To BE or not to be
Objectives

- **Brief** history ACL Injury
  - who, what, where
  - when, how, why
- **Brief** summary Protocol Based Injury Prevention Programs
  - why: what the research found
  - who: programs
- **Presentation of a Non-Protocol Based Fundamental Approach**
  - SMA³RT Training
  - Flow Training Principles
  - Pose Method Running
Who, where, when

- **Athlete**
  - Male
  - Professional/colligate
  - Contact > non-contact

- **Athlete**
  - High School
  - Males & females
  - Non-contact > contact

- **Athlete**
  - HS & below
  - ^ incidence females (all levels)
  - Non-contact >> contact
ACL “Allure”

• Joe Namath
  - very high profile
  - multiple knee injuries bilaterally
  - groundbreaking intervention
    • Surgery
    • Rehabilitation
    • bracing
Joe’s Contribution

- Realization of the costs of ACL injury
  - Time from play
  - $
- Recognition that ACL injuries need not be career ending
- Advancements in surgical, rehabilitative and bracing technologies
- And...
liberation from conservative fashion paradigms
But not everyone can be a Superhero
What: hurt, damage, loss

• injury

  *n. pl.* injuries

1. Damage or harm done to or suffered by a person or thing

2. A particular form of *hurt, damage, or loss*:
   a leg injury.

3. approximately 1750 Newtons or more
anterior cruciate ligament


- The ACL is a broad ligament joining the anterior tibial plateau to the posterior femoral intercondylar notch. The tibial attachment is to a facet, in front of, and lateral to the anterior tibial spine. The femoral attachment is high on the posterior aspect of the lateral wall of the intercondylar notch.

- It is composed of multiple non-parallel fibers, which, though not anatomically separate, act as three functionally distinct bundles i.e. anteromedial, posterolateral and intermediate. Owing to their wide attachments, variable fiber lengths and the rotation of the ACL that accompanies flexion, the tension in each bundle varies throughout the range of motion.

- The biomechanical function of the ACL is complex for it provides both mechanical stability and proprioceptive feedback to the knee. In its stabilizing role it has four (main) functions:
  - Restrains anterior translation of the tibia;
  - Prevents hyperextension of the knee;
  - Acts as a secondary stabilizer to valgus stress, reinforcing the medial collateral ligament; and
  - Controls rotation of the tibia on the femur in femoral extensions of 0-30°.

- This final role is the main clinical function of the ACL. ACL deficiency causes failure of this screw-home mechanism, resulting in subluxation of the tibia on the femur. This critical function in the range of 0 - 30° is important for movements such as side-stepping and pivoting.
The lateral collateral ligament (LCL) runs on the outside of your knee. It limits sideways motion.

The anterior cruciate ligament (ACL) connects the femur to the tibia in the center of your knee. It limits rotation and the forward motion of the tibia.

Articular cartilage lines the bones, cushioning your joint.

The medial collateral ligament (MCL) runs down the inside of your knee joint. It connects the femur to the tibia and limits the sideways motion of your knee.

The meniscus is cartilage that absorbs shock in your joint.

The posterior cruciate ligament (PCL) also connects the femur and tibia. It limits backward motion of the tibia.
How

- Contact or Non-contact
- Pivot – planting and cutting
  - IR varus
  - ER valgus
- Hyperextension – straight-knee landing
- Hyperflexion - gangtackle
- Quadriceps Contraction - pivoting and sudden deceleration
- Combinations - one-stop-landing in extension
Contact
ER valgus
Pivot – cut, varus
Why: Proposed Causes

- **Environmental**
  - Playing surface condition
  - Footware

- **Anatomic**
  - ACL agenesis
  - Intercondylar notch size
  - Lower-leg alignment
  - Knee joint laxity/genu recurvatum
  - Muscle flexibility
  - Ligament dominance
  - Increased Q angle/tight ITB
  - Pes planus

- **Physiologic**
  - High quad to ham ratio/neuromuscular imbalance
  - Poor biomechanics/motor execution
  - Hormones
  - Existing injury/pain (especially hams)
  - Protective reflex response (active extension particularly)

- **Psychological**
  - Previous or recently recovered injury
  - General lack of confidence
  - Reckless or timid playing style
What

DO

We Do?
Prevention

• pre·vent

v. pre·vent·ed, pre·vent·ing, pre·vents

v.tr.

1. To keep from happening: took steps to prevent the strike.

2. To keep (someone) from doing something; impede: prevented us from winning.

3. Archaic To anticipate or counter in advance.

4. Archaic To prepare for; precede.
If preventive modalities such as dynamic neuromuscular training can reduce the incidence of knee injury by even a few percentage points, thousands of knee injuries can be prevented in high school and collegiate sports annually. In addition, with the ever-increasing popularity of high-risk jumping and pivoting sports like soccer, volleyball, and basketball and the rapidly growing number of participants each year, even higher numbers of injuries could be avoided in the future.
Some Numbers

• **250,000 annual injuries**
  - 1 in 3000 general population
  - 2 – 8x greater incidence in females 15-25yo

• **$1.5 billion annual cost in surgeries**
  - Excludes pre/post op intervention
  - Excludes non-op sprains

• **Loss of Time**
  - 1 full season
  - 4 to 6 months recovery
  - 250 hours rehab
Evolution Prevention Programs

- Chuck Henning, MD
- Timothy Hewett: biomechanist (Sportsmetrics: CSM)
- Vermont Safety Research Group
- Hunter Valley Conference on ACL Prevention Strategies
- Santa Monica OSMG
- Dynamic neuromuscular training analysis (Myer, Ford, Hewett: CSM)
Chuck Henning, MD

- Viewed video female athletes
- "quad-cruciate interaction"
  - Knees extended
  - Quad force ^ stress ACL
- Landing, cutting, pivoting, and stopping with flexed knees & hips
- Reported reduction injury rates
Timothy Hewett: biomechanist
Cincinnati Sports Medicine
Sportsmetrics

- Plyo drills emphasizing landing BOF/HKF/BBLEs
  - posture
  - stability
  - soft landing
  - verbal cues
- Stretching
- Strengthening
Vermont Safety Research Group

- Awareness hazardous situations
- Pre-planning strategies
Hunter Valley Conference on ACL
Prevention Strategies

• Multidisciplinary

• Acknowledged success of research and previously implemented programs
  - Caraffa et al: sevenfold reduction
  - Vermont Ski Safety: 69% reduction
  - Hewett: 3.6x reduction trained vs. untrained
Santa Monica OSMG

PEP program

• Sport specific (soccer)

• On field, pre-practice/game
  – Warm up
  – Stretching
  – Strengthening
  – Plyometrics
  – Agilities

• Nationally implemented, research directed

• Video
Dynamic neuromuscular training analysis (Myer, Ford, Hewett)

- Dominance-based Program
  - Assessment based
    - 3-D digital videographic kinematic analysis
    - Isokinetic testing
  - Individually designed
  - Non-protocol intervention

- Dominance (in females)
  - Ligament dominance
    - Andrews and Axe
    - Allow GRF to be absorbed by ligaments vs. muscles
    - LE valgus/GRF/high torque @ knee
  - Leg dominance
    - Strength R vs. L
    - Coordination r vs. L
  - Quadriceps dominance
    - Hams to quad ratio 66%
    - = bilaterally
Athletic position
Tuck Jumps
Broad jump and hold
180 jump
Single-leg hop & hold
Squat jumps
X jumps
Single-leg balance
Jump, jump, jump, vertical jump
Bounding
Common Goals of Prevention Programs

- Avoid vulnerable positions
- Improve flexibility & strength
- *Maximize proprioception & kinesthesia through dynamic activities*
- *Enhance neuromotor performance*
Tools of Prevention Programs

- Literature
- Courses
- Internet
- DVD/video tape

*present information to/through athletic trainers, coaches, physical therapists to athletes*

*stress technique with verbal cues reinforcement*
Prevention Programs

- **Proactive intervention**
  - Educates
  - Condition
    - Physically
    - Psychologically

- **Protocol based**
  - Common factors
  - Primarily female
  - Implemented year round
  - Broad usefulness

- **SMART**
SMA^3RT Training

- **Systematic**
  - Purposeful
  - Schedule or regimen
  - Proper equipment
  - Appropriate nutrition
  - A^3RT

- **Mixed**
  - Variety training modalities
  - Maximize interest
  - Enhance all body systems: nms, cr, lymph, etc...

- **Aerobic, Anaerobic, Agility**

- **Rest, Recovery**
  - Micro
  - Macro

- **Technique**
  - Define
  - Describe
  - Demonstrate
  - Communicate
  - Evaluate
  - Emancipate
Technique = Teach, Teach, Teach

- Define
- Describe
- Demonstrate
- Communicate
- Evaluate
- Emancipate
Mirrors

Windows

Puddles
see, See, SEE
see
Poets SEE!
po·et

- A writer of poems or poetry
- One who is especially gifted in the perception and expression of the beautiful or lyrical
- One who composes in verse with meter, melody or flow
po·et·ry

- A quality that suggests grace, beauty, or harmony
BE a Poet
Flow Training is a method of physical performance enhancement applicable to all sports and general fitness. FT seeks to maximize performance via techniques derived from ancient Chinese and Indonesian arts, as well as current methodologies.
The fundamental premise of Flow Training is optimal performance through fluidity or ease of movement which is inherent in the neuromusculoskeletal systems of the body. FT develops flexibility, strength, power, accuracy, coordination and concentration through training attention, understanding and awareness. At the same time, FT promotes appropriate and intuitive physical action whereby the body instantaneously processes internal and external feedback resulting in performance through awareness.
• FT allows movement rather than directs movement. It enhances performance through ease rather than effort. It promotes grace, fluidity and whip-like power by teaching how to get out of your own way and when to don’t rather than do. Flow Principles are what elite athletes and other elite movement artists have mastered. Flow Training is a powerful tool toward that same mastery.
Flow Training Objectives

• Intervene
  – Pain
  – Imbalance
  – Fear
• Educate
  – Basic science
    • A & P
    • Kinesiology
    • Psychology
  – Technique
    • Demonstration
    • Emulation
    • Evaluation
    • Integration
• Inspire
  – A reason to be heard
  – A reason to devote
Technique Methodology

• Neuromotor programming
  - Digital
  - Overload
  - Path
  - Reflex management

• Emulation
  - Master
  - Reconstruct self (video)
Ecto – Endo Loop

- All movement is in response to forces in the environment
- Sensation is necessary for movement
- Sensation includes:
  - 5 senses
  - Muscle spindle, GTO, joint & tactile afferents
  - SNS & ANS
- Sensation provide the mechanism for interpretation or perception
- Awareness is accurate perception
- Without awareness movement is inaccurate inefficient, and dangerous
- Movement with awareness optimizes performance and avoids injury
Joints, Tendons, Ligaments, Fascia

- Awareness of involvement in movement
  - Martial arts, dance, gymnastics *train* JTLF
  - “springiness, suppleness, looseness”
- Non-contractile/elastic, Energy sparing
- Support, control, assist movement
- Crucial role endo-feedback
Flow Axioms

- Master movement through understanding, attention, awareness of *ecto-endo loop*
- Do less, *Don’t* more
  - Stay out of your own way
  - The more you don’t, the better you’ll do
- Seek **ease** not effort
- See, Listen, Feel
- Nature forms the standard
Standards

- Posture
- Leaping, Landing, Cutting, Running(?)
- Running
Posture as a Standard
Why have Standards?

• Maximize biomechanics
  – Preserve joints through alignment
  – Enhance muscular capacity
  – Avoid dangerous scenarios
• Maximize performance
• Prevent injury
• Place to work from and toward
Almost all athletes...
All Pose slides taken from [www.posetech.com](http://www.posetech.com), Pose Method® of Running Book, personal conversation.
Why Pose?

The Pose method is a simple and comprehensive biomechanical model which eliminates injuries and enables every runner from novice to elite to fully utilize their physiological potential.

Graham Fletcher,
Former British triathlon National Team Coach
• Developed the Pose Method® of Teaching Running Technique, in Russia, in the 1970's
• USA Triathlon Association
• British Triathlon National Team
• Mexican National Triathlon Team
• Author, coach, instructor, revolutionary
WHAT IS POSE METHOD®?

- System for teaching of human movement
- Key poses
- *With* the laws of nature
- Gravity as the primary force for movement
- Non-contractile, elastic properties of tissues
- Ground reaction force
SHORT POSE CONCEPTS

- **POSE** - Most important position, it is position from which all movement is generated
- **Wheel** - Keeping the general center of mass (GMC) above the support point (midfoot) and pulling the ankle from the ground in a vertical line under the hips, in a continuous motion, like the wheel of a car.
- **S-like Stance** - Keeping the runner's body perfectly balanced on one leg, with knee bent, making body compacted and loaded with elastic energy
- **Change of Support (CS)** - Shifting the body mass from one leg to another
- **Vertical Action** - Pulling of the support foot from the ground up under the hip
- **Gratuitous Forces** - Gravity, elasticity, inertia, Coriolis; forces working without ATP breakdown
Shoulders keep the balance of the vertical line on the support.

Body slightly leaning forward, ready to move to next stride, keep knee bent.

Shoulders, hips, ankles – on the vertical line of support.

Stand on one leg, balancing on ball of the foot (BOF), other leg up under hips.
Pose (Stance)

- **Running Pose**: start with it in the static position, keeping your balance on one leg, bent at the knee, with the body weight located on the ball of the foot. *(Drill 1. Pose Stance)*

Keep the Pose for 4-5 seconds then change the support from one foot to the other. *(Drill 4. Hop in Place)* Repeat. Do 2-3 sets of 10-15 reps of each drill to let your body "memorize" the pose.

Then incorporate it in a few short (30-50 meters) runs at any comfortable for you speed.

- Keep your hips above the ball of your foot.
- The most difficult thing to learn is to get a proper perception of holding the body weight on the ball of the foot.
- Barefoot to get even more precise perception of being on the ball of the foot.
- Stance knee ALWAYS in flexion
Fall

• Falling is a psychological "action" of allowing yourself to fall forward, but not your muscular efforts. ("Pose Method" book, Fig. 23.2-23.3, p.118-119)

• Lean your body from the ankles. Leaning is a rotational movement of the body where the foot is the pivotal point of rotation.
Pulling is very difficult, not physically but psychologically, because it goes against your paradigm and habits of running.

- Give up pushing off from the ground
- Develop action of hamstrings pulling foot under hip
- Minimal time in stance phase
Pose Method

- Understand biomechanics
- Develop *sensibility* through drills
- Integrate sensibility into running
Pose for ACL (all) Injury Prevention

- Knee always flexed in stance
- Stance phase absolutely minimized
- GCM over feet
- Optimal management GRF
- Sensibility through awareness
Pose as the Foundation

- Poetry
- Protocol Based Programs
- The Pose Method of Running
Poetry In Motion
To BE or not to be

IS the question
BE

Injury Free