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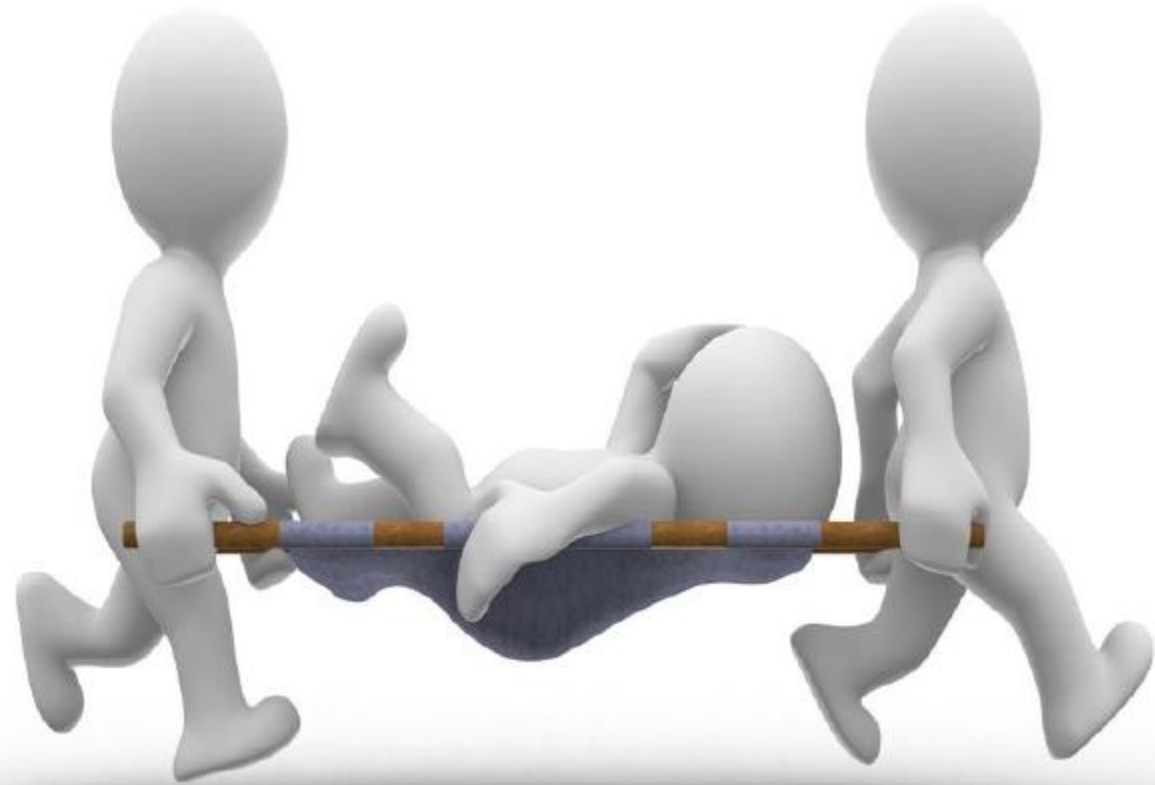


INJURY  
PREVENTION  
AND SCREENING

# INJURY PREVENTION AND SCREENING

- ❑ **Understanding** of musculoskeletal screening and its role in injury prevention.

- ❑ **Identify** the available musculoskeletal screening methods.



# INJURY PREVENTION AND SCREENING

**Injury prevention** is a process whereby the athlete is screened through a variety of tests to identify any potential problems with their musculoskeletal composition.

- Tests including
  1. **Physical activity tests**
  2. **Functional assessment**
  3. **Questionnaires**



# INJURY PREVENTION AND SCREENING

- Plans can be made to reduce the level of risk for injury of the athlete, after screening.





## SCREENING METHODS

### QUESTIONNAIRE

- Health screening questionnaire can be used in injury prevention.
- Research suggested that in conjunction with relevant functional assessments the questionnaire is a useful starting point in the screening process.



### QUESTIONNAIRE

Very often

Often

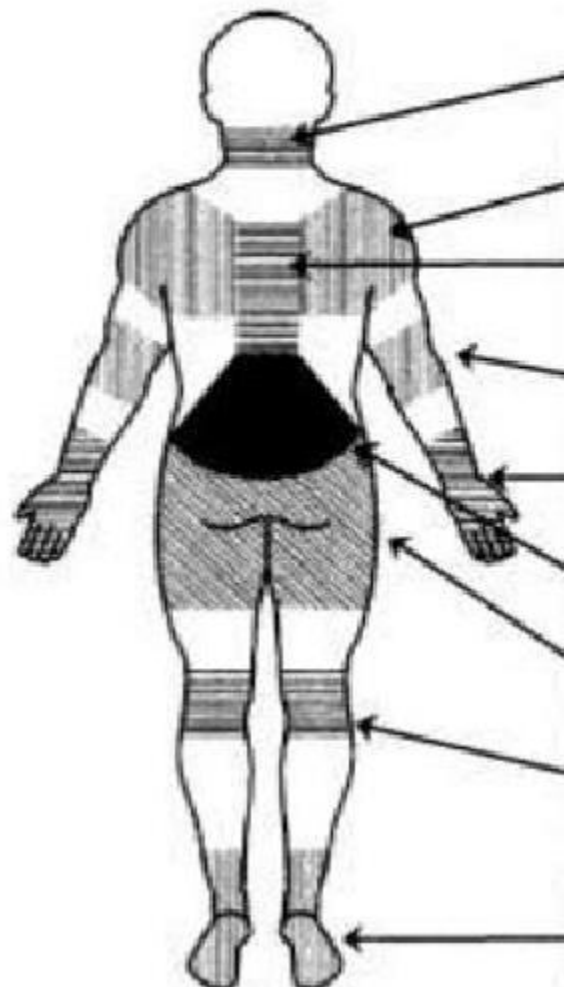
Sometimes

Rarely

# QUESTIONNAIRE

- **Nordic Musculoskeletal Questionnaire (NMQ)**
- **The Orebro Musculoskeletal Pain Screening Questionnaire (OMPSQ)**
- **Gait Arms Legs Spine (GALS) test**
- **Visual Analog Scale (VAS)**





	Have you at any time during the last 12 months had trouble (such as ache, pain, discomfort, numbness) in:	During the last 12 months have you been prevented from carrying out normal activities (e.g. job, housework, hobbies) because of this trouble in:	During the last 12 months have you seen a physician for this condition:	During the last 7 days have you had trouble in:
NECK	<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
SHOULDERS	<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
UPPER BACK	<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
ELBOWS	<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
WRISTS/ HANDS	<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
LOWER BACK	<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
HIPS/ THIGHS	<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
KNEES	<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
ANKLES/ FEET	<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes



## GAIT ARMS LEGS SPINE (GALS) TEST

- A simple Gait Arms Legs Spine (GALS) test can be used **to help identify abnormalities**
- The testing procedure has been found to be 95% accurate at helping to identify musculoskeletal abnormalities.
- GALS does, however, offer different results depending on the condition, with it providing 53% of positive results with acute conditions versus 95% in chronic conditions.





# GAIT ARMS LEGS SPINE (GALS) TEST

## 1. GAIT

- Symmetry & smoothness of movement
- Stride length & mechanics
- Ability to turn normally & quickly

## 2. ARMS (Hands)

- Wrist /finger swelling/deformity
- Squeeze across 2nd to 5th metacarpals for tenderness
- Turn hands over, Inspect muscle wasting & forearm pronation/supination

# GAIT ARMS LEGS SPINE (GALS) TEST

## 3. ARMS (Grip Strength)

- Power grip (tight fist)
- Precision grip (oppose each finger to thumb)

## 4. ARMS (Elbows)

- Full extension

## 5. ARMS (Shoulders)

- Abduction & external rotation of shoulders





- **LEGS (Feet)**

- • Squeeze across metatarsals for tenderness
- (indicates synovitis)
- • Calluses

- **LEGS (Knees)**

- • Knee swelling/deformity, effusion
- • Quadriceps muscle bulk
- • Crepitus during passive knee flexion



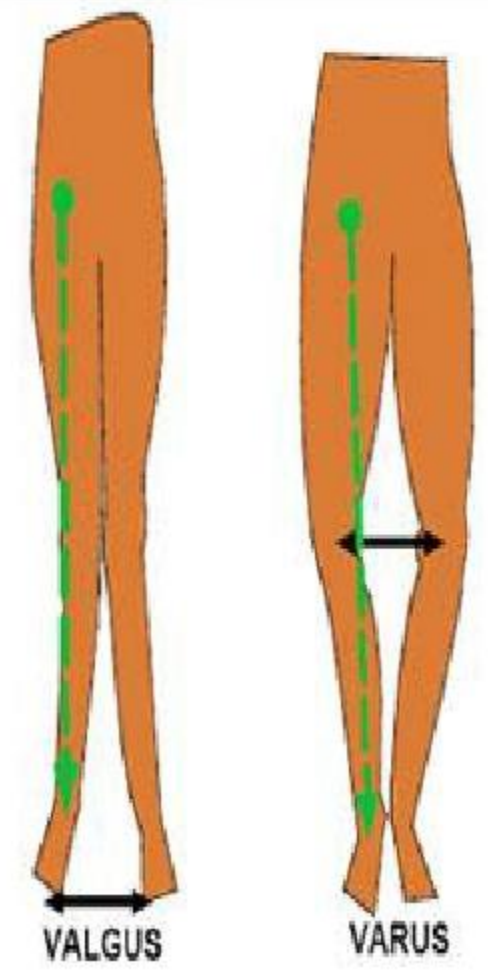


- **LEGS (Hips)**
  - • Check internal rotation of hips
- **SPINE (Inspection from behind)**
  - • Shoulders & iliac crest height symmetry
  - • Scoliosis
  - • Paraspinal, shoulder, buttocks, thighs & calves muscles normal
  - • Popliteal or hind foot swelling or deformity



## SPINE (Inspection from front)

- Quadriceps normal bulk & symmetry
- Swelling or at Varus or valgus deformity at knee
- Ear against shoulder on either side to check lateral cervical spine flexion
- Hands behind head with elbows back (check rotator cuff muscles, acromioclavicular, sternoclavicular & elbow joints)





## **SPINE (Inspection from side)**

- • Normal thoracic & lumbar lordosis
- • Normal cervical kyphosis
- • Normal flexion while touching toes
- **SPINE (Trigger point tenderness)**
- • Supraspinatus muscle tenderness (exaggerated response)

## INJURY PREVENTION AND SCREENING

- ❑ The back and knee are two of the major areas that the screening process needs to assess due to their importance to locomotion and therefore the resultant sporting performance.
- ❑ **Revels model** can be used as screening test for LBP, with no specific conditions.

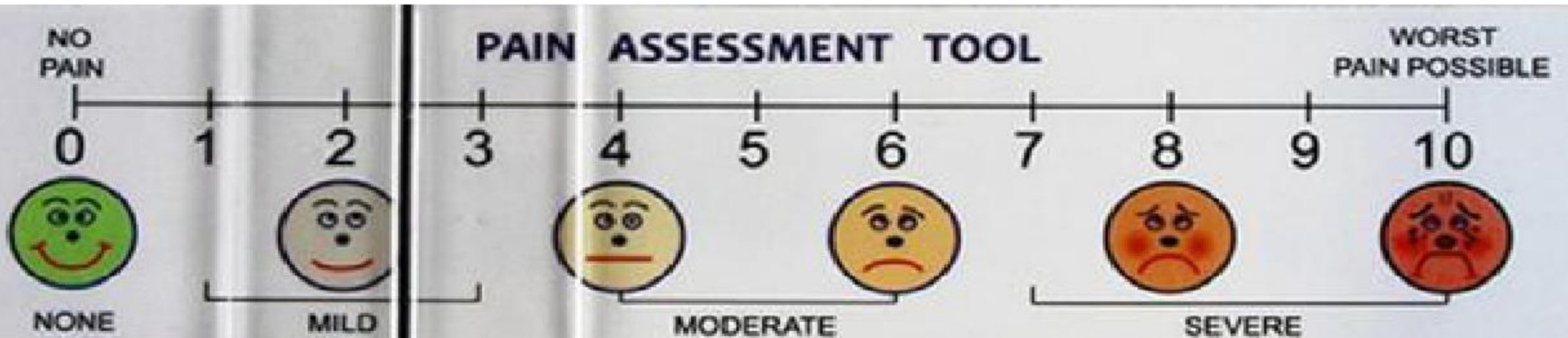


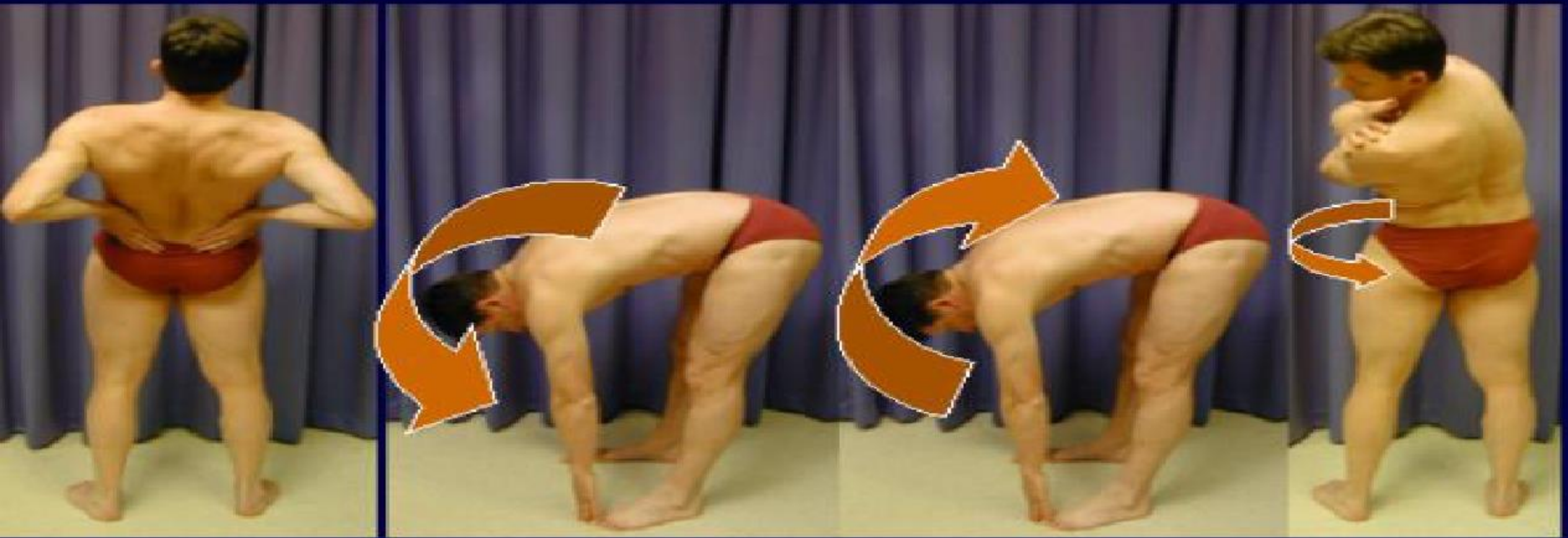


# INJURY PREVENTION AND SCREENING

## REVELS MODEL

- ❑ The Revels testing procedure involves the patient being asked to assess the back pain currently experienced using a VAS, then the highest amount of pain and then the lowest amount of pain experienced.
- ❑ Subjects were then asked to complete the exercises.





The four physical examination components of Revel's criteria for lumbar zygapophysial joint pain:

1. Standing flexion,
2. Returning from standing flexion,
3. Standing extension,
4. The extension rotation test.

## INJURY PREVENTION AND SCREENING

- The **prone four-point hold test** is used to measure the strength of the core muscles by assessing the length of time they can hold a neutral lumbo-pelvic position.



# INJURY PREVENTION AND SCREENING

- The **bridging hold** assesses the gluteal musculature endurance.

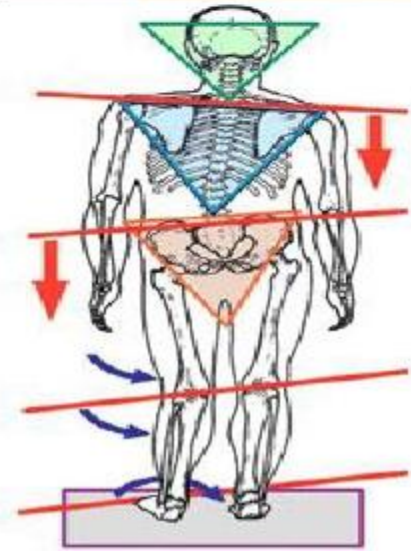


# INJURY PREVENTION AND SCREENING

## INJURY TO THE ANTERIOR CRUCIATE LIGAMENT (ACL)

The major risk factors associated with ACL injuries include lower extremity.

- ❖ Malalignments,
- ❖ Ligamentous Laxity,
- ❖ Lower Extremity Muscular Strength
- ❖ Neuromuscular Control,
- ❖ Hormonal Influences,
- ❖ Intercondylar Notch Width
- ❖ The Biomechanics Of The Athletes' Sporting Techniques





# INJURY PREVENTION AND SCREENING

## INJURY TO THE ANTERIOR CRUCIATE LIGAMENT (ACL)

- The rehabilitator can only improve and modify the strength and neuromuscular control risk factors
  - **How ?**
    - (Bonci, 1999).



# INJURY PREVENTION AND SCREENING

## INJURY TO THE ANTERIOR CRUCIATE LIGAMENT (ACL)

- In order to gain a full assessment of these risks, the athlete's foot pronation, knee recurvatum, tibial torsion and posture need to be measured.

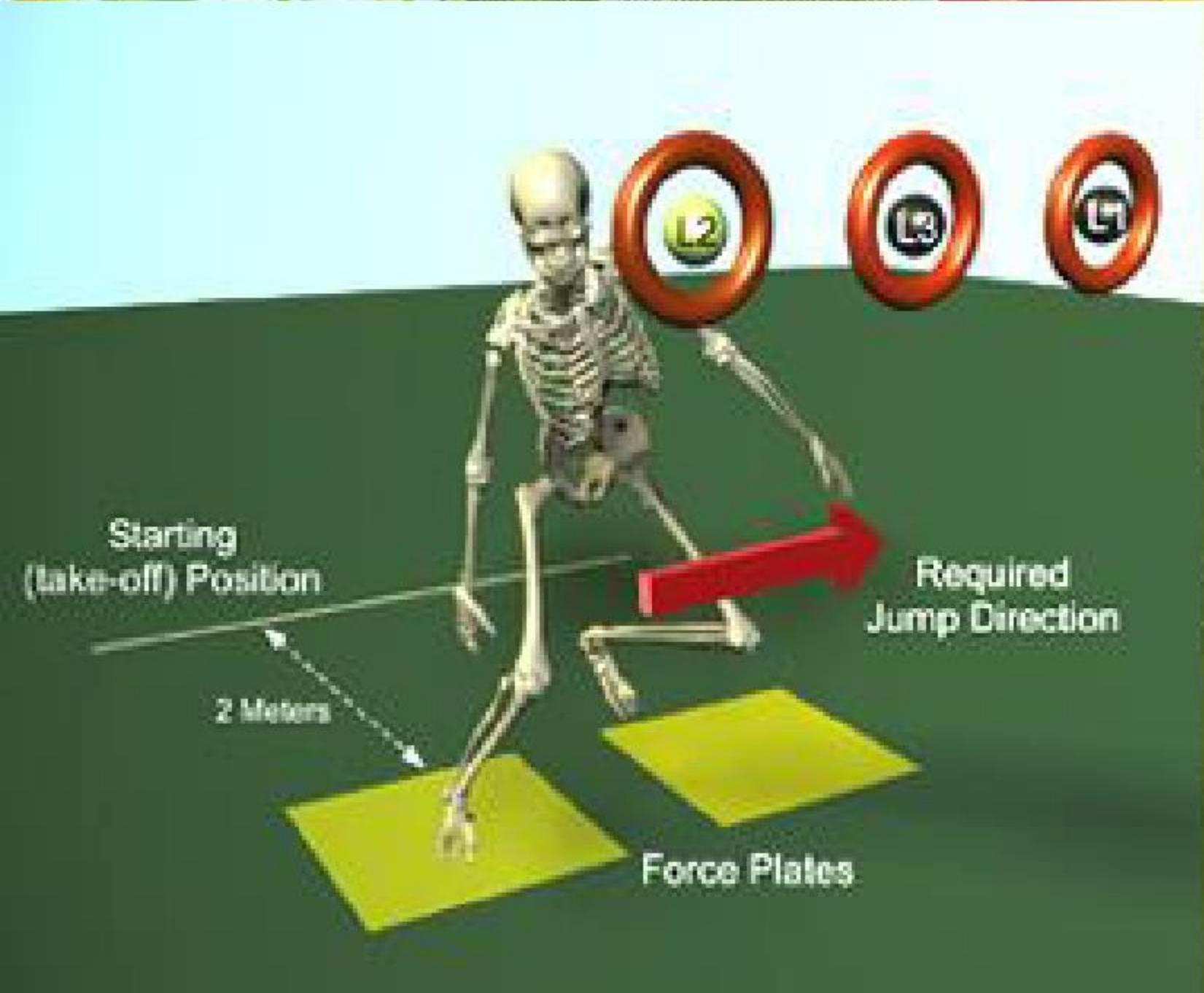
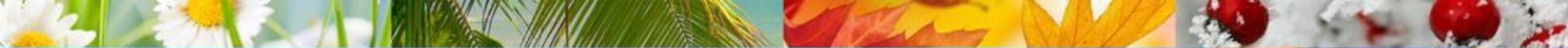


# INJURY PREVENTION AND SCREENING

## INJURY TO THE ANTERIOR CRUCIATE LIGAMENT (ACL)

- Neuromuscular control tests for the lower limb often involve a variety of movements but with common goals: to obtain an objective assessment of function and to challenge dynamic knee stability during landing and deceleration (Bonci 1999).





# INJURY PREVENTION AND SCREENING

## INJURY TO THE ANTERIOR CRUCIATE LIGAMENT (ACL)

A range of tests can be used to achieve these goals, with the;

1. Single leg hop,
2. One-leg vertical jump,
3. Timed hop Test,
4. figure of eight running,
5. Side stepping
6. Stair running  
Shark Skill Test





# INJURY PREVENTION AND SCREENING

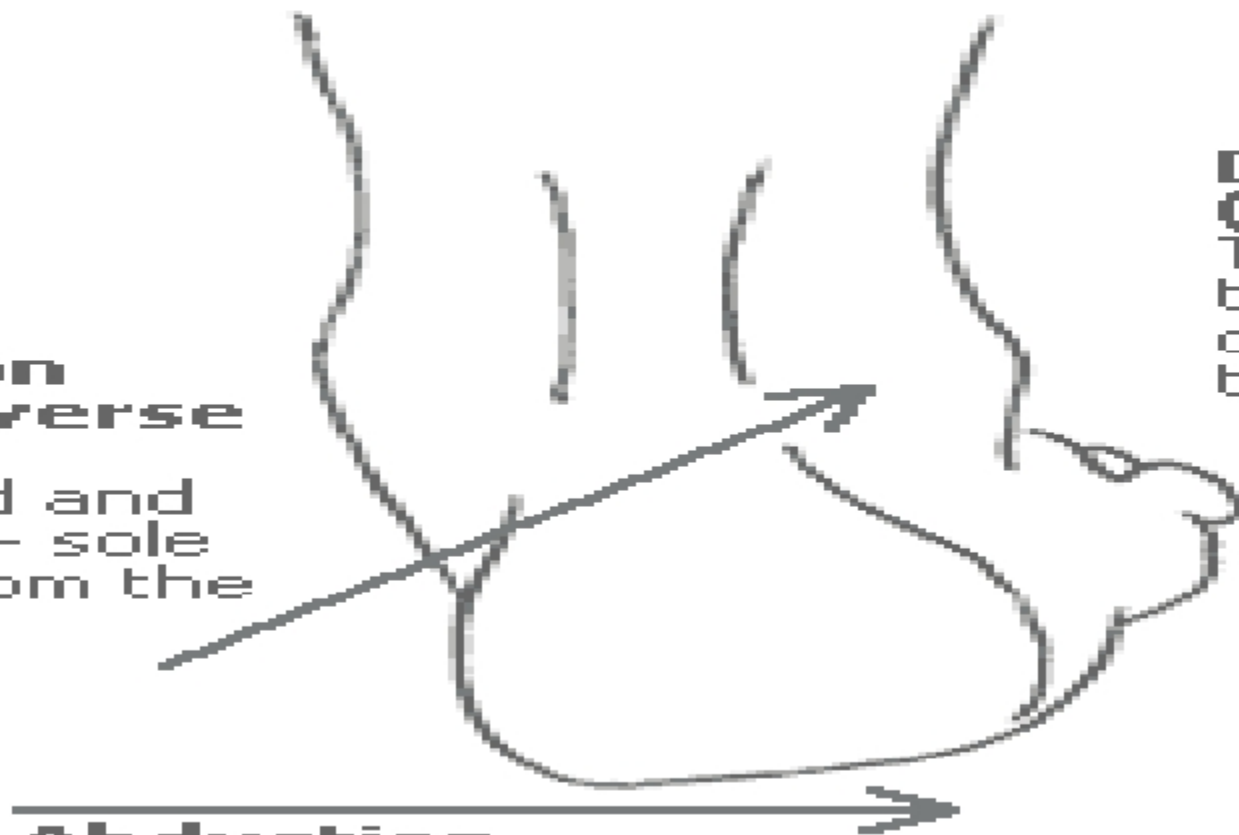
## INJURY TO THE ANTERIOR CRUCIATE LIGAMENT (ACL)

The way the athlete's foot lands during their gait has a large impact on the distribution of the force created. If the level of pronation is too high then one of the body's natural shock absorbers, the heel, will be unable to prevent force from travelling up to the knee.

## Pronation of the Foot

Pronation is made up of simultaneous movement in three directions (planes of motion), as shown below.

**Eversion  
(Transverse  
Plane)**  
Outward and  
upward - sole  
away from the  
body.



**Dorsiflexion  
(Frontal Plane)**  
Toes up - flexing  
the upper, or  
dorsal surface of  
the foot.

**Abduction  
(Sagittal Plane)**  
Away from the body



**Normal pronators**



**Overpronators**



**Supinators**



# Wet Test



# INJURY PREVENTION AND SCREENING

INJURY TO THE ANTERIOR CRUCIATE LIGAMENT (ACL)

NAVICULAR DROP TEST









# INJURY PREVENTION AND SCREENING

## INJURY TO THE ANTERIOR CRUCIATE LIGAMENT (ACL)

### NAVICULAR DROP TEST

- The navicular drop test is commonly used to assess the pronation of the foot, and identifies the difference between the subtalar joint (STJ) in a seated neutral position and a weight bearing position.
- Athletes who have had ACL problems generally have a difference of 13mm when compared to healthy individuals who will have a difference of just 8mm (Bonci 1999).

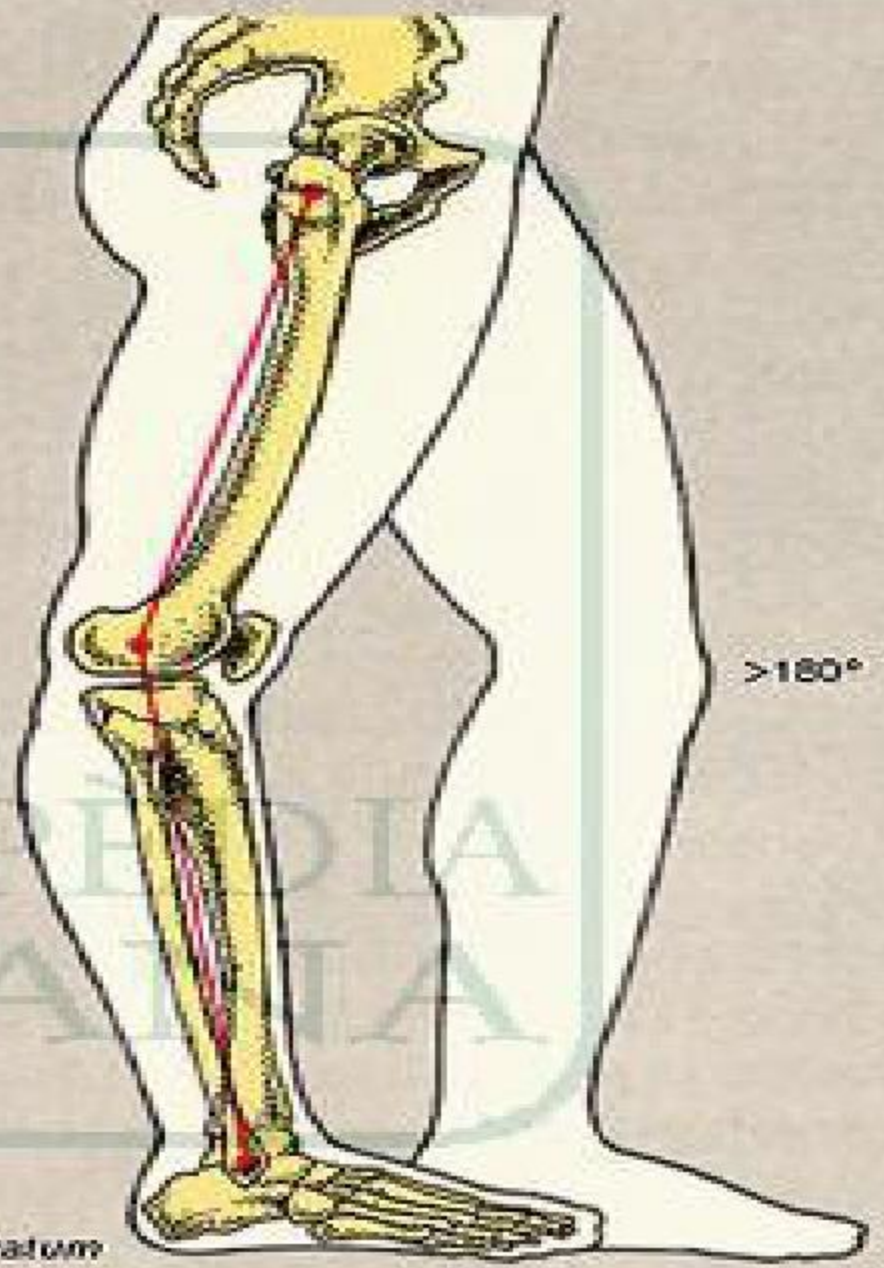
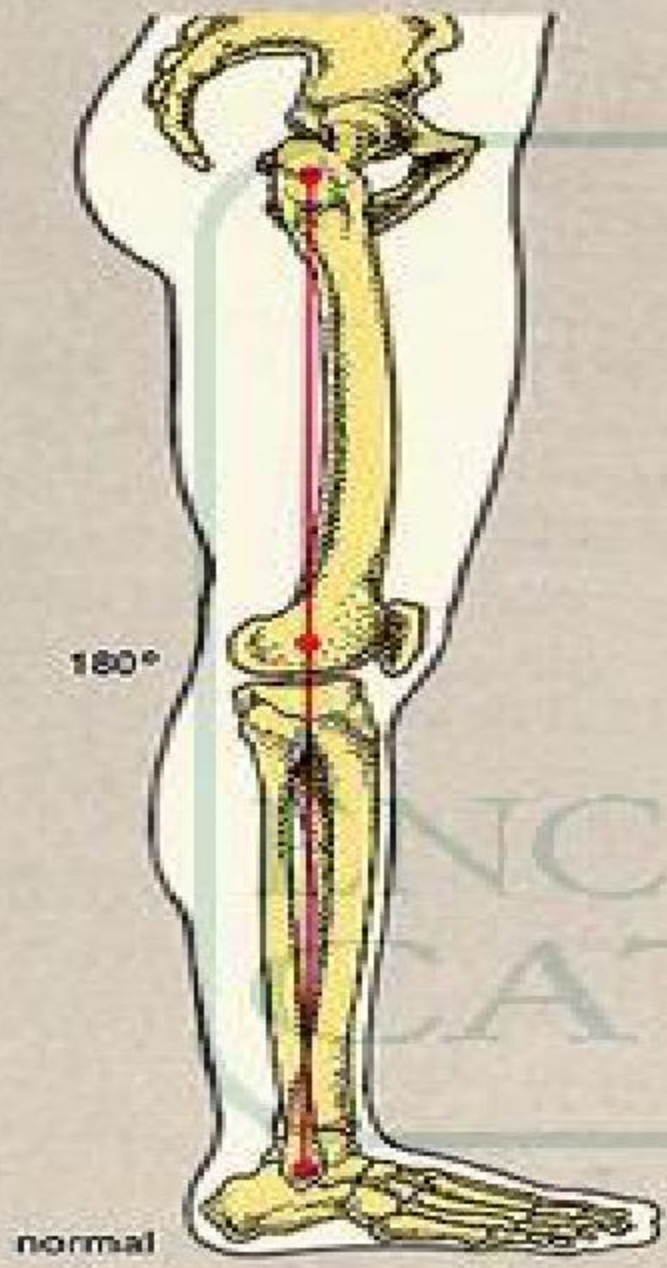


# INJURY PREVENTION AND SCREENING

## INJURY TO THE ANTERIOR CRUCIATE LIGAMENT (ACL)

### GENU RECURVATUM

- Genu recurvatum is also known as knee hyperextension and is normally due to problems in the athlete's skeleton and/or movement pattern abnormalities and proprioception.
- The problem is often increased due to soft tissue laxities, which cause occasional hyperextension of the knee.
- Over the course of the athlete's career the extent and occurrences of the hyperextensions will begin to place extra strain on the ACL.



ENCICLOPÈDIA  
CATALANA





# INJURY PREVENTION AND SCREENING

## INJURY TO THE ANTERIOR CRUCIATE LIGAMENT (ACL)

### Q ANGLE

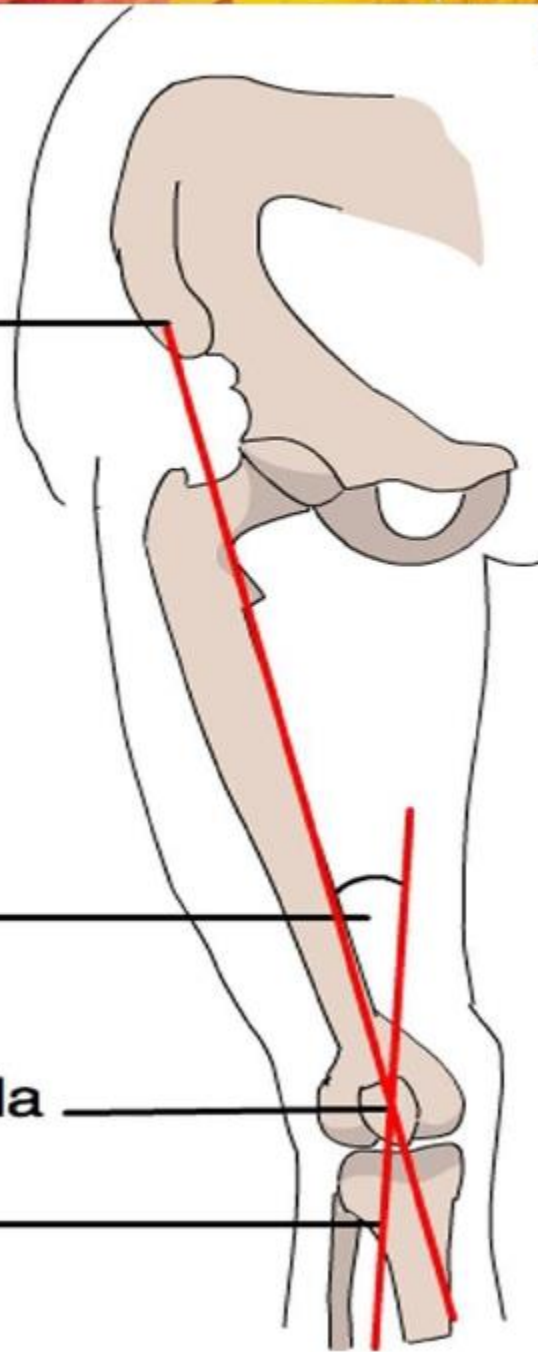
- The increase of the Q angle can be an indicator of a problem occurring in the knee and of increased strain being placed on the ACL.
- The Q angle in a normal athlete is between 10 and 15 degree (Bonci, 1999). The Q angle is a useful measure of potential knee problems.

Anterior superior  
iliac spine

Q-angle

Midpoint of patella

Tibial tubercle





# INJURY PREVENTION AND SCREENING

## INJURY TO THE ANTERIOR CRUCIATE LIGAMENT (ACL)

- The strength of the muscles around the knee has an important role to play in stabilizing the joint and therefore reducing the chances of injury.
- If the hamstring is more than 15% weaker than the other lower limb muscles then the athlete is 2.6 times more likely to suffer lower limb injury (Knapik et al. 1991; Gabbe et al. 2009).



# INJURY PREVENTION AND SCREENING

## INJURY TO THE ANTERIOR CRUCIATE LIGAMENT (ACL)

- The role of equipment used in the athletes' chosen sport can also have a major effect on the potential injuries that they could suffer.
- For example, the height of the saddle in cycling can have implication for a range of conditions in the knee of cyclists.
- **If the saddle is too high the athlete could suffer from iliotibial band (ITB) pain and potentially suffer from ACL strains (Callaghan 2005).**
- **the saddle is too low then the athlete could suffer from patellofemoral pain, LBP and anterior knee pain**





## INJURY PREVENTION AND SCREENING

- 3D analysis is the 'gold standard' measurement for lower limb angles and velocity variables.





## INJURY PREVENTION AND SCREENING

- When an injury occurs the body adapts by ensuring extra force is exerted by the surrounding tissues, for example the ligaments and other supporting muscles.
- When the muscle has recovered from damage the extra force continues to be exerted by those tissues and therefore the muscle becomes deactivated and untrained (Komura and Nagano 2004).



## INJURY PREVENTION AND SCREENING

- Knowledge of the movement and which muscle can perform the movement can help in correctly assessing injury or potential problems.
- During locomotion, bone on bone contact force is apparent, but limited when the correct muscles are activated. If those muscles become deactivated then bone on bone force increases and can result in injury.



## INJURY PREVENTION AND SCREENING

- The importance of a cool down is also an area that needs improvement with the traditional approach of concentrating on the warm up before practice being the dominant injury prevention measure.



# VALIDITY AND RELIABILITY OF SCREENING METHODS



# RISK ASSESSMENT IN INJURY PREVENTION

- Injury prevention and musculoskeletal screening is a form of assessment of risk on an athlete.
- Rather than viewing this process as a collection of singular tests, it should be viewed as building a picture of the athlete's functional capabilities, a performance matrix.



# RISK ASSESSMENT IN INJURY PREVENTION

- Once this matrix is established the 'weak links' can be worked on to improve the overall matrix and therefore the resultant performances of the athlete.
- With the correct identification of weak links, injury prevention programmes can become more specialized and therefore meet the needs of an individual athlete to eradicate potential problems occurring due to the body overcompensating due to a weakness (Mottram and Comerford 2008).





*Thank You*