



Pentagon Ski Club



Skiing

- Injuries
- Prevention
- Steven Horwitz, D.C
- www.youcanbefit.com
- 301-622-9000

MOST COMMON SKIING INJURIES

525,000 per year

By Body Area

- Knees
- Head/Face
- Shoulder
- Lower leg
- Wrist
- Thumb

By Body Area

- Sprain/strain
- Fracture
- Laceration
- Contusion
- Concussion

<http://www.ski-injury.com/stats1.htm>

How Does Injury Happen?

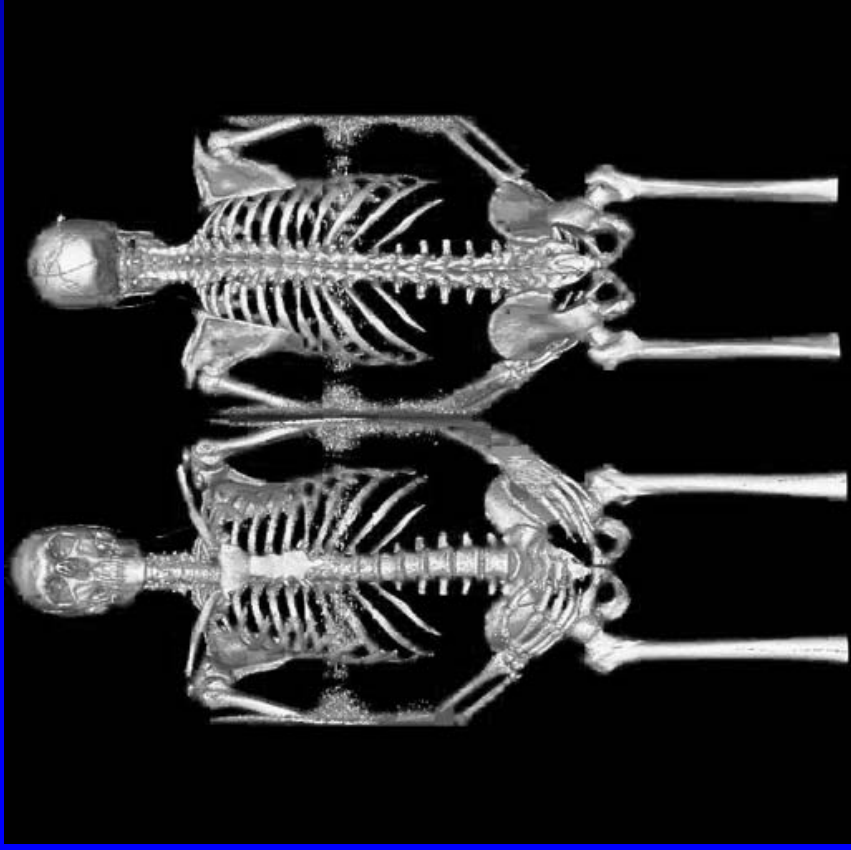
Tissue Overload

- Impact: Contact vs. Non-Contact (ACL)
- Overuse
- Movement Patterns
 - Poor technique
- Muscle Imbalance
- Muscle Weakness
- Inflexibility
- Structural Weakness
- Poor overall conditioning: Energy System (aerobic vs. anaerobic)
- Incompletely rehabilitated injury
- Poorly fitting equipment (boots!)

Musculo-skeletal System

- To support and protect the body and the organs
 - To provide motion
 - To protect joints by absorbing shock
 - To provide strength by generating force
- Bone
 - Joint
 - Ligaments
 - Tendon
 - Cartilage
 - Fascia
 - Muscle

BONE



- Support body
- Protection of internal organs from mechanical damage (e.g., skull, ribs)
- Reservoir of calcium and phosphate
- Source of all the blood cells

BONE INJURIES

Fractures

Breaking of a bone

- Simple Fracture

- Bone is broken skin intact

- Compound Fracture

- Bone protrudes through skin

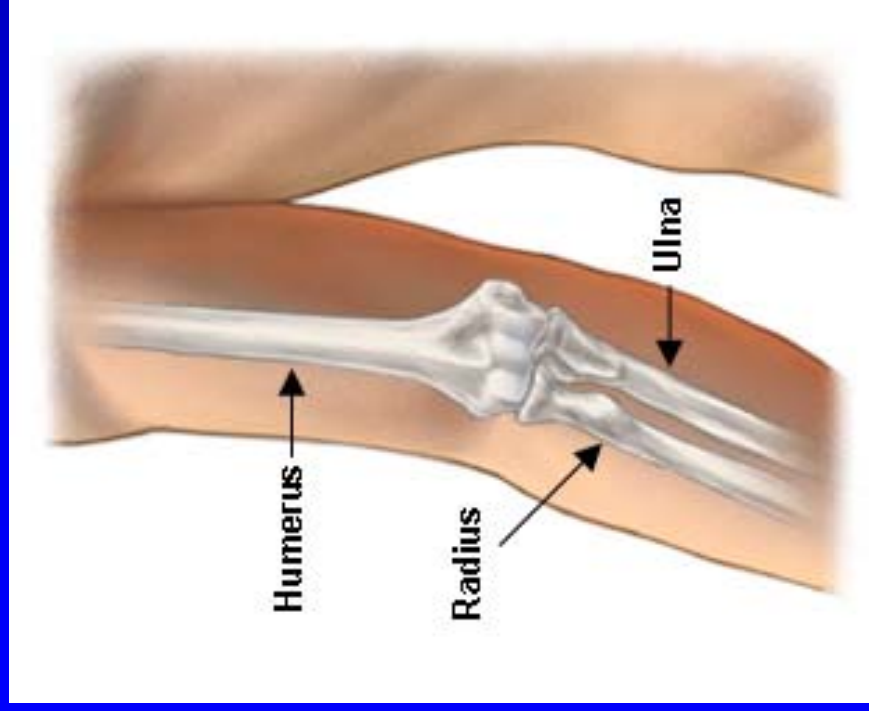
- Stress Fracture

- Small, hairline crack, like the crack in an automobile windshield



JOINT

- Location where two bones make contact or articulate.
- Joints allow movement and provide mechanical support.



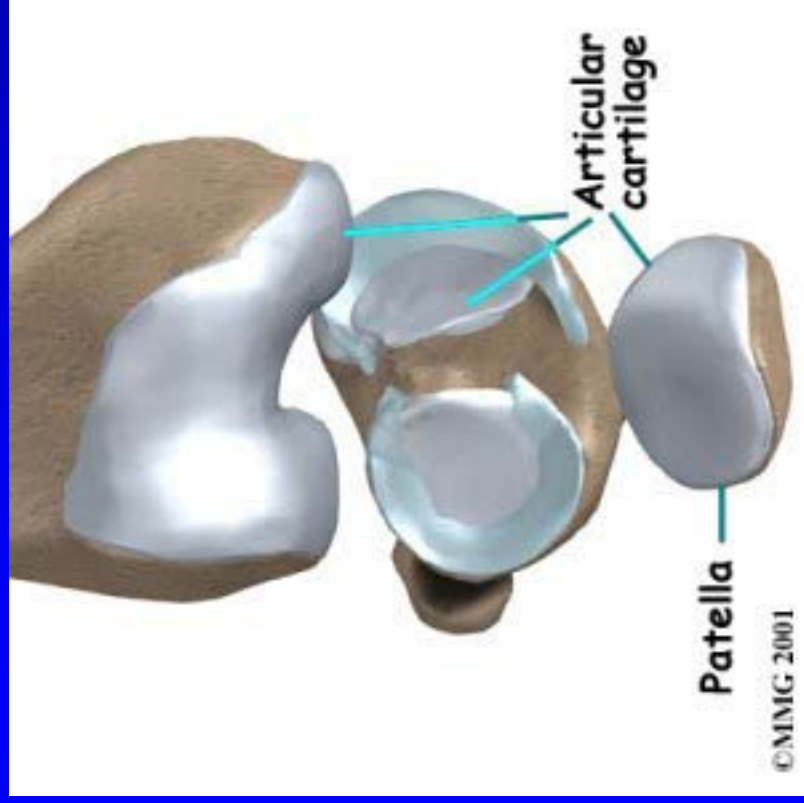
JOINT INJURIES

- **Dislocation**
 - Occurs when the bone ends that form a joint become separated
 - The shoulder is the most commonly dislocated major joint.
- **Separation**
 - AC joint
- **Do not attempt to move the joint**



CARTILAGE

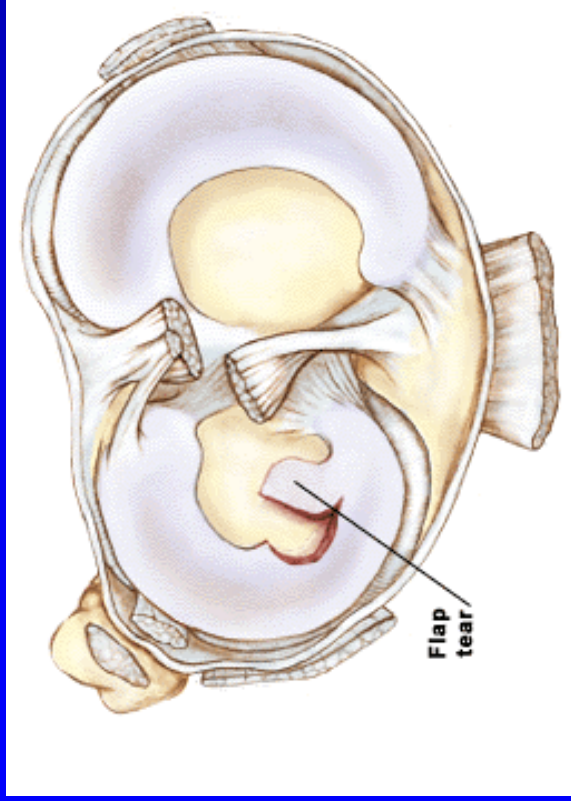
- Prevent rubbing of bone on bone
 - Knee, TMJ
- Maintains shape (nose, ears)



CARTILAGE INJURIES

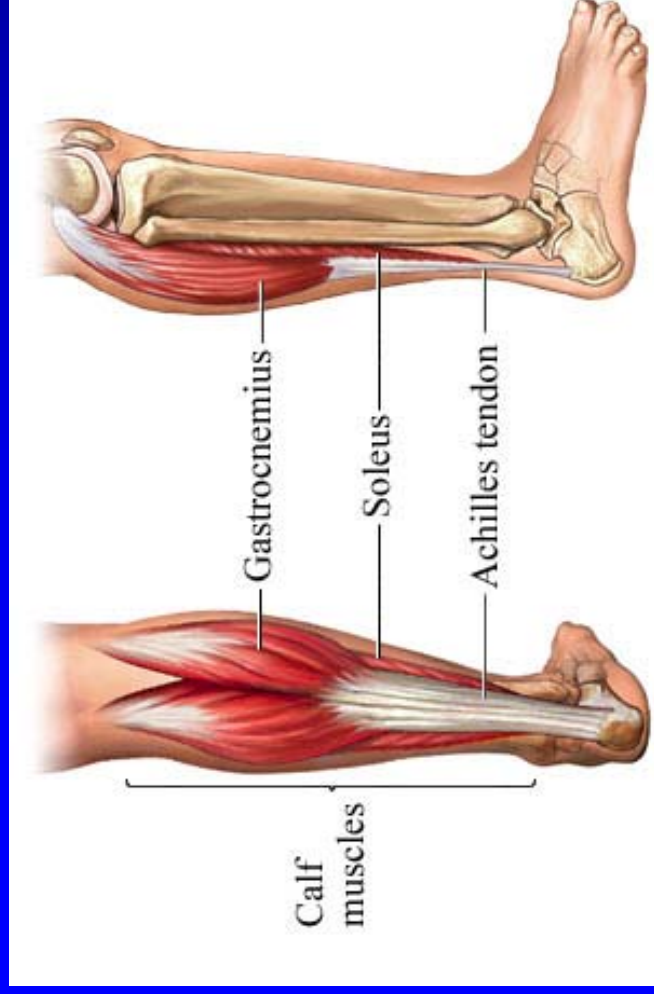
Cartilage Tear

- Knee is most common
- Occurs when the knee is forcefully twisted, or changing direction, or occasionally with minimal or no trauma, such as when you are squatting.



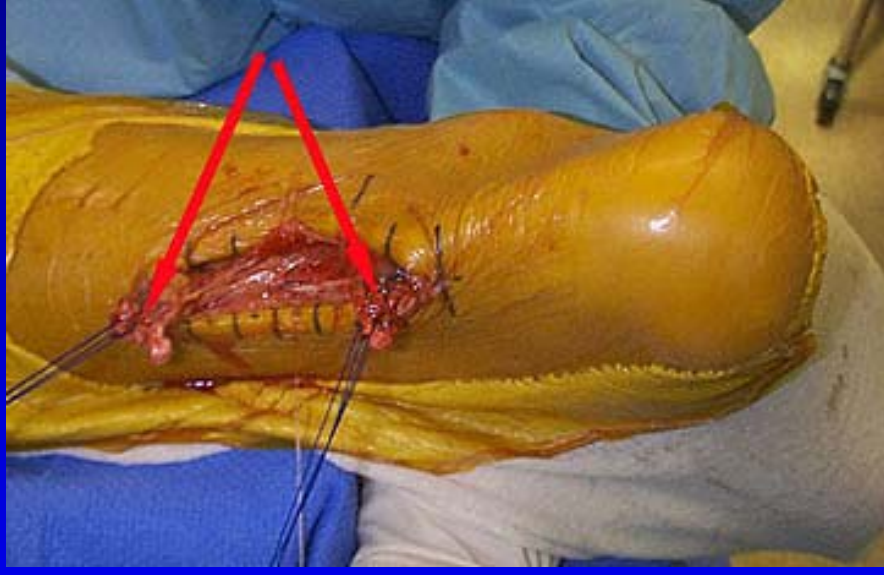
TENDON

- Connect muscle to bone
- Transmit contractile forces from muscle to bone
- They carry compressive forces when wrapped around bone like a pulley (finger)



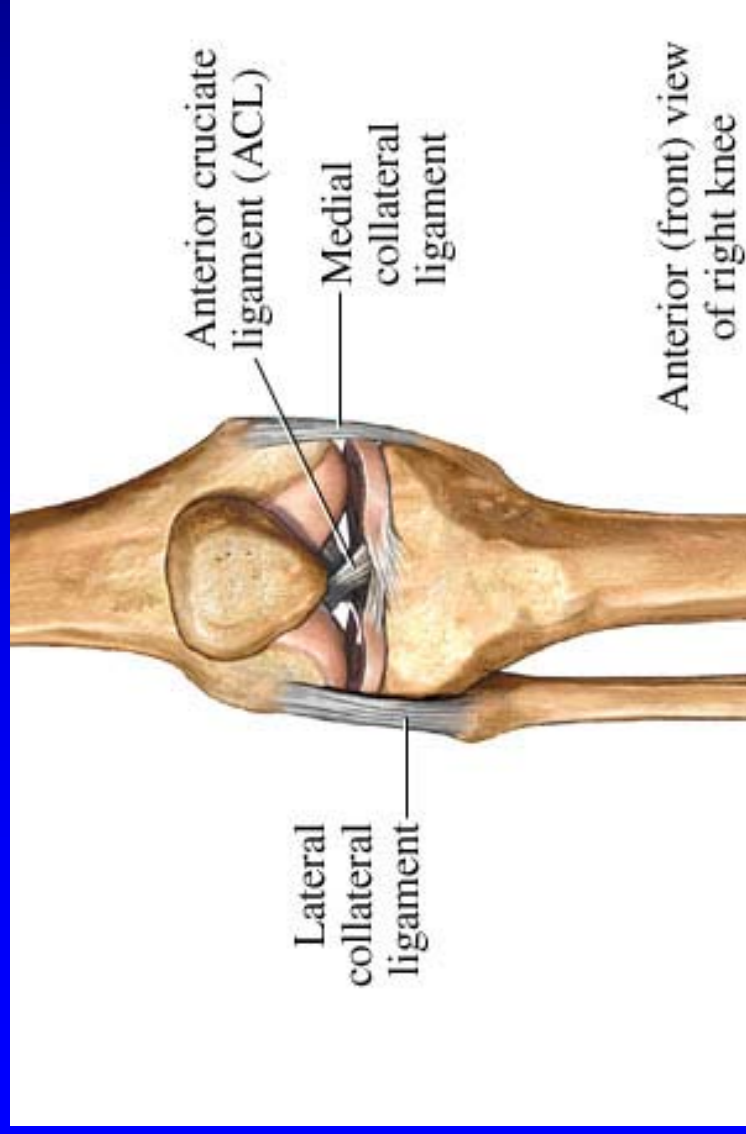
TENDON INJURIES

- **STRAIN**
 - Torn Tendon



LIGAMENT

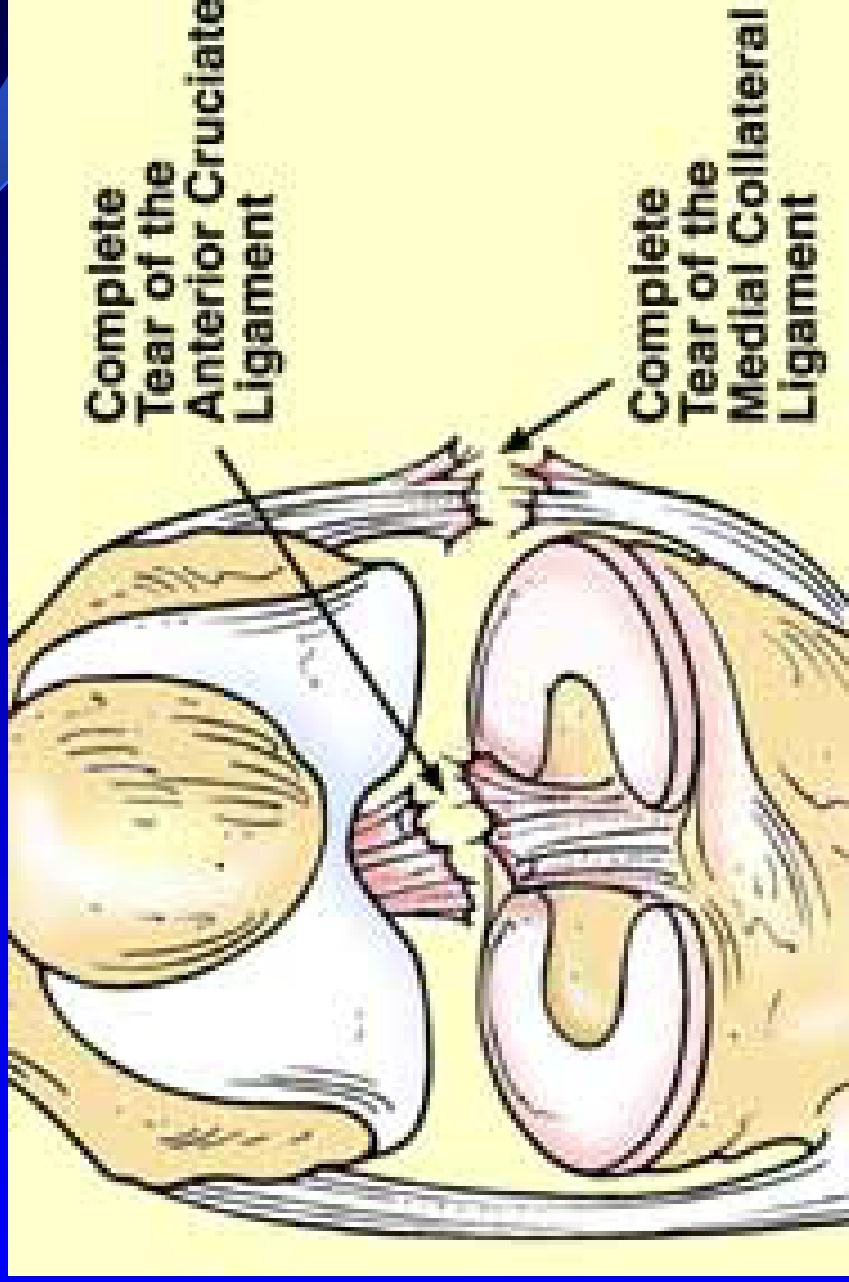
- Connects bone to bone
- Stabilize Joints



LIGAMENT INJURIES

- **SPRAIN**

– Torn Ligaments

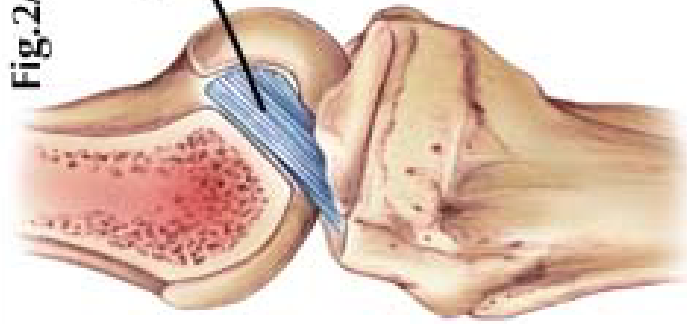


ACL INJURIES

- Society: 200,000 injuries per year
 - 10% - 20% of skiing injuries
 - 85,000 – 100,000 per year
- 1/3 of all ACL patients need surgery
- Avg. \$17,000 per surgery
- Cost: \$1.7 billion/year spent
- Cost to Athlete:
 - Short term: Loss of game time
 - Long term: Higher risk of Osteoarthritis
- More common in female athletes
 - 2-8 times more common
 - http://www.associatedcontent.com/article/50594/preventing_anterior_cruciate_ligament.html

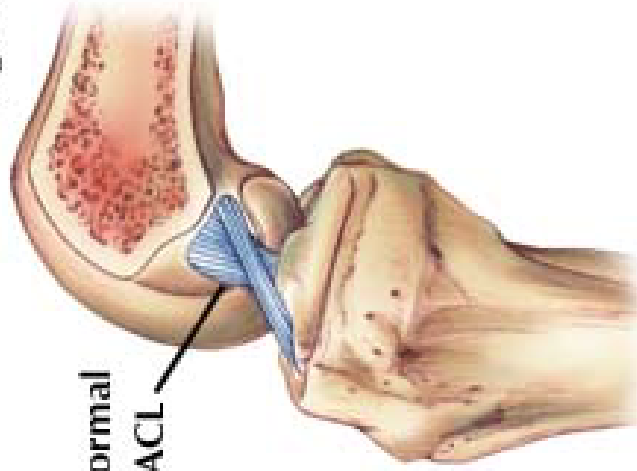
ACL FUNCTION

Fig.2A



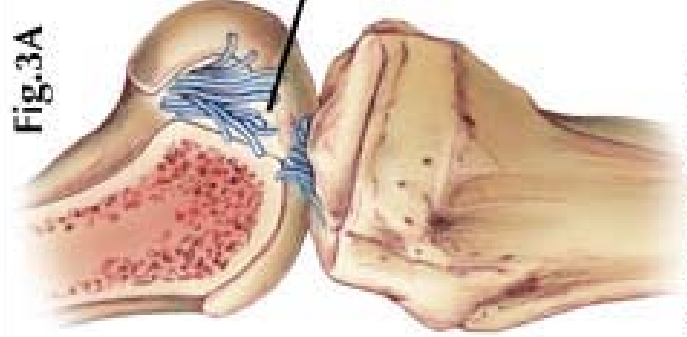
Extension

Fig.2B



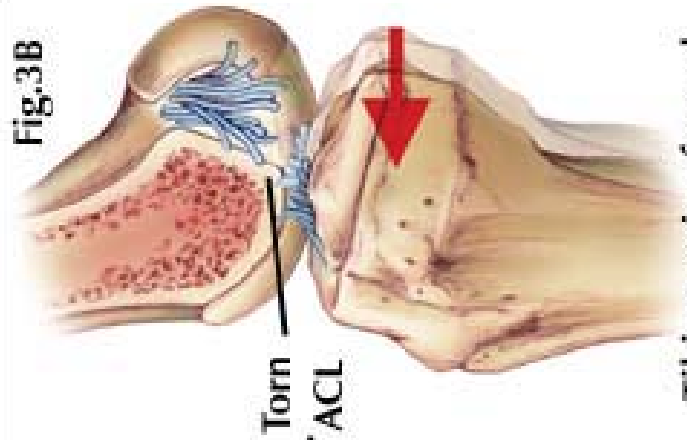
Flexion

Fig.3A



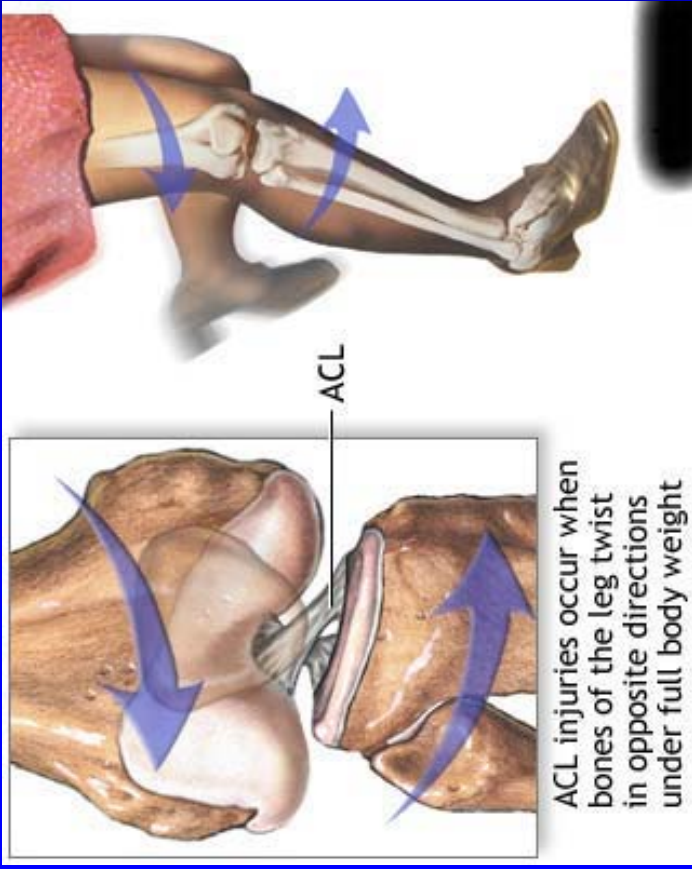
In hyperextension

Fig.3B



Tibia moving forward under the femur

ACL INJURY CAUSES



WHAT ATHLETE FEELS

- What athlete feels is single, double or triple pop
- Knee twists and subluxates - goes in and out of the groove
- Instantaneous pain!
- Swelling
- Inability to move knee

KNEE INJURIES

Phantom Foot Injury

- tail of downhill ski points in direction opposite the foot

Fall backwards
between the skis

Catches inside edge
of downhill ski

Internal rotation of
leg



KNEE INJURIES

- They often occur when the skier is:
 - 1) attempting to get up while still moving after a fall
 - 2) attempting a recovery from an off-balanced position
 - 3) attempting to sit down after losing control

KNEE INJURIES

- A profile has been recognized when these situations occur:
 - 1) Uphill arm is back.
 - 2) Skier is off-balance to the rear.
 - 3) Uphill ski is un-weighted.
 - 4) Hips fall below the knees.

KNEE INJURIES

- You are advised to:
 - 1) Place your arms forward.
 - 2) Skis together.
 - 3) Hands over skis.
 - 4) Do not fully straighten your legs when you fall, keep them flexed.
 - 5) Do not try to get up until you stop sliding and you are sure you can get up.

BURSITIS

- Friction, contusion
- Prepatellar (kneeling), Infrapatellar (pat tendon overuse)
- Local swelling, heat
- RICE, meds, eliminate cause, protect, aspirate, steroids (chronic and recurring)



MUSCLE TEAR

- Pull or Strain
- A tear in the muscle-tendon unit will occur when the tension in the unit exceeds the strength of the weakest structural element



MUSCLE or TENDON TEAR

Think of each fiber of a muscle as a strand of a rope. How many strands were damaged?

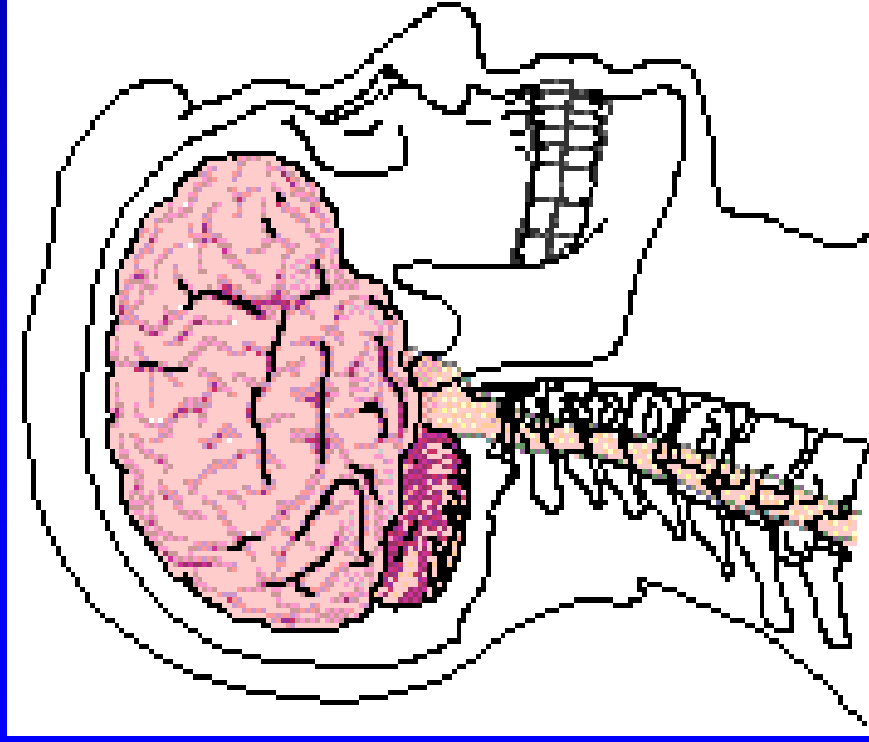


CONTUSION



Direct blow or fall
crushing
underlying
muscle fibers
and connective
tissue without
breaking the
skin.

Anatomy of a **CONCUSSION**



The brain is a jello-like substance vulnerable to outside trauma.

Skull protects the brain against trauma, but does not absorb impact forces.

Brain moves like a pinball inside of the skull

CONCUSSION Symptoms

- Headache
- Nausea
- Balance problems or dizziness
- Double or fuzzy vision
- Sensitivity to light or noise
- Feeling sluggish
- Feeling “foggy”
- Change in sleep pattern
- Concentration or memory problems
- Confusion

Concussion Grades

- Grade I/II
 - Transient confusion
 - NO loss of consciousness
 - Symptoms resolve in
 - Management – Stop activity
 - Grade I - < 15 min
 - Grade II - >15 min
- Grade III
 - LOSS of consciousness
 - Management - Call 911 immediately

When to Seek Medical Help

- Obvious deformity to the body part
- Inability to weight bear on affected leg
- Large degree of swelling within a couple of hours of injury
- Loss of range of motion at joint
- Pain not relieved by rest
- Point specific pain
- Pain affects performance
- Comparative weakness
- Numbness and/or tingling

Return To Skiing

REST: Resume Exercise Below the Soreness Threshold

Compare injured side to uninjured side:

- No more pain
- Full healing (no swelling)
- Complete ROM
- Strength
- Flexibility
- Endurance
- Able to replicate sport movements with no pain
- Must listen to body

COLD INJURY

- Human tissue freezes at 28 ° F.
- Fresh winter snow falls at temperatures between 0 and 20 ° F.
- Hypothermia ► vasoconstriction ► reduced circulation
- Most common areas: feet, hands, nose, cheeks, ears, and penis (aarrgghh)!
- <http://www.offpistemag.com/themag/medic/vol3/hypothermia.html>

HYPOTHERMIA

- You cannot maintain your normal body temperature in the face a cold environment
- Body works to keep the trunk area (home to vital organs) warm by burning ingested and stored calories, increasing movement (exercise or shivering) and by limiting the blood flow to the extremities (hands and feet). Keeping your core warm is integral to keeping the rest of your body warm.
- Normal core temperatures - 96-99 ° F (35.5-37.2 ° C). As patient's core temperature drops below 96 ° F (35.5 ° C) - mental status becomes noticeably affected.

HYPOTHERMIA

MILD HYPOTHERMIA

- Core temperature 96-99 ° F (32.2 - 35.5 ° C).
- Lethargic ► irritable ► Rule of umbles: mumbling, fumbling, grumbling, tumbling.
- Uncontrollable shivering; shivering will stop when patient runs out of available calories.

TREATMENT

- Create dry wind-proof shelter (ground) and add heat in any manner: fire, hot tub, sauna, heat packs, hot water bottles, body heat, etc.
- Remove wet clothing ► place in sleeping bag ► seal completely around face ► place him (bag and all) inside two sleeping bags joined together with a warm person on each side.

HYPOTHERMIA

SEVERE HYPOTHERMIA

- Core temperature is below 90 ° F (32.2 ° C).
- Decreased consciousness ► Pulse, respiration, blood pressure decrease
- Skin - white or cyanotic (blue) and cold. The patient may no longer be shivering and urination has decreased or stopped.

TREATMENT

- No peripheral rewarming
- **DO NOT BEGIN** chest compressions on a severely hypothermic patient.
- Begin assisted ventilations (up to 20 per minute)

HYPOTHERMIA PREVENTION

- **Stay Dry** – wicking clothes and layers
- **Eat.** Remember your body is constantly working just to produce heat, let alone fuel your activity. Bring food and eat it.
- **Drink.** Stay hydrated, avoid caffeine and alcohol. Keep hydrated.
- **Provide rest days** to rebuild sugar and fat stores before a strenuous event in the cold
- **Avoid smoking;** nicotine is a strong vasoconstrictor.

FROSTNIP

- Numbness, lack of local motor skills.
- Affected area - soft and dough-like
- Skin appears white and waxy.
- **Treatment goal** - rapid rewarming
 - Exercise, placing of hands on area
 - Warm water (104-108 °F or 40-42.2 °C) 30-40 minutes. Monitor water temperature.
 - 600 mg ibuprofen every six hours if area is swollen and pain persists.
 - If no blisters after 24 hours - limb may be used. Limb is predisposed to refreezing. If blisters appear, the damage may be significant and the limb should not be refrozen or used.

FROSTBITE

- Complete loss of sensation - no movement.
- Tissue feels solid and “wooden” to the touch.
- Skin is white - ice crystals visible
- **Treatment**
 - Consider walking out on frozen feet if less than 24 hours from a major hospital. Consider field rewarming only if greater than 24 hours from medical care and subsequent use and refreezing can be avoided.
 - Warm water (104-108 °F or 40-42.2 ° C) 30-40 minutes. Monitor water temperature.
 - 600 mg ibuprofen every six hours if area is swollen and pain persists.
 - **Treat as a high risk wound. Apply cotton between digits during healing phase. Avoid refreezing and use.**

Ski Injury Prevention

- Avoid altogether high risk behavior,
- Routinely correct poor skiing technique
- Recognize and respond quickly and effectively to potentially dangerous situations.
- Never train hard when stiff from the previous effort
- Lots of time for warm-up and cool down
- Check equipment
- Train with the correct equipment
- Travel comfortably
- Monitor hydration
- Wash hands

INJURY PREVENTION

PART I: ASSESSMENT

Static Posture and Gait Analysis

PART II: PREPARATION

Warm-up

Dynamic Stretching

PART III: STRENGTH AND POWER

Strength - Squat technique and exercises

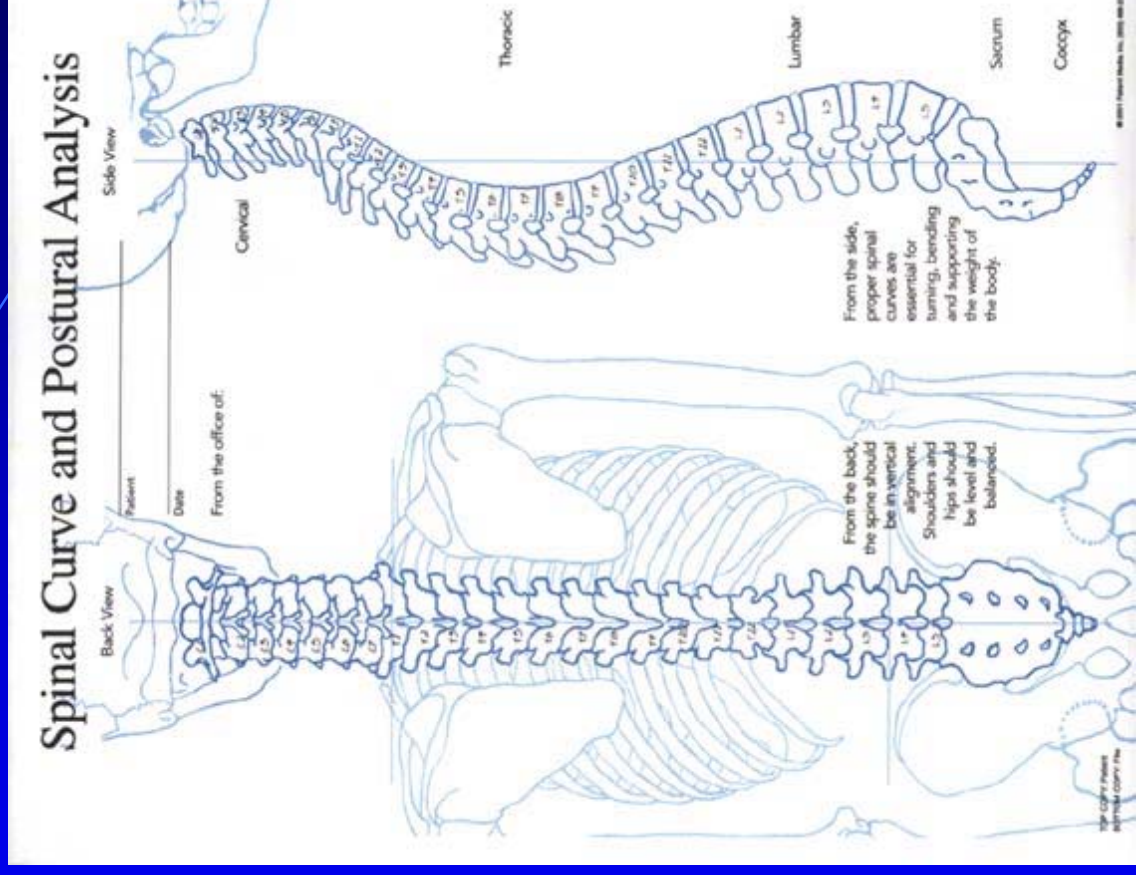
Power - Jump technique and exercises

PART IV: AGILITY

Forward, Backward and Side to Side Movement

PART V: CORE AND COOL DOWN

PART I: ASSESSMENT - Posture

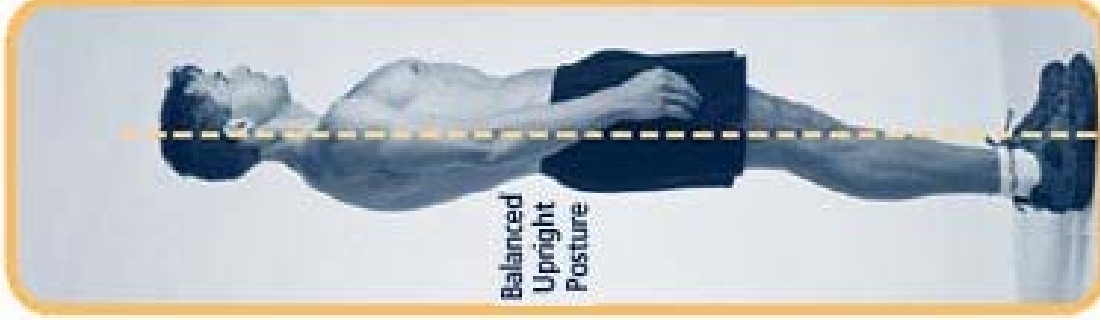


Posture

Poor Posture



Good Posture

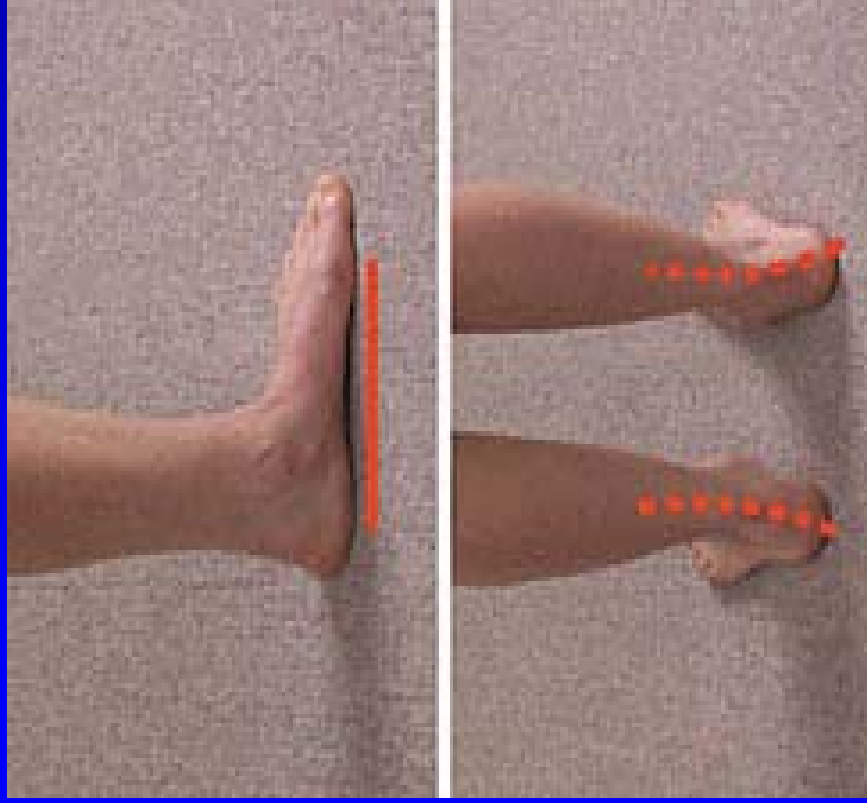


Poor Posture



Pronation

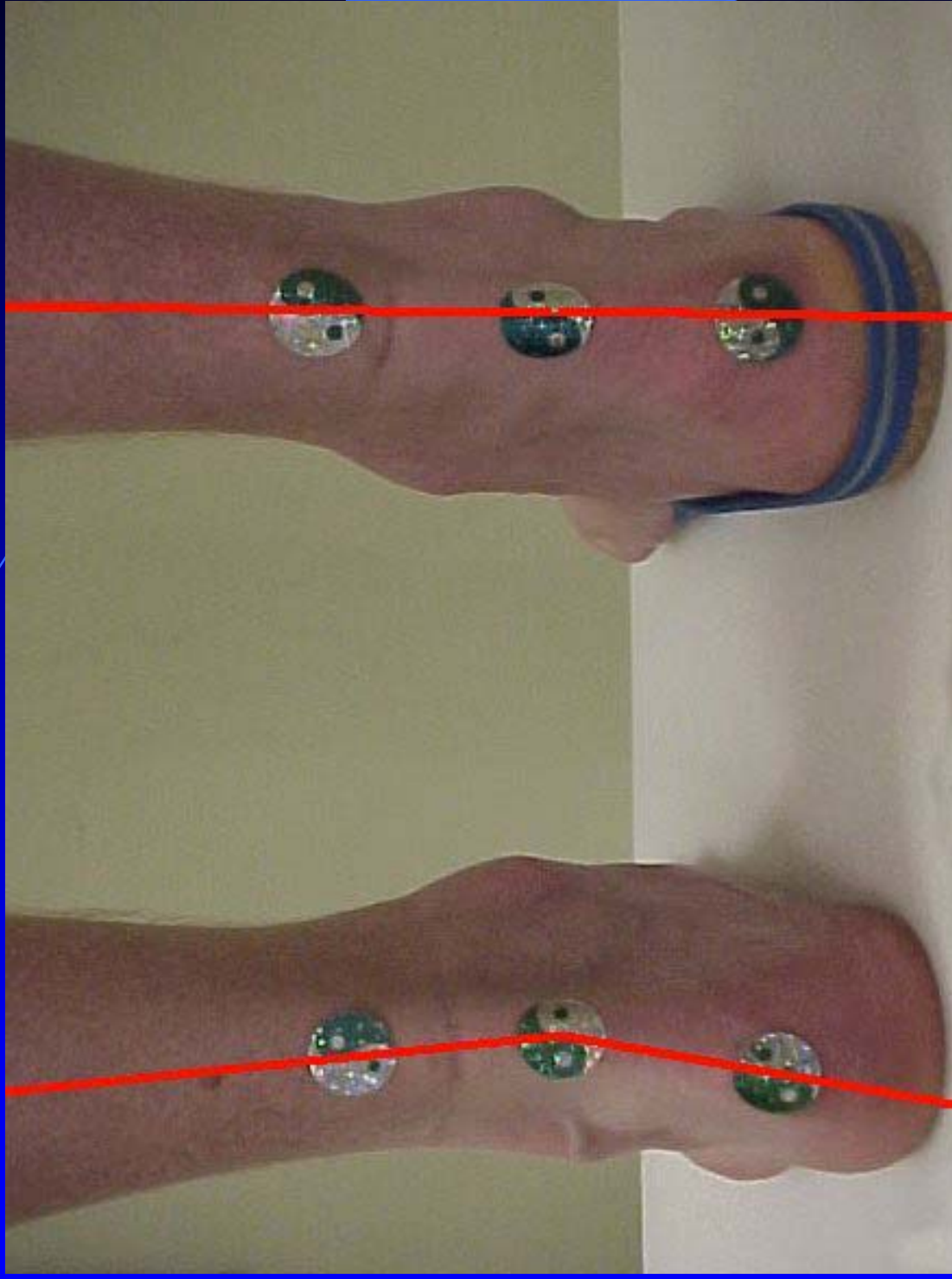
- In a ski turn the foot must bear a load up of to 3 times your body weight. Boot fit problems occur as the foot is forced to pronate (flatten) causing pressure of the foot against the boot shell. Typically this pressure occurs at the base of the little toe (sixth toe syndrome), the navicular and medial malleolus (inside ankle bones), and heel.



Gait Analysis - Pronation



Pronation Corrected



HIPS AND SQUATTING

- A healthy back depends on proper function in the pelvis and hips.



- Power is generated in the hips, not the lower back.

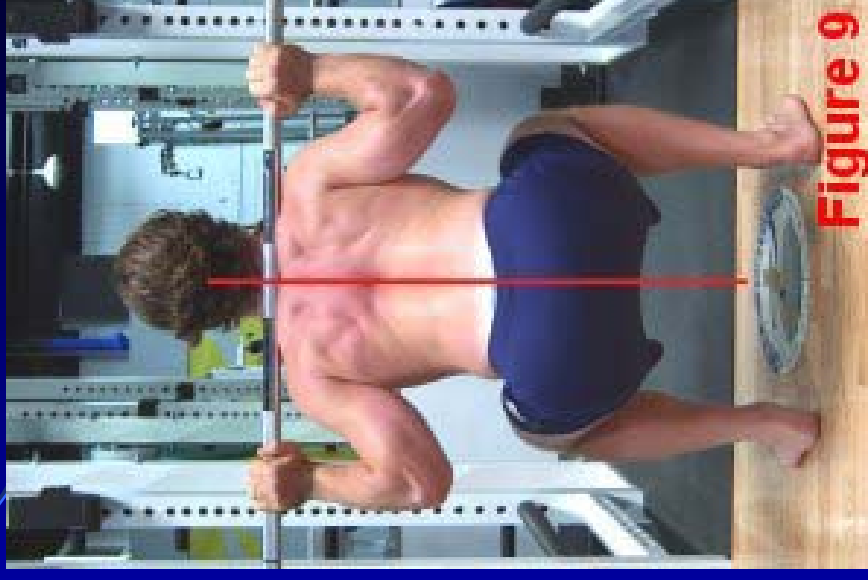


Figure 9

PROPER SQUAT AND JUMP POSITION

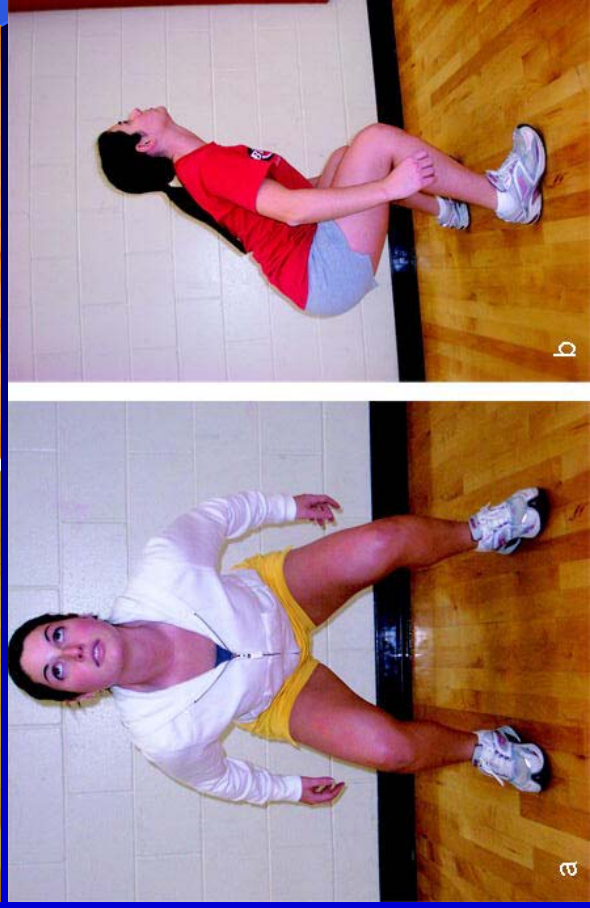
- BAD

- Knees buckle in
- Torso too far forward



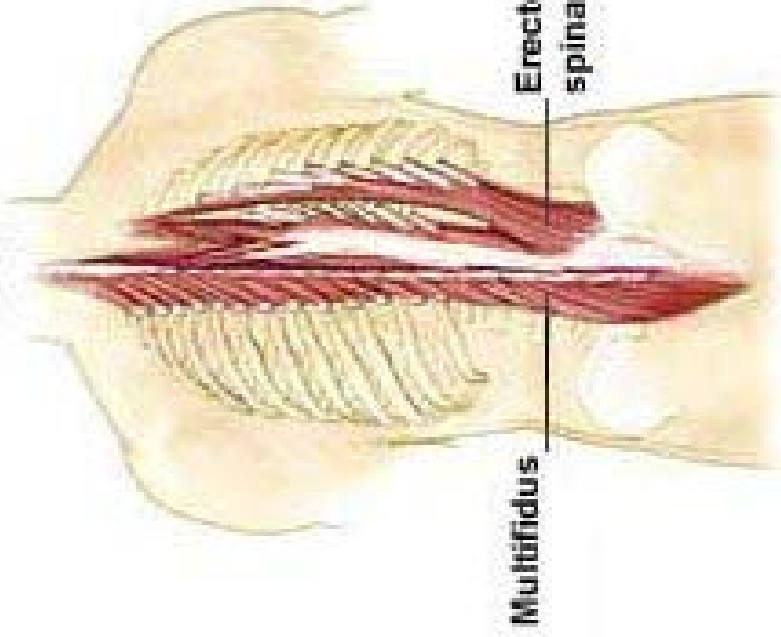
- Good

- Knees in line with toes
- Torso upright

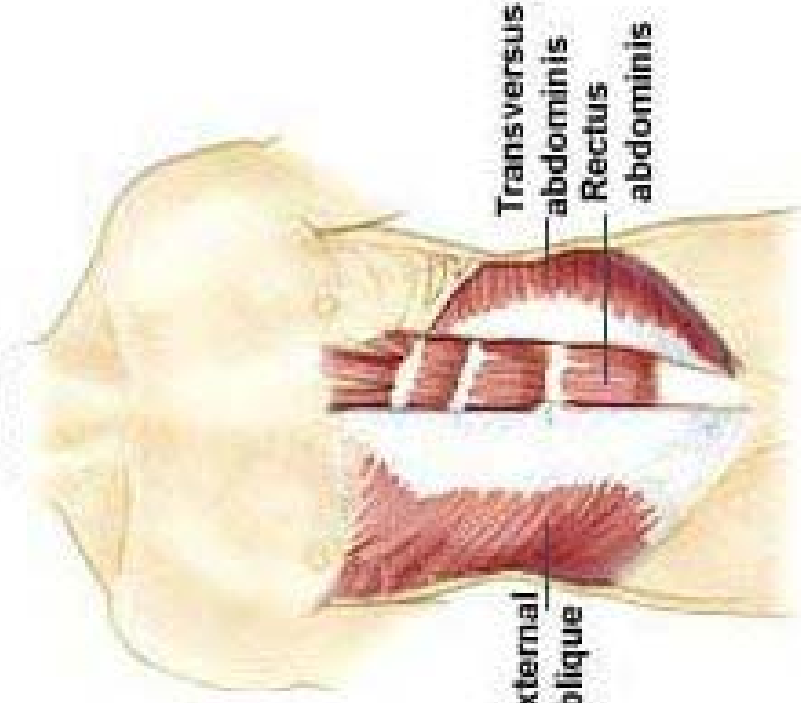


CORE MUSCLES

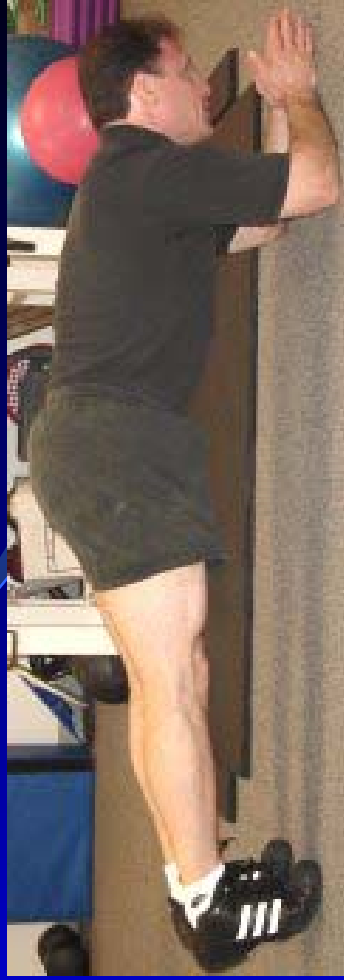
Back



Front



CORE EXERCISES



ENJOY!

