JHARKHAND RAI UNIVERSITY

RANCHI

LAB MANUAL

Physiotherapy in Sports Condition- I Practical

BPT-23A703P

VII Semester

List of Practical

1. To assess the pre-exercise evaluation for safe exercise
2. To understanding and measuring fitness component
3. To design PIVD Rehabilitation Protocol for sports athletes
4. To design ACL Rehabilitation Protocol for sports athletes
5. To Assess the sports injury assessment protocol

Practical: 01

Aim: To assess the pre-exercise evaluation for safe exercise
Objective: To determine the effectiveness of pre-exercise evaluation to ensure safe exercise participation

A compressive pre- exercise test evaluation in a clinical setting generally include-

1. Medical history
2. Physical examination
3. Laboratory Examination

Components of medical history:

I. Medical Diagnosis

- Cardiovascular diseases, including myocardial infarction, percutaneous coronary artery procedures, including angioplasty
- Coronary artery bypass surgery
- Vascular surgery
- Diabetes mellitus
- Hypertension
- Asthma
- Peripheral vascular disease
- Stroke
- Cancer
- Osteoporosis
- Pregnancy

II. Previous Physical Examination Findings

- Abnormal heart sounds
- Abnormal pulmonary findings
- High blood pressure
- Abnormal blood sugar levels
- Edema

III. History of Symptoms

- Discomfort: Bloating, heaviness, numbness, pain
- Affected areas: Chest, jaw, neck, back , arms
- Dizziness
- Fainting
- Shortness of breath
- Palpitations (especially if associated with physical activity)

IV. Recent Illnesses

- Hospitalization
- New medical diagnoses
- Recent surgeries or procedures

V. Orthopaedic Problems

- Osteoarthritis
- Joint swelling
- Strain
- Sprain
- Any condition that may limit movement or sudden mobility difficult

VI. Medications

- Recent medicines, allergies, or drug reactions

VII. Other Habits

- Alcohol
- Caffeine
- Tobacco

VIII. Exercise History

- Changes in habitual activity levels
- Type of exercise
- Frequency
- Duration
- Intensity

IX. Family History

- Cardiac problems
- Pulmonary diseases
- Stroke
- Sudden death

Components of Physical Examination

- Body weight
- Determination of BMI:
  18.9–24.9: Underweight
  25–29.9: Healthy
  30–39.9: Overweight
- Waist circumference
- Body composition
- Pulse rate and rhythm (normal or high)
- Resting blood pressure (seated, supine, standing)

- Auscultation of lungs (abnormal sounds, e.g., absence of breath sounds, wheezing)
- Auscultation of heart (murmurs, clicks, gallops)
- Palpation and auscultation of carotid, abdominal, and femoral pulses
- Evaluation of abdominal bowel sounds, abnormal masses, visceral mobility and tenderness
- Palpation and inspection of lower extremities for edema and arterial pulses
- Follow-up examinations for orthopaedic or other medical conditions that may limit exercise testing
- Tests of neurological function, including reflexes and cognition
- Inspection of the skin, especially the lower extremities in cases of known diabetes

Recommended Laboratory Tests by Risk Level and Clinical Assessment

I. Apparently Healthy (Low Risk) or Individuals at Increased Risk but Without Known Disease (Moderate Risk)

- Fasting blood sugar (for individuals over 45, younger adults with high BMI)
- Lipid profile
- Hypertension >140/90 in adults
- Triglyceride levels
- Thyroid Test (as a screening evaluation for dyslipidemia)

II. Patients with Known or Suspected Cardiovascular Disease (High Risk)

- Previous test records for comparison
- Tests:
- ECG (Electrocardiogram)
- Angiography
- Chest radiograph (if congestive heart failure is suspected or present)

III. Patients with Pulmonary Disease

- Pulmonary function tests
- Chest radiography
- Spirometry
- Arterial blood gas analysis
- Oximetry
- Pulmonary function test (Recommended for diminished lung function, COPD, smoking, dyspnea, chronic cough, etc.)

Contraindications

1. Absolute Contraindications

(Patients with these conditions should not perform exercise tests until stabilized.)

- Recent significant changes in resting ECG
- Recent myocardial infarction (within 2 days) or other acute cardiac events

- Unstable angina
- Uncontrolled cardiac dysrhythmias
- Symptomatic severe aortic stenosis
- Uncontrolled symptomatic heart failure
- Pulmonary dysfunction
- Acute pericarditis or myocarditis
- Acute fever
- Swollen lymph nodes

2. Relative Contraindications

(Patients with these conditions may proceed only after careful evaluation of the risk-benefit ratio.)

- Ventricular aneurysm
- Uncontrolled metabolic diseases (e.g., diabetes mellitus)
- Chronic infectious diseases (TB, HIV/AIDS)
- Mental or physical impairment leading to inability to exercise adequately
- Hypertension

Practical: 02

Aim: To understanding and measuring fitness component
Objective: To develop a thorough understanding and precise measurement techniques for evaluating key fitness components.

Components of Physical Fitness:

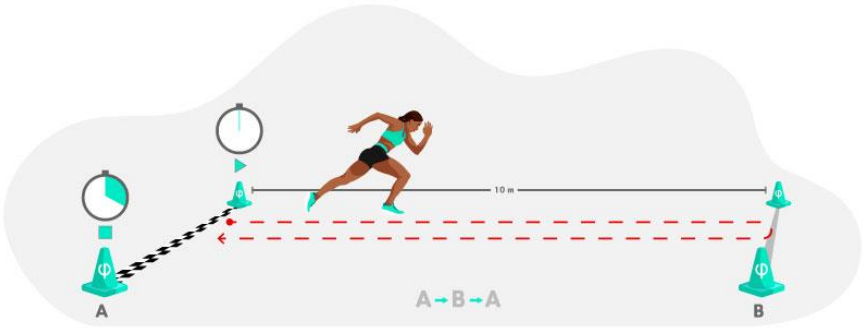
1. Skill-Related Fitness Components

i. **Agility** – It is the ability to rapidly change the direction of whole body in space.

Example:

a. Shuttle Run Exercise

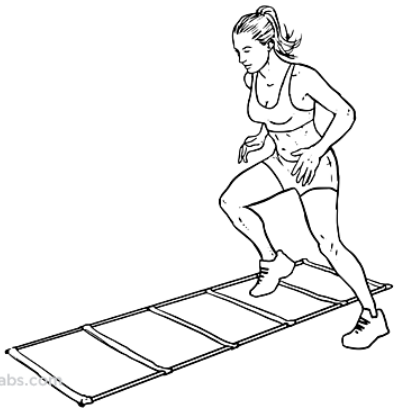
- **Test:** Shuttle Run Test
- **Aim:** To assess the ability to rapidly change the direction of the whole body in space.
- **Equipment:** Measuring tape, marking tape/chalk, stopwatch, two wooden blocks (non-slip surface).
- **Procedure:**
    - Place markers (cones) at a designated distance apart.
    - Start behind the line and sprint to the opposite marker, touch it with your hand, and sprint back to the starting point.
    - Repeat this process within a set time period and record the number of completed runs.
- **Advantage:** Helps build agility and improve ability to change direction quickly.



b. Ladder Drill Exercise

- **Test:** To assess speed, movement coordination and balance of lower body.
- **Equipment:** Mat (non-slip surface), stop watch, 21-foot (approx. 6.4 meters) long sticks or 20 run rope ladder (flat/square shaped). A football field with each yard marked can also be used.

- **Procedure:**
    - Begin at one end of the ladder in a ready stance.
    - Run forward along the ladder, placing a foot in each space without touching the sides.
    - The timing starts when their foot first touches the ground between the first and second stick and ends when they step beyond the last stick.
    - Rest for 2 minutes then repeat the test.
- **Advantage:** Improves fitness including cardiovascular health, coordination, balance, footwork, body control and CNS activation.



ii. Balance - It is the ability to rapidly change the direction of whole body in space.

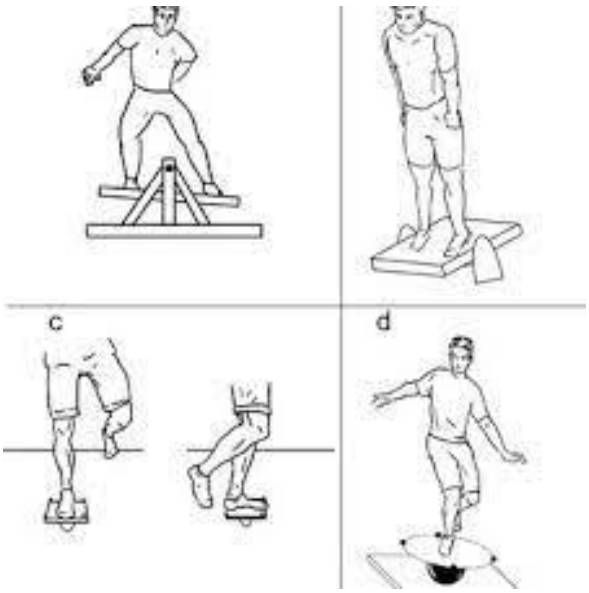
Example: -

a. Stationary (Flamingo Balance Test)

- **Test:** To assess the ability to balance successfully on a single leg.
- **Equipment:** Stopwatch, metallic beam (50 cm long, 5 cm high, 3 cm wide, and non-slip surface)
- **Procedure:**
    - Stand on the beam with one leg, keeping balance using the instructor's hand initially.
    - Raise the free leg with the knee flexed and foot near the buttocks.
    - Start the stopwatch when the hand support is released.
    - Stop the stopwatch each time balance is lost. Count the number of falls in 60 seconds.
    - If there are more than 15 falls in the first 30 secs, the test evaluated and a score of zero is given.
- **Advantage:** Evaluates balance strength; helps in rehabilitation and predicting health.

b. Dynamic Balance (Balance Board Test)

- **Test:** To measure whole body balance.
- **Equipment:** Wooden balance platform (50 x 50 x 15 cm) with a 2 cm wide beam on the underside. Small stoppers are placed on the corners of platform so that board cannot tilt more than 18 degree.
- **Procedure:**
    - Stand on the platform with toes pointed outward (15 degree) and heels 15cm apart.
    - Participants must try to keep platform balanced for a period of 30 seconds.
    - The board must remain level without touching the floor.
    - The timer stops when contacts touch the floor.
    - After one practice trial the best score of three trial is recorded.
- **Advantage:** Improves balance, increased coordination, stronger core, reduces the risk of falls, enhances agility and aids in rehabilitation.



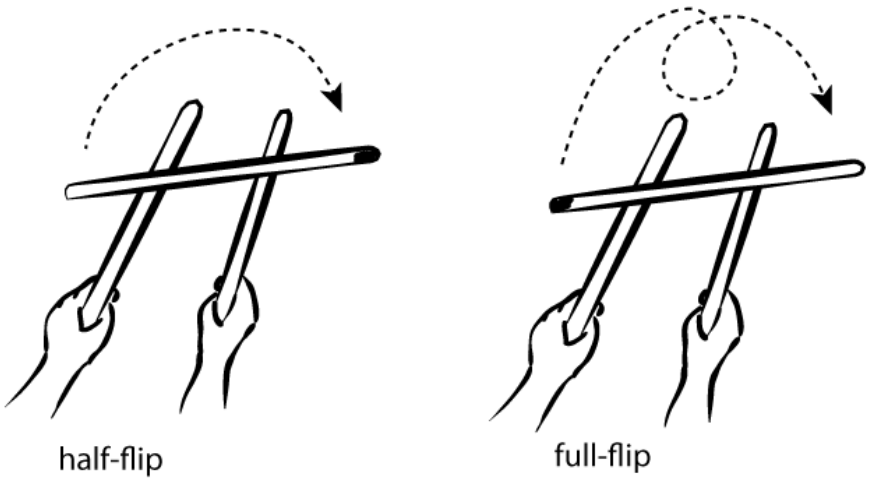
iii. Coordination – It is ability to use sense body parts in order to perform motor task smoothly and accurately.

Examples: -

a. Stick Flip Coordination Test

- **Test:** To measure hand-eye coordination and dexterity.
- **Equipment:** Three sticks per participant, each 60 cm long, 2cm in diameter and with tape or pointed at one end.
- **Procedure:**
    - There are two parts to this test, one with five attempts at a half flip, the other with five attempts at a full flip. Three practice attempts are allowed before each part
    - **Half-Flip:** the subject holds a stick in each hand at waist level so that the sticks are horizontal. The assessor places the third stick across the two hand-held sticks.
    - **Full-Flip:** The starting position is the same as for the half-flip part of the test. In this second part, a full flip is attempted. The stick must go through a full rotation and land balanced across the other two sticks, with the same orientation as the starting position
    - Two points are awarded for each successful attempt.

Advantage: Enhances hand-eye coordination and rapid alternating movements.

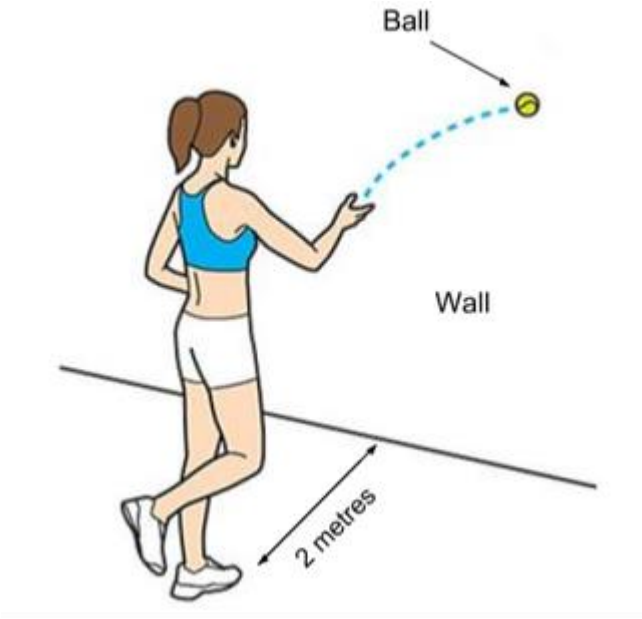


b. Ball Wall Toss Test

- **Test**: To measure hand-eye coordination.
- **Equipment:** Tennis ball or baseball, smooth and solid wall, marking tape, stopwatch (optional).
- **Procedure:**
    - A line is placed on the ground a certain distance from the wall (e.g. 2 meters, 3 feet).

- The person stands behind the line and facing the wall. The ball is thrown from one hand in an underarm action against the wall, and attempted to be caught with the opposite hand.
- The ball is then thrown back against the wall and caught with the initial hand. The test can continue for a nominated number of attempts or for a set time period

- **Advantage:** Simple and effective test for improving coordination, reflexes, and reaction speed.



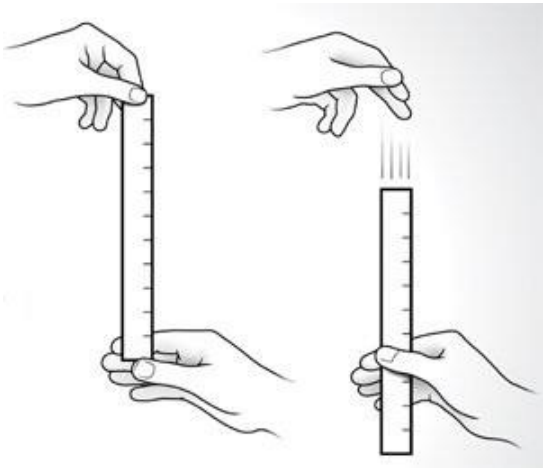
iv. Reaction Time – It is the ability to respond quickly to a stimulus.

Examples: -

a. Ruler Drop Test

- **Test:** To measure reaction time, hand eye quickness and attentiveness.
- **Equipment:** 1-meter-long ruler or Yardstick, calculator.
- **Procedure:**
  - The person to be tested stands or sits near the edge of a table, resting their elbow on the table so that their wrist extends over the side.
  - The assessor holds the ruler vertically in the air between the participant's thumb and index finger, but not touching.
  - Align the zero mark on the ruler with the participant's fingers. The participant should indicate when they are ready.
  - Then, without prior warning, the assessor releases the ruler and lets it drop - the subject must catch it as quickly as possible as soon as they see it fall.
  - Record in centimetres the distance the ruler fell (the level the participant grabs the ruler). Repeat this procedure several times (e.g. 10 times) and take the average score.

- **Advantage:** Quick and easy to test with minimal equipment.



b. Batak Reaction Test

- **Test:** To assess visual reaction, processing speed and react to visual information quickly.
- **Equipment required:** BATAK light board
- **Procedure:**
    - Participants stand comfortably in front of the BATAK board. Light buttons are lit randomly, and the subject must strike out as many as possible in the allocated time (30 or 60 seconds).
    - As soon as one target is struck the next target lights up. Plenty of practice is very important, as performance can increase rapidly in the first few attempts

- **Advantage:** Enhances reaction time, concentration, and coordination.

v. Speed - It is the amount of time; it enables body to perform a specific task.

Examples: -

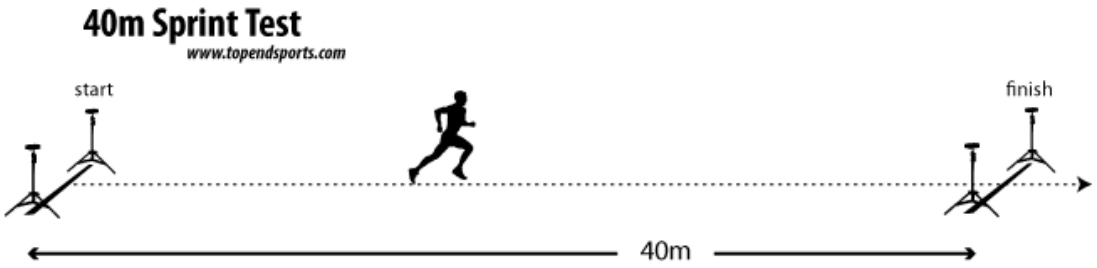
a. Sprint Test

- **Test:** To determine acceleration, sprinting speed, and speed endurance.
- **Equipment:** Measuring tape, cones, stopwatch/timing gates.

- **Procedure:**

- The test involves running a single maximum sprint over a set distance, with time recorded. After a standardized warm-up, the test is conducted over a certain distance, such as 10, 20, or 40 meters or yards, depending on the sport and what is being measured.
- The starting position should be standardized — starting from a stationary stance with one foot behind the starting line and no rocking movement. The test measures the time taken to run each split distance during the same run. From this, acceleration and peak velocity can also be determined.

- **Advantage:** Provides valuable data on speed, acceleration, and peak velocity.



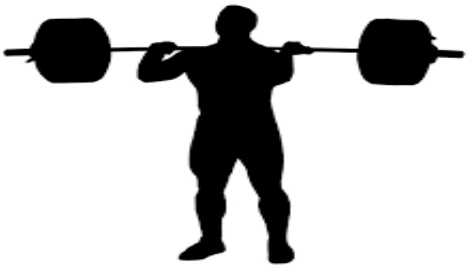
vi. Power – It is the ability to use strength at speed or to overcome resistance as quickly as possible.

Example-

a) Power Clean Repetition Max Test

- **Test:** To measure body's maximum power.
- **Equipment:** Barbell and appropriate weights.
- **Procedure:**
    - After an adequate warm-up, the subject stands at the bar with feet shoulder-width apart. Bend down and grasp the bar with hands outside the knees, palms facing the body.
    - Ensure the head and neck are in a neutral position with eyes facing forward. Lift the weight from the floor by extending the legs, keeping the arms straight. Once the weight is at thigh level, the knees are flexed and the torso is dropped below the bar, catching the weight in front of the shoulders.
    - The weight is then pushed up to finish in a standing position.

- **Advantage**: Measures strength and power output.



b) Kneeling Power Ball Overhead Throw

a) **Test:** Measures explosive power, body coordination, and injury prevention.
b) **Equipment:** 2-3 kg medicine ball, measuring tape, mat.
c) Procedure:

- The athlete starts by kneeling with the back erect, facing the direction they are going to throw.
- The thighs should be parallel and the knees positioned at the start line. Begin with the ball gripped in both hands at the sides and held out in front of the body.
- The ball is brought back over the head, then in one continuous motion, it is pushed forward and upward.
- Several practice attempts may be required to achieve the best maximum distance.
- The athlete is permitted to fall forward over the line after releasing the ball. The knees should not leave the ground, and the toes must not be used to gain extra traction.

d) **Advantage:** Measures upper body strength and explosive power.

2. Health-Related Fitness Components

i. **Body Composition:** It describes the relative portion of bone, muscles and mass in human body.
Body composition can be measured using test such as:
a) **Body Mass Index (BMI) :** It is an amount of lean body mass (bone, muscles, organ, body fluids
BMI = weight (kg) / height (m)^2

Equipment: Weighing scale, measuring tape, calculator.
Procedure: Use kilogram for weight and meters for height to determine unit. Multiply height by itself then divide weight by result of step 2.
Advantage: Simple method to estimate body fat based on height and weight.

BMI	Nutritional status
Below 18.5	Underweight
18.5–24.9	Normal weight
25.0–29.9	Pre-obesity
30.0–34.9	Obesity class I
35.0–39.9	Obesity class II
Above 40	Obesity class III

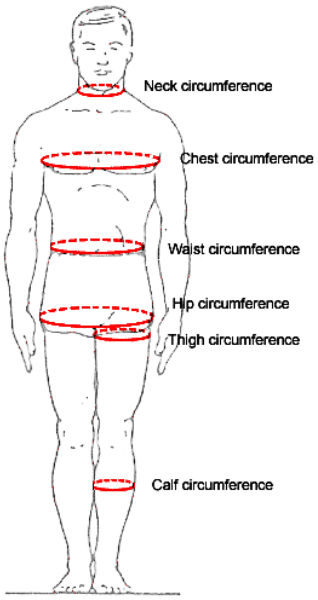
b) Body Circumference Measurement:

It is a measured of width of a specific body part, often taken with a tape measure. It can be used in determining body size and composition.

Equipment: Flexible metal tape measure and pen for marking. Myotape is useful for self-assessment.

Procedure: First mark sites to be measured. When recording, you need to make sure the tape is not too tight or too loose is lying flat on skin and is horizontal.

Advantages: Circumference measuring helps in assessing health risk such as DM2, certain cancers and to figure out fat stored around body.



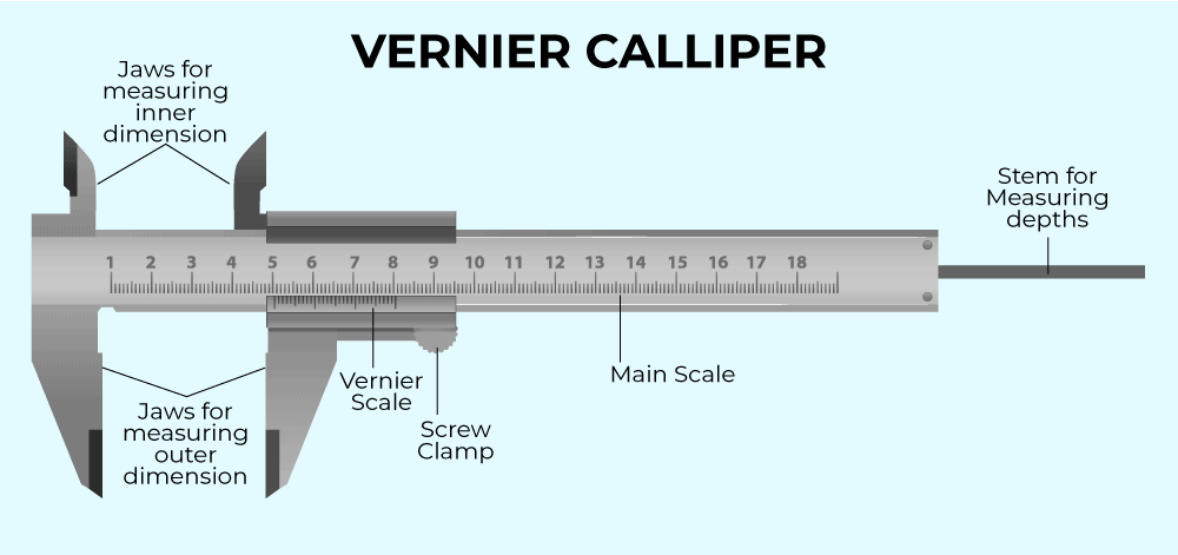
c) Skinfold Measurement

It is used to estimate body fat composition. It estimate body fat level by measuring of skin fold thickness.

Equipment: Skinfold caliper, tape, marker, pen, recording sheet.

Procedure: skin fold measurement can use from 3 to 9 different standard anatomical sites around body. The tester pinches the skin at appropriate site to raise a double layer of skin and underlying adipose tissue but not muscles. The calipers are then applied 1 cm below and at right angle to pinch and a reading in mm taken two seconds later. The mean of two measurements should be taken.

Advantage: Estimates fat distribution and nutritional status.



2. Cardiovascular Health- Cardiovascular endurance or aerobic fitness refers to your body's ability to efficiently and effectively intake oxygen and deliver it to your body's tissues through the heart, lungs, arteries, vessels, and veins.

Examples:

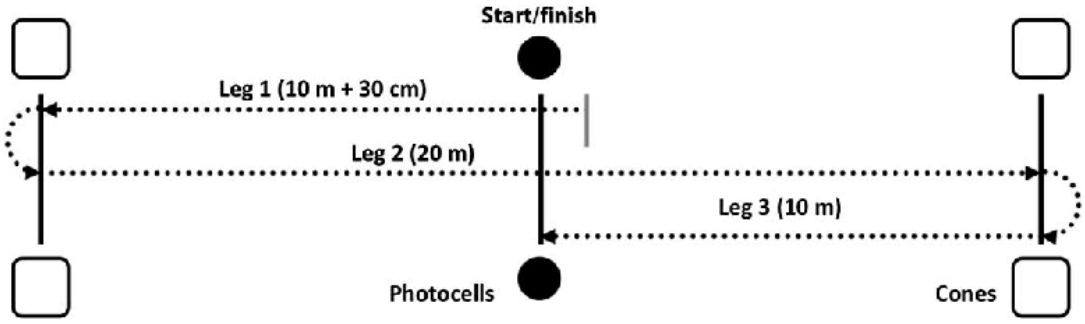
a) Interval Shuttle Run Test

Test: To assess the ability to recover and repeat intermittent activity

Equipment: clear flat area for conducting the test at least 20m long, audio recording of test, marker cones.

Procedure: The test involves 30 seconds of running alternated with 15 seconds of walking. Participants start behind one of the end lines. They begin to run on the first "beep", pacing their effort to arrive at the opposite end at the next "beep". This continues until there is a double beep, indicating the end of the 30 second period, and which point they stop running. This will not necessarily be at either end line. They then walk forwards to the next line, waiting for the start of the next level in 15 seconds. The running speed starts at 10 km/hr, and increases by 1 km/hr every 90 seconds. Once the running speed has reached 13km/hr, the increase in speed is 0.5km/hr. The test ends when the athlete fails to make it into the tolerance zone twice.

Advantage: This test is more relevant to intermittent sports rather than the commonly used beep test.



b) Rockport Walk Test

Equipment required: stopwatch, smooth and level marked 1 mile track, paper and pencil, heart rate monitor (optional), bodyweight scales.

Procedure: The purpose of this test is to walk as fast as possible for 1 mile. After you have completed the mile, immediately take your pulse rate. If you do not have a heart rate monitor, you can manually count the number of beats for 10 seconds, and then multiply that by 6 to get your minute heart rate. Note the time it took to complete the mile. You will also need to know your body weight for the VO_{2max} calculation.

Advantages: minimal equipment and costs are required, and the test can be self-administered.

3. Muscular Strength: Muscular strength refers to the ability of a muscle or muscle group to exert force against resistance

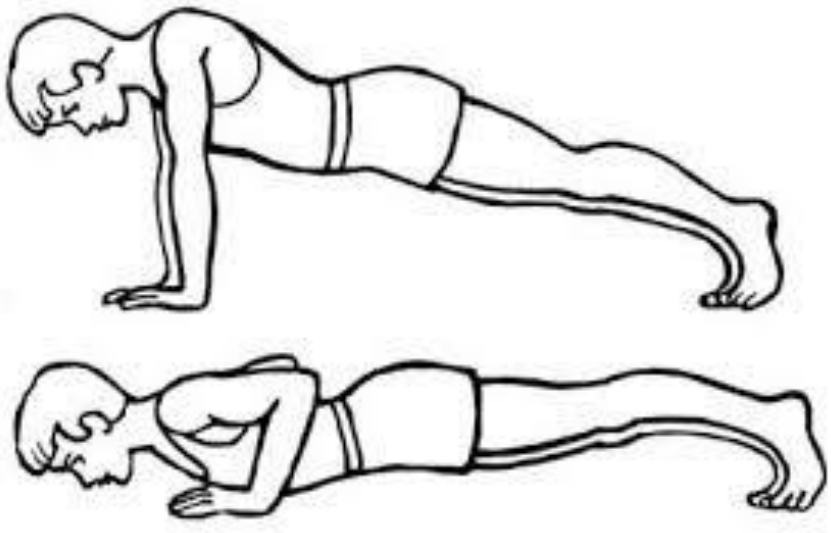
Examples:

A) **Push-Up Test:** The push-up fitness test (also called the press-up test) measures upper body strength and endurance.

Equipment required: Depending on which protocol you use, you will need a floor mat, metronome (or audio tape, clapping, drums), stopwatch, wall, and chair.

Procedure: A standard push-up begins with the hands and toes touching the floor, the body and legs in a straight line, feet slightly apart, the arms at shoulder-width apart, extended and at a right angle to the body. Keeping the back and knees straight, the subject lowers the body to a predetermined point, to touch the ground or some other object, or until there is a 90-degree angle at the elbows, then returns back to the starting position with the arms extended. This action is repeated without rest, and the test continues until exhaustion, or until they can do no more in rhythm or have reached the target number of push-ups. See push-up videos for some examples of push-up fitness tests

Advantages: this test is easy and quick to perform, usually requiring minimal or inexpensive equipment. Many participants can be tested at once.



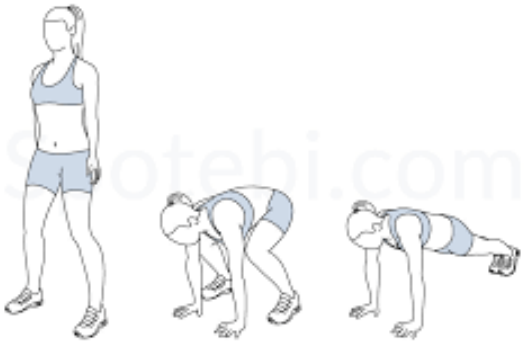
b) Squat Thrust Test:

Test: Measures lower body strength and muscular endurance.

Procedure:

- Start in standing position, perform a squat and plank, and return to standing.

Advantage: Builds leg strength and cardiovascular health.



4. Muscular Endurance: Muscular endurance is the ability of a muscle or group of muscles to repeatedly exert force against resistance for an extended period

Examples:

a) 1000m Run or Walk Test:

Test: Measures muscular endurance.

Procedure: Cover 1000 meters in the shortest time possible.

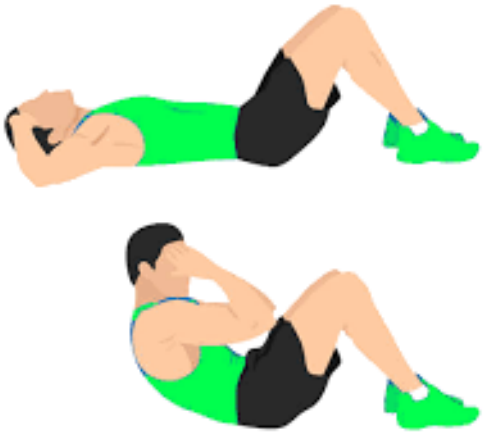
Advantage: Reliable test to assess lower body endurance.

b) Sit-Up Test

Test: Measures abdominal muscular endurance.

Procedure: Perform as many sit-ups as possible in a given time.

Advantage: Improves core strength and posture.



4. **Flexibility:** Flexibility is the ability of a joint or series of joints to move through an unrestricted, pain free range of motion

Examples:

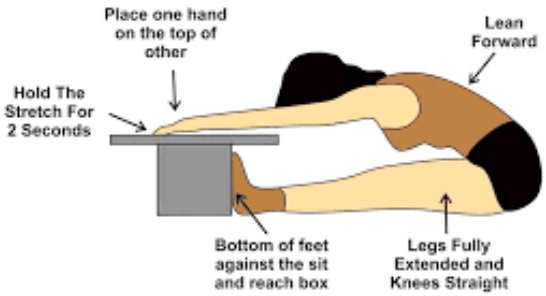
Sit and Reach Test

Test: Measures flexibility of the lower back and hamstrings.

Equipment: Sit-and-reach box, mat.

Procedure: Sit with legs extended, feet against the box, and reach forward as far as possible with both hands.

Advantage: Simple and effective test for flexibility assessment.



PRACTICAL – 3

Aim: To design PIVD rehabilitation protocol for sports athletes.

Objectives: To design a comprehensive rehabilitation protocol for Sports athletes with PIVD, aimed at reducing pain, restoring function, enhancing mobility and preventing re-injury while optimizing athletic performance.

PIVD - Stands ds for Prolapsed Intervertebral disc, a condition that occurs when the soft centre of spinal disc bulges or ruptures through its outer layer. This can happen in any disc in the spine, but it's most common in neck (cervical) or lower back (lumbar).

Rehabilitation Protocol for sports athletes with PIVA-

1. Phase 1 - Acute phase (0-2 weeks).

Goals-

- Reduce pain and inflammation.
- Promote relaxation and reduce muscles spasm
- Maintain range of motion.
- Patient Education and Prevention.

Rehabilitation Program -

Pain management

- Use of ice – 10 – 15 min, 3 times a day.

To manage pain and inflammation.

- Complete bed rest and relaxation.
- Gentle mobilization - Perform gentle mobilization exercise to maintain range of motion.

Manual therapy Gentle traction to relieve nerve compression.

Modalities -

- Ultrasound 10-15 minutes, 2-3 times a week...
- Electrical stimulation 10-15 minutes, 2-3 times a week.
- IfT 10-20 minutes, 2-3 times a week...

Soft tissue manipulation to paraspinal muscles.

Exercises-

i. **Pelvic tilts -** lie on your back with your knees bent and feet flat on floor Tilt your pelvis upward and then back down again, repeating the motion for 10 reps., (3 sets of 10 reps.), 2-3 times a week.

ii. **Knee to chest stretches -** Lie on your back and bring one knee toward your chest. Hold for 10 seconds and then releases, repeating on other side and vice versa (3 sets of 10 reps).

iii. **Cabra pose** - lie on your stomach with hands under Shoulder, fingers spread wide, keep shoulder down and away from ears, gaze forward and slightly upward. Hold for 3-5 breaths, (3sets of 10 reps.) in a day.

iv. **Piriformis stretching -** lie on your back with affected leg Crossed over other deg. Place your hand on knee of crossed leg and pull it toward your opposite shoulder. Hold for 30 seconds and repeat 3-4 times.

Patient Education and Prevention

- Avoid Long duration of walking
- Avoid prolong sitting work.
- Use of western restrooms.
- Avoid lifting heavy weights.
- Take a regular break

2. Phase 2 Sub-Acute Phase (2-6 weeks)

Goals

- Progressively increase range of motion.
- Improve flexibility and me and mobility.
- Strengthen come and gluteal muscles.

Rehabilitation Program -

1. Progressive mobilization - Gradually increase the intensity of mobilization exercises.

II. Modalities

- Ultrasound 10-15 minutes. 1-2 times a week.
- Electrical stimulation 10-15 minutes 1-2 times a week.
- IFT 10-20 minutes 1-2 times a week.
- Soft tissue manipulation to paraspinal muscles.

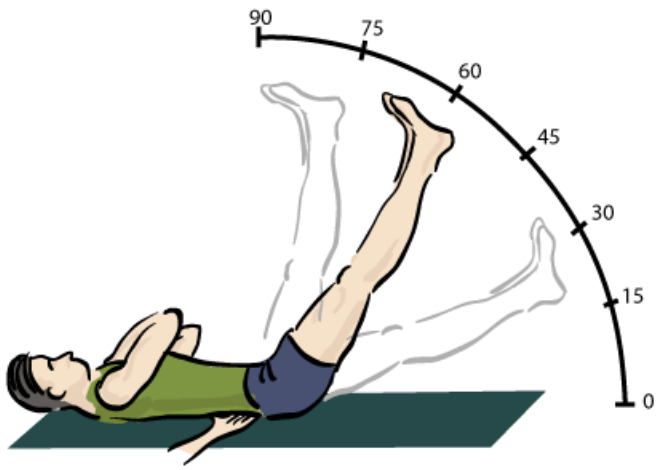
III. Introduce isometrics for back muscles -

Patient in supine put pillow under his back, knee in 30° flexion now patient will push the pillow in downward direction from his back, hold for 10 seconds, 3 reps. a day.

Exercises:

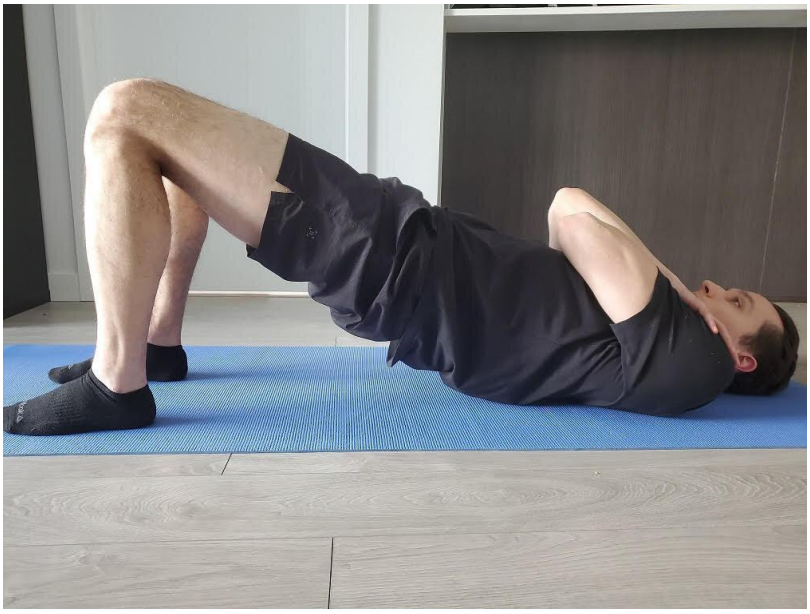
Follow up exercise of acute phase with increase in frequency and intensity of exercises with addition of following –

Straight leg raise - Lie on your back with your arm extended overhead. Lift one leg towards the ceiling, keep it straight and hold it for 10 Seconds before lowering it, 3 sets of 10 reps. 2 times a day.



Planks - Start in a push-up position with your hand Shoulder width apart. Engage your core hold the position for 20-30 seconds 3 sets, 2 times a day.

Bridging - Lie on your back with your knees bent and feet flat on floor lift your hips toward ceiling, squeezing your gluteus and holding of 10 second for holding for 10 seconds. 3 sets of 10 reps. 2 times a day.



Hamstring stretches - Sit on floor with your leg straight in front on you. Lean forward and reach for your toes, holding it for 10 seconds, 3 sets of 10 reps.

Phase 3 - Strengthening Phase / Chronic phase (6-12 weeks).

Goals –

Progressively increase strength and power.

Restore Range of motion.

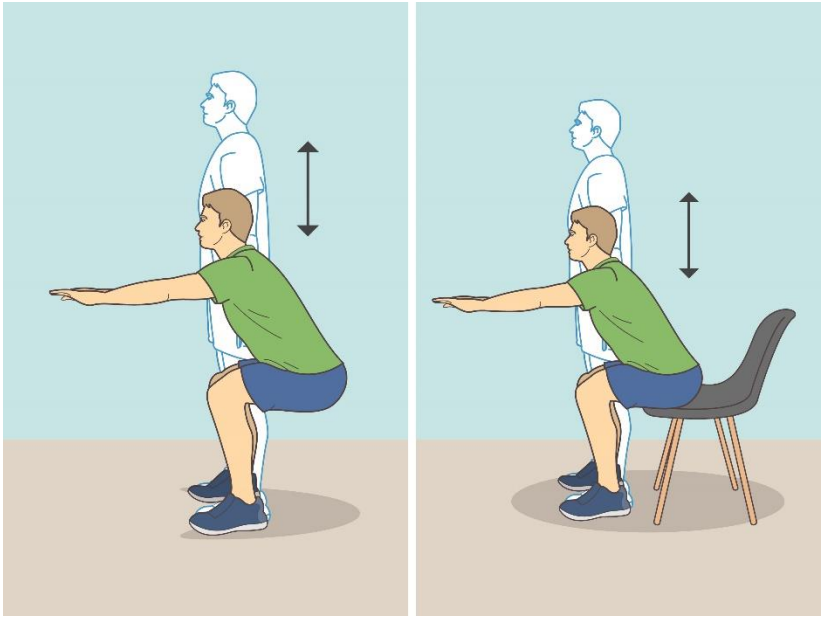
Here is the text written on the page:

Enhance endurance and stability to support the spine.
Improve functional movement patterns.

Rehabilitation Program –

1. **Progressive strengthening** – Continue to progress the exercises of subacute phases including acute phase with increased frequency and intensity.
2. **Functional exercises** – Introduce functional exercises that mimic sports-specific movements.
3. **Plyometric exercises** – Incorporate plyometric exercises to improve power and explosiveness.
4. **Soft tissue manipulation** to paraspinal muscles to relax muscles.

Exercises:
a. Squats – Stand with your feet shoulder-width apart. Lower your body in downward direction into a squat, keeping your back straight and knee behind your toes. Push back up to the starting position. (3 sets of 10 reps)



b. Lunges – Stand with your feet together. Take a large step forward with one foot and lower your body down into a lunge, keeping your front knee behind your toes and your back knee almost touching the ground. Push back up to starting position. (3 sets of 10 reps)

c. Leg press – Sit in a leg press machine with your feet shoulder-width apart on platform. Push the platform.

Away from you extending knee. Lower platform back down in starting position. (3 sets of 10 reps)

d. Step ups – Stand in front of a step or platform. Step up onto the platform with one foot and then bring the other foot to meet it. Step back down to starting position. (3 sets of 10 reps)

e. Box jumps – Stand in front of a box or platform. Jump up onto the box and then step down to starting position. (3 sets of 10 reps)

5. **Phase 4 – Return to sports phase (3 – 6 months)**

   Goals:
   i. Gradually return to sports-specific training
   ii. Enhance sports-specific skills
   iii. Improve performance

Rehabilitation Program –

1. **Sports specific training** – Gradually introduce sports-specific training drills.
2. **High quantity-level of agility drill** – Progress to high level agility drill that mimic game-like situation.
3. **Plyometric exercise with resistance** – Incorporate plyometric exercise with resistance to improve power and explosiveness.

Return to Competition
gradually return the athlete to competition. Start with low-intensity games or practice sessions.

Exercises:
a. Sports-Specific Drills
Perform drills specific to the athlete's sport, such as sprinting, cutting, and jumping.

b. High-Level Agility Ladder Drills
Perform advanced agility ladder drills such as the Ice key shuffle or carioca drill.

c. Plyometric with Resistance
Perform plyometric exercises with resistance, such as box jumps with weights or resistance band training.

d. Weightlifting
Perform weightlifting exercises under supervision.

e. Aerobic Conditioning
Include aerobic conditioning exercises like swimming or cycling.

Patient Education:

- Emphasize lifelong core strengthening and flexibility exercises.
- Teach proper body mechanics for lifting, bending, and twisting.

Precautions throughout the Program:

1. Avoid exercises that increase lumbar spine compression or exacerbate symptoms.

Monitor for signs of neurological worsening (e.g. increase pain, numbness or weakness)

iii. Ensure gradual progression to avoid re-injury.

iv. Additional Interventions (if needed):

- **Hydrotherapy** – Beneficial for low-impact strengthening.
- **Psychosocial Support** – Important for chronic cases where pain affects mental health.

PRACTICAL – 4

Aim: To design ACL rehabilitation protocol for sports athletes

Objective: To design and implement a comprehensive ACL rehabilitation protocol that includes gradual to progressive range of motion, strengthening, endurance, stability exercises, and sports-specific drills for return to play. It also includes a long-term maintenance plan focused on injury prevention.

ACL:
The Anterior Cruciate Ligament (ACL) begins from the anterior part of the intercondylar area of the tibia. It runs upward, backward, and laterally, and attaches to the posterior part of the medial surface of the lateral condyle of the femur.
It becomes taut during knee extension.

Rehabilitation Protocol for Sports Athletes with ACL Injury

Phase 1: Acute Phase (0–2 weeks)

Goals:

1. Reduce swelling and minimize pain
2. Protect the site
3. Restore patellar mobility
4. Restore full extension and quadriceps control
5. Patient education

Interventions:

- Swelling management
- Ice, compression, and elevation: 10–15 minutes each, twice a day
- Retrograde massage: Massage using fingertips in an upward motion upward direction. Massage for 5–15 minutes.
- Ankle Pumps: Perform continuous ankle dorsiflexion and plantarflexion for 5–10 minutes, twice daily to improve blood flow.

II. Range of Motion / Mobility

- Patellar Mobilization – Superior/Inferior and Medial/Lateral
- Seated Assisted Knee Flexion and Extension
- Heel Slides using Towel
- Low-Intensity, Long-Duration Extension Stretches: Prone Hang
- Standing Gastrocnemius Stretch and Soleus Stretch
- Supine Passive Hamstring Stretch

III. Strengthening

- **Calf Raises**
- **Quad Sets** – Hold for 5 seconds, 10 reps, 3 sets

- **NMES (High-Intensity Neuromuscular Electrical Stimulation)** 2500 Hz, 75 bursts Supine position with extended knee, 10 sec contraction × 10 reps, 2× per week during sessions
- **Hip Abduction** – Active-assisted, 10 reps, twice daily
- **Multi-Angle Isometrics** – At 90° and 60° of knee extension
- Keep the knee straight and elevated when sitting or lying down.
- Do not rest with a towel placed under the knees.
- Do not actively kick the knee out straight while sitting or lying.
- Do not pivot the knee.

Phase II (3–5 weeks)

Goals

1. Improve range of motion and mobility
2. Gentle stretching
3. Strengthening with progression
4. Balance and proprioception

Interventions

- **Continue with Phase I interventions**

II. Range of Motion / Mobility

- **Stationary Bicycle** – Gentle movement of the knee without resistance
- **Active Assisted Knee Flexion and Extension**

III. Stretching

- **Gentle Stretching for All Muscle Groups**
    - **Prone Quad Stretch** – Bend the knee and pull the foot toward the buttock. Hold for 30 seconds and release.
    - **Standing Quad Stretch** – Bend the knee, grab the front of the foot, and pull toward the buttock. Hold for 15–30 seconds.
    - **Kneeling Hip Flexor Stretch** – Kneel on one leg with the other leg bent in front and foot flat on the floor. Slowly push the hip forward and hold the stretch for 15–30 seconds. Repeat 2–4 times.

IV. Strengthening

- **Step-Ups** – Step up with the right foot, pressing through the heel to straighten the right leg. Bring the left foot to meet the right foot on the step, bend the right knee, and step back down with the left foot.

- **Partial Squat Exercises** – Bend knees up to 30°–45° while pushing buttocks out. Ascend until hips and knees are fully extended.
  Repeat: 10 times, 2 times a day.
- **Wall Slides and Mini Squats (0°–60°)** – Stand upright with back against a wall and feet shoulder-width apart. Slowly bend knees up to 45°, keeping elbows straight. Hold

for 5 seconds, then slide back up.
Repeat: for 5 reps.

VI. Balance & Proprioception

- **Single Leg Standing Balance** – (Knees slightly flexed), begin with static balance and progress to dynamic and level progression.
- **Lateral Step-Overs** – Step sideways onto a step and balance on that leg as the other foot lifts off the floor.
- **Joint Position Re-training** – Perform proprioceptive exercises to improve joint position sense in the knee and reduce the risk of injury.
- **Straight Leg Raises** – Lift leg up and hold for 6 seconds.
  Repeat: 10–20 times.
- **Balance Board Exercises** – Balance on the affected leg for 1 minute.

Phase III (6–12 weeks): Strengthening and Early Return to Activity

Goals:

1. Achieve nearly full range of motion (0°–135° of flexion)
2. Restore muscle strength
3. Improve knee stability and proprioception
4. Enhance functional movements
5. light sport-specific drills

PRACTICAL - 5

Aim: Sports injury assessment protocol

Objective: The primary aim of sports injury assessment is to ensure the athlete's safety, provide an accurate diagnosis, and develop an effective management plan.

TOTAPS

- **T** → Talk
- **O** → Observe
- **T** → Touch
- **A** → Active movements
- **P** → Passive movements
- **S** → Skilled test

1. Talk

Objective:
Gather a detailed history of the injury and symptoms.

Questions:

- What happened? (Mechanism of injury)
- Where does it hurt? (Location of pain)
- How severe is the pain? (Pain scale 1–10)
- Is there any numbness, tingling, or weakness?
- Have you had this type of injury before?

Purpose:
To understand the nature and severity of the injury.

2. Observe

Objective:
Visually inspect the injured area and assess the athlete's overall condition.

Assess:

- Swelling, bruising, deformity, discoloration
- Posture, movement, weight-bearing ability
- Compare injured side to uninjured side

Purpose:
To identify visible signs of injury that might indicate severity.

3. Touch

Objective:
Palpate the injured area to locate specific pain points and assess for abnormalities.

Assess:

- Start away from the injury and move toward it to avoid aggravating pain unnecessarily
- Feel for swelling, heat, tenderness, crepitus (crackling) sound

Purpose:
To confirm the location of injury and detect structural damage.

4. Active Movements

Objective:
Assess the athlete's ability to move the injured body part independently.

Steps:

- Ask the athlete to perform movements: bend, rotate, straighten the limb
- Evaluate the range of motion, strength, and pain level during the movement

Purpose:
To determine functional limitation and whether further assessment is safe.

5. Passive Movements

Objective:
Test the range of motion when the injured body part is moved by the therapist.

Steps:

- Gently move the joint or limb through its range of motion without the athlete's effort
- Note any resistance or increased pain during movement

Purpose:
To assess joint integrity, soft tissue involvement, and range of motion.

6. Skilled Test

Objective:
To evaluate the athlete's ability to perform sport-specific movements safely.

Steps:

- Conduct tasks relevant to the athlete's sport (e.g., running, jumping, throwing, kicking)

- Observe for pain, instability, or poor movement patterns

Purpose:
To determine if the athlete can return to play or requires further treatment.