pick out the dead tissue, gravel and debris that might be sticking to the area of abrasion.
2. Use clean as well as sterile gauze to wipe the dirt from the affected part. Do it very gently so that the abrasion does not hurt much. Then, dry the affected area with a clean piece of gauze.
3. After that apply medicinal ointment so that proliferation of bacteria does not take place. Use enough ointment so that it does not stick to the abrasion. Use a big piece of gauze for dressing.
4. Then, visit a doctor for proper dressing and tetanus injection which is required to prevent the wound from causing an infection.
5. The dressing should be changed as per the instructions of the doctor.

(2) Contusion

Contusion is a muscle injury. A direct hit with or without any sports equipment can be the main cause of contusion. Contusion can also be due to minor accidents to the skin, such as falling, bumping into something or being hit or kicked. Contusion is common in boxing, wrestling and kabaddi. In contusion, blood vessels in the muscles are broken and sometimes bleeding may occur in the muscles which may cause bruise. The raised area of the contusion is the result of accumulation of blood and fluid from the injured blood vessels into the tissue. Stiffness and swelling are common features at the site of contusion. Sometimes, in such cases muscles fail to respond. In severe cases, muscle becomes completely inactive.

Treatment of Contusion

1. Cold compression should be used immediately. Ice or cold water should not be used for more than 40 minutes persistently. The cold compression should be performed 5 to 6 times daily.
2. If there is more swelling at the area of contusion, anti-inflammatory medicine should be given.

3. If the swelling still persists, consult a doctor immediately.
4. For the purpose of rehabilitation, flexibility exercises should be performed carefully.

(3) Laceration

A laceration is an irregular cut in the skin from a sharp object or sharp edged sports equipment. These wounds are more dangerous than incised wounds. Such wounds are not smooth. Bleeding is less from such wounds. These wounds may be very poisonous. Usually rough marks remain even after the treatment.



Laceration

Treatment of Laceration

1. First of all you should control bleeding before anything else. To stop bleeding put pressure directly on the laceration while holding it above the level of heart for 15 minutes. If you are unable to stop bleeding try to use pressure points.
2. Once bleeding has stopped, wash the laceration with warm water and mild soap. If bleeding starts again repeat step one.
3. Assess and see if the laceration requires stitches. If the affected person requires stitches, take him/her to the doctor.
4. For simple lacerations which do not require stitches, use antiseptic ointment.
5. Cover the laceration with sterile gauze and wrap with roller gauze. Clean the laceration whenever you change the dressing.
6. Watch the infection and change the dressing regularly.
7. Take painkiller if pain persists.

(4) Incision

Incision may also occur due to sharp-edged objects of sports equipment or spikes, etc. Sometimes, arteries or veins may be cut. Blood usually comes out freely from incisions.

Treatment of Incision

If the wound is not deep, let the blood come out. In this process, germs also come out with the blood. Such wounds should be cleaned with iodine tincture or spirit. Then, after placing a piece of cotton on the wound, a bandage should be applied. In such process, dirt should not enter into the wound. In case of excessive bleeding, the bandage should be kept tight. If the wound is too deep, a doctor should be consulted immediately.

(5) Sprain

It is a ligament injury. It may occur due to overstretching or tearing of ligament. Generally, sprain occurs at wrist joint and ankle joint. Sometimes, fracture is also possible along with the sprain. In such injury, swelling, inflammation, severe pain and tenderness are common

symptoms. There can be laxity in the ligament. All the above mentioned symptoms depend on the severity of sprain.

Treatment of Sprain

There are two procedures for the treatment of sprain, i.e., PRICE and MICE. These procedures of treatment of sprains are described below.

- (a) **PRICE Procedure:** The PRICE procedure should be followed for the first 24 to 48 hours after the injury, depending on the severity. PRICE stands for: protection, rest, ice, compression and elevation.

Protection: Protect the injured area of the victim from further injury by using a support or wearing shoes that enclose and support the feet, such as lace-ups.

Rest: It is very beneficial to have as much rest as possible in the early stages in order to allow the wound to heal. Avoid the temptation to move the injured part in order to see if it still hurts. So, for proper treatment, reduce the exercises and other activities completely and have complete rest.

Ice: Ice should be applied directly on the area of the injury as soon as possible. It reduces bleeding and swelling by slowing down blood circulation. It also relaxes the injured area by reducing pain. Ice should be wrapped in a wet cloth to prevent skin burns. Ice should be applied for 5 minutes for a small area like the wrist and for 20 minutes for a large area at a time. Application of ice should be done 4 to 8 times a day. To avoid cold injury and frostbite, do not apply ice for more than 20 minutes at a time. When ice is removed, the skin should look pale. On the other hand, if the skin is red then it means ice has been applied for too long.

Compression: Compression of an injured ankle, knee or wrist helps in reducing the swelling as well as bleeding. It is best applied using a firm pad over the site of injury with a strap around it to hold it in place. Compression should not be applied round a whole limb. The compression should not be applied very hard as it may hinder blood circulation.

Elevation: If possible, keep the injured ankle, knee, elbow or wrist elevated on a pillow, above the level of heart to reduce swelling.

- (b) **MICE Procedure:** Once the signs of inflammation have gone and heat and redness are reduced, the MICE procedure should be followed until the injury is healed. MICE stands for: mobilisation, ice, compression and elevation.

Mobilisation: It can be started by taking the injured part through its full range of movement. Such movements should be avoided that cause pain. This will prevent wasting of the muscles through lack of use. If any movement is done easily then try



Sprains

to increase the range of movement gradually. If the basic function of the injured part has been restored, start more exercises. It usually takes time for the injured part to get back to its normal strength, so only light and simple exercise should be done at first. If pain is felt during exercise, the exercise should be stopped immediately. If the pain disappears within 20 to 30 seconds, the exercise can be continued with caution.

Ice: Treatment with ice should continue for about a week according to the severity of the injury. After approximately 4 to 5 days, heat treatment such as hot pads can be applied. It helps in stimulating the blood circulation to the affected area.

Compression: This should be continued for a few days and after that it is not required.

Elevation: Elevation should be done until all signs of swelling, heat and redness have disappeared.

(6) Strain

Strain is a muscle injury. It can be mild as well as severe. Sometimes, the complete muscle can be ruptured. In case of complete rupture, it is not possible to move that part of limb. There may be severe pain around the rupture. There may be many situations during the practice or clash when strain may occur.

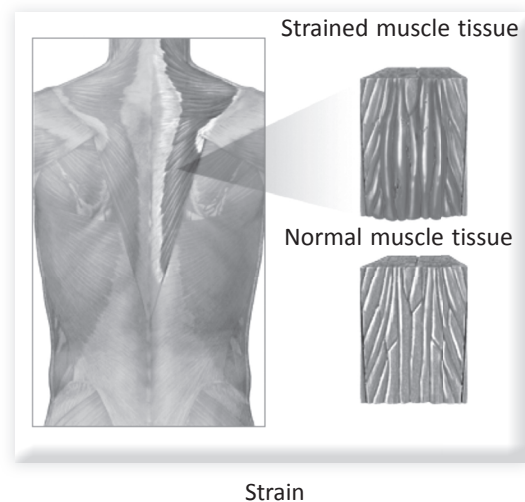
Treatment of Strain: There is a procedure for the treatment of strain i.e., PRICE. The procedure of treatment of strain is described below.

PRICE Procedure: The PRICE procedure should be followed for the first 24 to 48 hours after the injury, depending on the severity.

Protection: Protect the injured area of the victim from further injury by providing support to him.

Rest: It is very beneficial to have as much rest as possible in the early stages in order to allow the body to heal. Avoid the temptation to move the injured part in order to see if it still hurts. So, for proper treatment, reduce the exercises and other activities completely and have a complete rest.

Ice: Ice should be applied directly on the site of the strain injury as soon as possible. It reduces bleeding and swelling by slowing down blood circulation. It also relaxes the injured area by reducing pain. Ice should be wrapped in a wet cloth to prevent skin burns. Ice should be applied for 5 minutes for a small area like the wrist and for 20 minutes for a large area at a time. Application of ice should be done 4 to 8 times a day. To avoid cold injury and frostbite, do not apply the ice for more than 20 minutes at a time. When ice is removed, the skin should look pale. On the other hand, if the skin is red that means ice has been applied for too long.



Compression: Compression of an injured thigh muscle, hamstring, calf bicep or tricep muscle helps in reducing the swelling as well as bleeding. It is best applied using a firm pad over the site of injury with a strap around it to hold it in place. Compression should not be applied round a whole limb. The compression should not be applied very hard as it may hinder the flow of blood circulation.

Elevation: If possible, keep the injured leg or hands elevated on a pillow, above the level of heart for reducing the swelling.

For the first 72 hours after a muscle strain, the injured should avoid any kind of heat such as hot baths, sauna bath or heat packs. Running or exercise may cause more damage and massage may cause bleeding.

For more severe injuries of muscles (strain), physiotherapy should be provided. It is beneficial for improving range of motion and return to the normal function of the muscles.

Treatment of Bone and Joint Injuries

Dislocation of Joint

Dislocation of joints is a main injury. In fact, it is a dislocation of surfaces of bones or it can be said that it is an injury which forces the bones out of their sockets. It temporarily deforms or immobilizes the joint. There are following types of dislocations.

- (i) Dislocation of lower jaw:** Generally, it occurs when the chin strikes to any other object. It may also occur if mouth is opened excessively.
- (ii) Dislocation of shoulder joint:** Dislocation of shoulder joint may occur due to sudden jerk or a fall on hard surface. The end of the humerus comes out from the socket.
- (iii) Dislocation of hip joint:** By putting maximum strength spontaneously may cause dislocation of hip joint. The end of the femur is displaced from the socket.

Treatment of Dislocation

1. Call medical help immediately.
2. Don't try to move the joint or to place it back in the socket.
3. Keep ice on the spot of dislocation to control swelling.
4. Sling or splint the affected joint into its fixed position.

Fractures

There are different types of fractures and they also require different types of treatment. Their explanation is given below.

(1) Stress Fracture

A stress fracture is a crack in a bone. It can be common injury in high impact sports such as long distance races or basketball, etc. Such types of fractures can be very painful. However, these fractures usually heal themselves if proper rest is taken for appropriate duration which may be up to two months. Usually, these fractures occur in leg bones.

Treatment of Stress Fracture

1. First of all elevate the extremity and rest while the bone heals itself.
2. Apply ice to the affected area for 24 to 48 hours.
3. If pain persists, give some painkillers.
4. If there is any need of immobilization of the affected area, use a splint.
5. When swelling is reduced, start putting partial weight on the affected area. Crutches or walking stick may be used in the beginning. After two weeks start putting normal weight.
6. For 6 to 8 weeks, avoid the activity that caused stress fracture. Then start doing the activity slowly.

(2) Greenstick Fracture

A greenstick fracture is that fracture when a bone bends and cracks instead of breaking completely into separate pieces. This type of fracture usually occurs in children because their bones are soft and more flexible than the adults.

Treatment of Greenstick Fracture

Most of these fractures involve arms and legs which require immobilization to make the bone grow back together in proper or natural position. A removable splint is the most recommended one among children. The swelling that occurred on the site of the fracture may be reduced with anti-inflammatory drugs. Pain can be relieved by taking pain relievers. Generally, it takes eight weeks for complete bone healing. High impact activities should be avoided in the beginning.

(3) Comminuted Fracture

When a bone is broken into two or more pieces, it is called comminuted fracture. Such type of fracture is possible in cycle race or motorcycle race.

Treatment of Comminuted Fracture

The management as well as treatment for comminuted fracture is not an easy job because of many fragmented pieces of bones. Immobilization above and below the fractured area should be maintained with the help of plasters and splints. For pain management specially in arm fractures painkiller should be given to the affected sportsperson. Infections should be avoided by giving antibiotics. It may take for more than few months to restore to its normal condition. After that physical therapy should be used to treat completely.

(4) Transverse Fracture

It is a break in one of the bones of the spine or a part of it. It is shaped like a wing. Most probably, these injuries occur in the thoracic spine (the upper and middle parts of the vertebra and lumbar region)/low back area.

Treatment of Transverse Fracture

If the injury is limited to a break of a transverse process with no other injury, hospital care is not necessary. Medication for pain control should be given. Limit the various activities. In intricate or multiple fractures of backbone (spine) there can be damage to spinal cord and may require operation. There can be pain and stiffness in the back for some weeks

after transverse fracture. Complete rest should be given to the person. After that the affected person should not join in any activity. Neck and back braces may also be helpful in reducing pain and increasing mobility. Exercise should be done to improve motion and to strengthen back.

(5) Oblique Bone Fracture

An oblique bone fracture occurs when the bone is broken diagonally to the axis of the bone. Mostly these fractures occur at the humerus or femur bones, i.e., in long bones of our body.

Treatment of Oblique Bone Fracture

The method of treatment of oblique bone fracture usually depends on the amount of damage to the bone. If the damage is minimum, a plaster cast may be used to treat the fracture. However, in most of the oblique fractures surgical treatment is required. If the damage is extensive, metal rods and screws are used to hold the bone in place.

(6) Impacted Fracture

When the end of a fractured bone enters into other bone, it is called impacted fracture.

Treatment of Impacted Fracture

If the damage is not too severe, a splint or sling may be sufficient to hold the fractured bone in place so it can heal correctly. If an impacted fracture only involves a few bone fragment and the damage is not too significant, immobilization may be enough to treat it. The movement of the affected part should be minimised for quite some time even after a splint is removed. These fractures usually take more time to heal. In severe cases, surgery is required.

Exercises

Objective Type/Multiple Choice Questions Carrying 1 Mark.

Give one word answers.

1. Which muscle fibres are best used for aerobic activities?
2. In which type of fracture the end of the fractured bone enters into another bone?
3. In which types of fracture a broken bone damages the internal organs?
4. Who are usually affected by greenstick fracture?
5. In which type of fracture a bone is broken into three or more pieces?

Fill in the blank.

1. Aerobic capacity depends upon oxygen intake, oxygen transport and

State True or False.

1. The strength of the muscle largely depends upon the size of the muscle. (True/False)
2. White muscle fibres can produce more force in comparison to red muscle fibres. (True/False)
3. Red muscle fibres are not capable of contracting for a longer duration. (True/False)
4. The aerobic capacity depends upon the muscle glycogen and sugar level in the blood. (True/False)
5. Vital air capacity is the sum of tidal volume, inspiratory and reserve volume. (True/False)
6. Reaction time can be improved if exercises are performed regularly. (True/False)

Choose the correct answer.

1. White muscle fibres are better adopted to perform:
(a) Slow contraction (b) Fast contraction
(c) Medium contraction (d) No contraction
2. The functional efficiency of a muscle depends upon its:
(a) Nerve stimulation (b) Girth
(c) Fiber quality (d) Tonus
3. Which one of the following is included in soft tissue injuries?
(a) Contusion (b) Strain
(c) Abrasion (d) All the above
4. Which one of the following is not a soft tissue injury?
(a) Strain (b) Bruises
(c) Laceration (d) Greenstick fracture

Unit-8 Biomechanics and Sports

In the history of physical education and sports, individuals have been interested in enhancing their performance. Today, physical education teachers, coaches and physical trainers are concerned with helping individuals to learn how to move efficiently and effectively. In primary and high schools, stress is laid down on learning the fundamental motor skills, which provide a base for the learning of advanced sports skills. The teachers as well as coaches always make their best efforts to improve the performance of students in various competitive games and sports. They can be instrumental to improve the performance of students if they have adequate knowledge of 'Biomechanics'. Nowadays, biomechanics is playing important roles in improving the performance of sportspersons.



Dick Fosbury performing high jump with fosbury technique.

8.1 MEANING AND IMPORTANCE OF BIOMECHANICS IN SPORTS

Meaning of Biomechanics

Biomechanics is a subdiscipline of physical education. The term 'biomechanics' is a combination of two words *i.e.*, 'Bio' and 'mechanics'. Here 'bio' is a Greek word that refers to life or living things and 'mechanics' refers to the field of physics and the forces that act

on bodies in motion. The primary purpose of biomechanics is to evaluate a living organism's motion as well as its application of force. In other words, biomechanics is a subdiscipline that applies the laws of mechanics and physics to study the bodily movements and the causes of movements, both internally and externally. It can also be said that biomechanics is the study of forces and their effects on living systems.

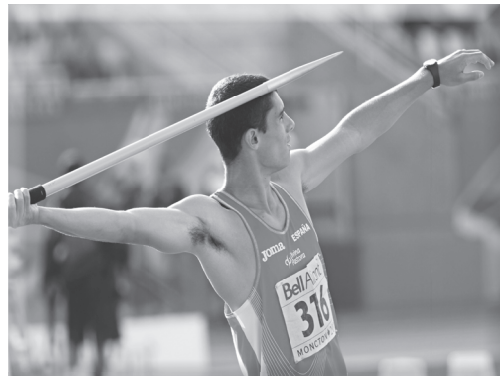
According to **Bartlett, R.**, "*The study and analysis of human movement patterns in sports is called biomechanics.*"

As a matter of fact, it can be said that biomechanics is the study of the body as a machine. This study of the body looks at the internal and the external forces that act on the body and the movements that these forces produce.

Importance of Biomechanics in Sports

Biomechanics focuses on the application of the scientific principles of mechanical physics to understand movements of action of human bodies and sports implements such as cricket bat, hockey stick, javelin, etc. How the different forces affect human motion and how the movement can be improved are studied in biomechanics. In fact, the knowledge of biomechanics provides a better understanding of the human body and other internal and external forces that affect human movement and also the forces that act on object in motion. It can improve the techniques of sports and games. The detailed description of importance of biomechanics is stated below.

1. Assist in Improving Technique. The simple method for improving performance in most of the sports is to improve the technique of sportspersons. As a matter of fact, it is one of the motivating factors for studying biomechanics. Biomechanics can be applied to improve techniques in two ways. First, the teachers of physical education may use their knowledge of mechanics to correct or rectify the errors of a sportsperson in order to improve the proper execution of a skill. Second, the sportsperson may discover new and more effective techniques for performing a sports skill. For example, Dick Fosbury discovered the new technique of high jump with the help of biomechanics and that technique helped him in achieving extraordinary enhancement in comparison to the straddle technique. For making correct actions or rectifying the technical errors, the teachers, of physical education use qualitative biomechanical analysis methods in everyday coaching. While discovering new techniques, teachers use quantitative biomechanical analysis methods. After that, these techniques are communicated to the teachers to implement them on sportspersons.



Javelin throw technique

- 2. Helps in Improving Equipment.** Study of biomechanics also help in improving sports equipment. It helps in improving designs for the equipment used in various sports. Shoes and sports clothes constitute the equipment used in almost every sport. The equipment used by sportspersons may have an effect on the performance, either directly or through injury prevention. For example, bigger tennis rackets help players better control over the ball, runners' injuries are reduced and performance is enhanced because of better designed running shoes and improved helmets reduce chances and severity of injury in football and ice-hockey. Biomechanics also help in designing the sports clothes particularly aerodynamic clothings and, equipment such as in skiing, speed skating, cycling and swimming costumes. Such improvement in equipment ultimately help in enhancing sports performance.
- 3. Facilitates Performance in Sports.** The main goal of biomechanics is the improvement in sports performance. Indeed, biomechanics enhances performance by utilizing mechanical principles to improve an individual's technique, the equipment he/she uses and to modify the specific training method. Along with this, biomechanics is also used to develop such techniques that reduce the chances of injuries as well as make changes in the equipment design to reduce injury. In this way an athlete usually remains uninjured and hence performs better. So, it can be said that biomechanics helps in improving sports performance.
- 4. Supports in Preventing Injury.** Biomechanics helps in preventing injury in various ways. It also helps in the process of rehabilitation of injuries. In fact, biomechanics is useful in identifying what forces may have caused an injury, how to prevent the injury from occurring or reoccurring and what exercises may help in the process of rehabilitation of injury. Biomechanics is used to provide the basis for changes in techniques, equipment and training to prevent injuries.
- 5. Helps in Promoting Safety.** Biomechanics also helps in promoting the safety of sportspersons. When a sportsperson moves his nervous system instructs his muscles to contract. These contractions cause bones to move around the axes of joints. When teachers of physical education impart training to the sportspersons, they have a responsibility to not only guide them to enhance their performance but do so in a safe and effective manner. It is important to have some understanding of how the human body is meant to move and more importantly, which movements should be avoided and why. The teachers of physical education get such knowledge from biomechanics. In this way, biomechanics helps in promoting safety of sportspersons along with the enhancement of their sports performance.
- 6. Works in the Improvement of Training.** Biomechanics has a potential for bringing modifications in training which helps in improving sports performance. Biomechanics can be applied in various ways. A proper mechanical analysis of the technical deficiencies of a sportsperson can help a physical education teacher in identifying the type of training the sportsperson requires in improving the sports performance. The sportsperson may be limited by the strength, or edurance of certain muscle groups by speed of movement or by any specific aspect of his technique. So,

once the teacher learns about the limitations, training can be imparted accordingly.

7. **Facilities in Understanding of Human Body.** Biomechanics helps in understanding the complete human body. The knowledge of biomechanics provides the teachers and learners with a better understanding of human body and various internal and external forces that affect human movement. The teachers come to know about the various systems such as nervous system, muscular system, skeletal system, etc., and their mutual interactions. This knowledge in turn enables the physical education teachers to be better teachers/instructors of many physical activities and skills encompassed within physical education.
8. **Assists in Improving Teaching and Learning Process.** Biomechanics helps in teaching and learning process. In physical education and sports, each and every activity usually involves some type of movements. Biomechanics helps in moving the body with precision or accuracy, which ultimately helps in enhancing the sports performance. So, it can be alluded that biomechanics helps in improving teaching and learning process. In conclusion, it can be said that biomechanics is significant in improving sports performance, reducing the risk of injury, improving technique, equipment, design and promote safety.

Exercises

Objective Type/Multiple Choice Questions Carrying 1 Mark.

Give one word answers.

1. Name the type of movement in which the angle at a joint decreases and the parts come closer together.
2. Name the type of movement in which the angle at a joint increases and the parts move farther apart.
3. Who formulated the laws of motion?
4. Which law of motion is applied when a basketball player dribbles the ball on the court?
5. Which law of motion is applied during the take off in high jump?
6. When a cricket ball is hit, it rolls on the surface of the ground and finally it stops after some time. Which type of dynamic friction is applied on the ball?

Fill in the blank.

1. Sliding friction and rolling friction are the types of friction.

State True or False.

1. Biomechanics is the study of forces and their effects on living systems. (True/False)
2. Friction is a necessary evil in sports. (True/False)

Choose the correct answer.

1. Which one of the following is an example of the Law of Inertia
 - (a) Starting in rowing
 - (b) Stating on roman rings
 - (c) Raising an opponent in wrestling
 - (d) All the above

2. Which one of the following is an example of the Law of Reaction?

(a) Bouncing on trampoline	(b) Springing on the diving board
(c) Thrust against the water in swimming	(d) All the above
3. Biomechanics helps in one of the following:

(a) In improving technique	(b) In improving designs of sports equipment
(c) In improving teaching and learning	(d) All the above
4. Which one of the following is not Law of Motion?

(a) Law of Inertia	(b) Law of Reaction
(c) Law of Readiness	(d) Law of Acceleration

Unit-9

Psychology and Sports

Objective Type/Multiple Choice Questions Carrying 1 Mark.

Give one word answers.

1. Who said "The drive to strive is called motivation".
2. What is that motivation, which occurs when people are compelled to do something out of pleasure, importance or desire?
3. What is that motivation which occurs when external factors compel the person to do something?
4. Which hormones is responsible for elevating mood?

Fill in the blanks.

1. The term 'Motivation' is derived from the word
2. In aggression, the main aim is to cause injury or harm to another sportsperson.
3. Any physical injury that may occur through behaviour is accidental and unintentional.

State True or False.

1. Positive attitude can play a significant role in motivating a sportsperson. (True/False)

Choose the correct answer.

1. Which one of the categories is included under Sheldon's classification of personality?

(a) Endomorph	(b) Mesomorph
(c) Ectomorph	(d) All the above
2. Which one of the categories is included under Jung's classification of personality?

(a) Introverts	(b) Extroverts
(c) Ambiverts	(d) All the above
3. Which one of the big five traits of personality is not its domain?

(a) Extroversion	(b) Agreeableness
(c) Closedness	(d) Neuroticism

4. Which one of the following is not a technique of motivating in the field of sports?

(a) Presence of spectators	(b) Goal setting
(c) Ignorance	(d) Praise or blame
5. What is the reason to do exercise regularly?

(a) To enhance physical appearance	(b) To feel more energetic
(c) To decrease the risk of diseases	(d) All the above
6. Which one of the following is not the benefit of exercise?

(a) Improves mood	(b) Improves anxiety
(c) Improves self confidence	(d) Improves flexibility
7. Which one of the following is not the strategy for enhancing adherence to exercise?

(a) Simple exercise in the beginning	(b) Set appropriate goal
(c) Same pattern of exercise	(d) Always remain punctual

Unit-10

Training in Sports

Objective Type/Multiple Choice Questions Carrying 1 Mark.

Give one word answers.

1. In which year, the Interval Training Method was introduced?
2. Who developed Interval Training Method?
3. Who was Bikila?
4. What is the other name of Interval Training?
5. Who developed Fartlek Training Method?
6. What does 'Fartlek' mean?
7. In which year, Fartlek Training Method was developed?
8. Who designed circuit training method?
9. In which year circuit training method was designed?

Fill in the blanks.

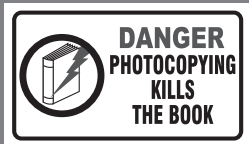
1. is a systematically planned preparation with the help of various exercises.
2. is the ability of muscles to overcome resistance.
3. Continuous training is one of the best methods for improving
4. In continuous training method, the rate of heart beat remains in between to beats per minute.
5. is the range of movements of joints.

State True or False.

1. Circuit training provides maximum results in minimum time. (True/False)
2. Circuit training is inconvenient for sportspersons. (True/False)
3. Circuit training is not ideal for beginners. (True/False)

Choose the correct answer.

1. Which one of the following methods is helpful in improving flexibility?
(a) Ballistic Method (b) Static Stretching Method
(c) Dynamic Stretching Method (d) All the above
2. Which one of the following is not the type of coordinative abilities?
(a) Handling ability (b) Coupling ability
(c) Balancing ability (d) Reaction ability
3. Which one of the following methods is used to develop endurance?
(a) Continuous Training Method (b) Interval Training Method
(c) Fartlek Training Method (d) All the above
4. Which type of exercise was developed by Perrine?
(a) Isotonic exercise (b) Isometric exercise
(c) Isokinetic exercise (d) None of the above



About the Series

Saraswati Health and Physical Education is a much acclaimed and popular series. It demonstrates a deep understanding of the principles and concepts related to the subject of Health and Physical Education while providing students with all the pedagogical tools necessary for comprehension and application.

The fully revised edition, which includes all the latest developments in the field, in its colourful avatar will not only enhance the teaching-learning process but also makes it more enjoyable.

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New Saraswati House (India) Pvt. Ltd.

Head Office: Second Floor, MGM Tower, I9 Ansari Road, Daryaganj
New Delhi-110002, INDIA, • T +91-11-43556600 • F +91-11-43556688
E-mail: delhi@saraswathihouse.com, www.saraswathihouse.com
Customer Support Number: +91-1800-2701-460



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