IMPORTANT FACTORS IN TEACHING CORRECT SPRINT MECHANICS

A. Analysis of Maximum Speed Sprinting
   1. Stride length factors which can be influenced through training:
      a. Strength and Power
      b. Neuromuscular Integration and Coordination
      c. Mechanical Efficiency
      d. Elasticity
      e. Dynamic Mobility

   2. Relationship between Stride Length and Stride Frequency
      - Stride frequency is a larger limiting factor in sprint performance
      - Both stride length and stride frequency are improved by increasing strength
      - As stride length increases frequency decreases
      - As stride frequency increases stride length decreases
      - An increase in stride frequency; reduces ground contact

B. Phases of Running Mechanics
   1. Preparation for Support:
      - Hip extensors contract violently
      - Upper leg speed (back) at takeoff is critical
      - Rapid acceleration of thigh down and back by hip extensor ankle is cast
      - Rigid ankle joint maximizes elastic force production
      - Toe remains up, keeps gastronemius on STRETCH
      - Foot is pulled back actively under C.O.M. ACTIVE LANDING

   2. Support Phase
      a. Eccentric phase: contributes greatest to maximum velocity sprinting
         Frontside Mechanics/Positive Foot speed

      b. Concentric phase: contributes greatly to the acceleration phase
         Backside mechanics/Negative Foot speed
         Thighs together at touchdown, foot is in support under C.O.M.

   3. Recovery Phase:
      - Thigh is flexed at the hip as soon as possible along with flexion
        at knee and ankle
      - Figure 4 / or h-position
      - Ankle of swing leg passes above knee of support leg
      - Keep leg levers short for as long as possible/keep hamstring
        in a position so it does not decelerate the thigh
      - Glutes continue to extend the thigh

   4. Body position
      a. Posture...trunk erect, head level, hips tall
      b. Arm action...used for balance, initiates action of legs
C. Straight Ahead Speed Drills

A. Part Actions
   1. A-Skip (high knee skip)
   2. B-Skip (high knee skip with active lower leg actions)
   3. C-Skip (continuous hurdle trail leg)
   4. A-Run (Rotary running)
   5. Fast Leg
      a. Single leg
      b. Alternating leg
   6. Straight Leg Bounds

D. Exercises for:
   Recovery phase: fast leg, high knee A-runs,
   Support phase: ankle hops/over 12” hurdles
   Hurdle hops: (stuck/static... for eccentric overload)
                  (continuous... for reaction time)

E. Definitions of important aspects of Sprint Mechanics:

   RECOVERY PHASE...Support foot breaks contact with ground, followed by incomplete
                   extension of the hip, knee and ankle joints. Higher knee lift or better front side mechanics
                   results in: earlier recovery which advances knee further and more hip flexion of swing leg at
                   takeoff.

   ECCENTRIC PHASE...is initiated at ground contact and ends when the center of mass (COM) is
                      directly over foot. It contributes greatest to maximum velocity sprinting. The eccentric phase
                      is very important to greater stride frequency and reduced flight time.

   STRENGTH...stabilizes joints so that little force is absorbed in knee, ankle, and hip joint.

   POWER...necessary to move C.O.M. (center of mass) through ground contact as fast as
             possible minimizing breaking forces.

   NEUROMUSCULAR INTEGRATION...involves the sequential firing order of the muscles
                                 involved, anticipation of the forthcoming action. Coordinating the agonist and antagonist
                                 muscles to work in concert together.

   CONCENTRIC PHASE...is initiated when the center of mass (COM) is over the foot and ends at
                      the start of leg recovery. It contributes greatly to acceleration phase.

   ELASTICITY...the ability of a falling body part to absorb energy in a contracted muscle, than
                 forcibly lengthening it rebounds with greater force. Connective tissue is the elastic part
                 (ACHILLES TENDON is the source of he elastic energy)

   DYNAMIC MOBILITY...the ability to move a limb segment through a greater range of motion
                      in the same time or prescribed range in a shorter time, this is particularly important in the HIP
                      JOINT.
F. Summary of what we have learned about Sprinting

MECHANICAL EFFICIENCY...short levers aid in speed of leg recovery.

MAXIMUM STRENGTH...stabilizes joints so that little force is absorbed in knee, ankle, and hip joint upon ground contact.

POWER...to move center of mass (COM) through ground contact as fast as possible, minimizing breaking forces.

IMPORTANT CONSIDERATIONS IN TRAINING SPRINTERS:

POWER before SPEED
SPEED before SPEED ENDURANCE
(trying to develop the ability to maintain maximum velocity, this is a coordination issue at high speed. Example: 4-5 efforts out to 120m

ACCELERATION DEVELOPMENT-----SPEED DEVELOPMENT--------SPEED ENDURANCE

1. Eccentric strength is more important than Concentric strength, because it is Important to vertical and horizontal velocities

2. Ground time is the key element that makes the difference. Note: In speed training we are trying to get the athlete apply a BIG FORCE in a SHORT PERIOD OF TIME. (This type of work is usually 6 sec. in duration)

3 Focus must be on FRONTSIDE MECHANICS in training, the goal is to increase (horizontal) foot speed, which is a function of the technical and physical component. A direct result of improvement in this area is HIGHER KNEE RECOVERY.

G. Acceleration

Ground contact times are HIGH in acceleration LOW n maximum velocity sprinting
Body angle changes occur as a result of leg extension movements.
Key point: Toe-off is BEHIND during acceleration
Touchdown is UNDERNEATH during maximum velocity sprinting.

H. The Stimulus/Reaction Time at the Start:

1. Aim to react with maximum force with minimum loss of block clearance time.

2. There are two types of reaction to a stimulus:
   a. AUTOMATIC
   b. CONDITIONED

3. If the athlete concentrates on the SOUND OF THE GUN, then the gun must be FIRED before the athlete can react, since the athlete has CONDITIONED their mind to the stimulus.

4. If the sprinter’s mind is concentrating on the forthcoming ACTION, while in the SET POSITION, then the slightest sound will cause an AUTOMATIC REFLEX.

One tenth of a second means an extra 2 to 3 feet at the FINISH LINE!!!