Sprinting

MECHANICS OF SPEED

RATIONALE:
Coaching to a Model

- SIMILARITY BETWEEN BIOMECHANICAL EFFICIENCIES
- LAWS OF MOTION AND MECHANICS APPLY TO <u>EVERYONE</u>
- MECHANICAL PRINCIPLES PRODUCE A MODEL
- INDIVIDUALS WILL HAVE SOME UNIQUENESS
- MECHANICS OF SPEED CANNOT BE COMPROMISED

OUR GOAL

- OUR GOAL IS TO MINIMIZE DEVIATION FROM THE STANDARD ESTABLISHED THROUGH SOUND SCIENTIFIC PRINCIPLES OF TRAINING.

PHYSICS FUN-DAMENTELS

WHAT IS FORCE?

- FORCE IS A VECTOR QUANTITY
- RESULTS FROM BOTH

MAGNITUDE AND DIRECTION

- VERTICAL FORCES
- PUSHING MECHANICS

“Vertical Force Production
is the key component of top-end and that in turn influences the ability to maintain a slight increase in stride length and stride frequency”
—Dan Pfaff

“To go faster, you need more
force. The more force you apply, the higher you will rise off the ground.”
—Charlie Francis

APPLICATION OF FORCES

- PAY ME NOW OR PAY ME LATER
- Magnitude and Direction of forces applied properly during the initial stages of a race will inherently affect posture, stability, and force production in later stages of the race.
- Gross postural and mechanical inefficiencies early will lead to both accelerative and distributive issues later in the race.

CONCEPT OF STIFFNESS

- REFERS TO THE ABILITY OF THE LEG TO ACT LIKE A SPRING
- MOMENTUM IS DEVELOPED DURING ACCELERATION
- BODY WILL MOVE AT SAME RATE UNLESS ACTED UPON BY UNBALANCED FORCES
- TWO EXTERNAL FORCES WILL CAUSE DECELERATION
- LEG STIFFNESS INCREASES VERTICAL IMPULSE, SHORTENS GROUND CONTACT TIMES, AND INCREASES ELASTIC RETURN

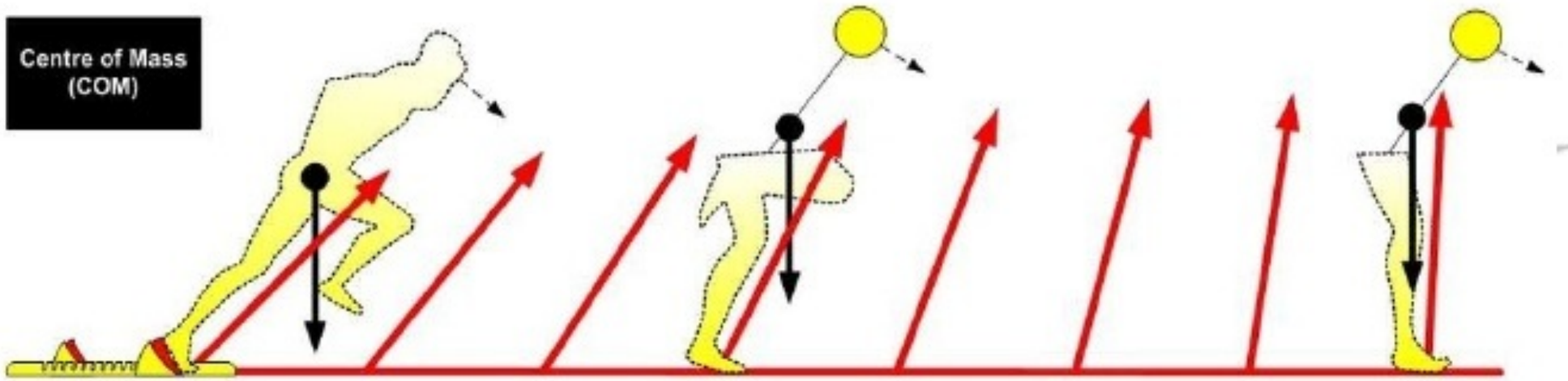
Acceleration: The Start Looks like?

- BIG SPLIT OF ARMS AND LEGS
- FORWARD LEAN FROM ANKLE
- POSTURAL ALIGNMENT FROM HEAD THROUGH SPINE
- TRIPLE EXTENSION
- LOW HEAL RECOVERY
- GRADUAL PROGRESSION OF BODY ANGLES
- LONG GROUND CONTACT TIMES
- ACUTE ANGLES OF THE SHIN

Acceleration: The Start Cues

- Big Push, Big Split
- Knees to Chest
- Stay on Front Pedal
- Push off both feet
- Feel feet behind you
- Push, Push, Push
- Step Over the Ankle
- Push down to Stand Up
- Push yourself up

Drive Phase Mechanics



Block Clearance

1 2 3 4 5 6 7

Shin Angle 45° + 6-7° per Stride 90°

Torso Angle + 2-3° per Stride

0% 80%

Negative shin angles & forward body lean facilitate rapid acceleration

Start of Drive Phase:
> Shin angles at 45° to facilitate maximum displacement from blocks
> Torso angle matches shin angle on foot strike (straight line head to toe)
> Extremely exaggerated arm action to counterbalance extreme forward rotations

Key Coaching Points:
Monitor smooth transition of 1. Shin angles and 2. Torso angle

Other key points to focus on: 3. Arm action, 4. Good posture (straight back, head in neutral position relative to spine), 5. Piston legs and low heel recovery

End of Drive Phase:
> Shin angle at foot strike is perpendicular to ground
> Torso remains slightly inclined
> Arm action still slightly exaggerated to counterbalance slight forward rotation resulting from incline body lean

THE ACCELERATION PROCESS

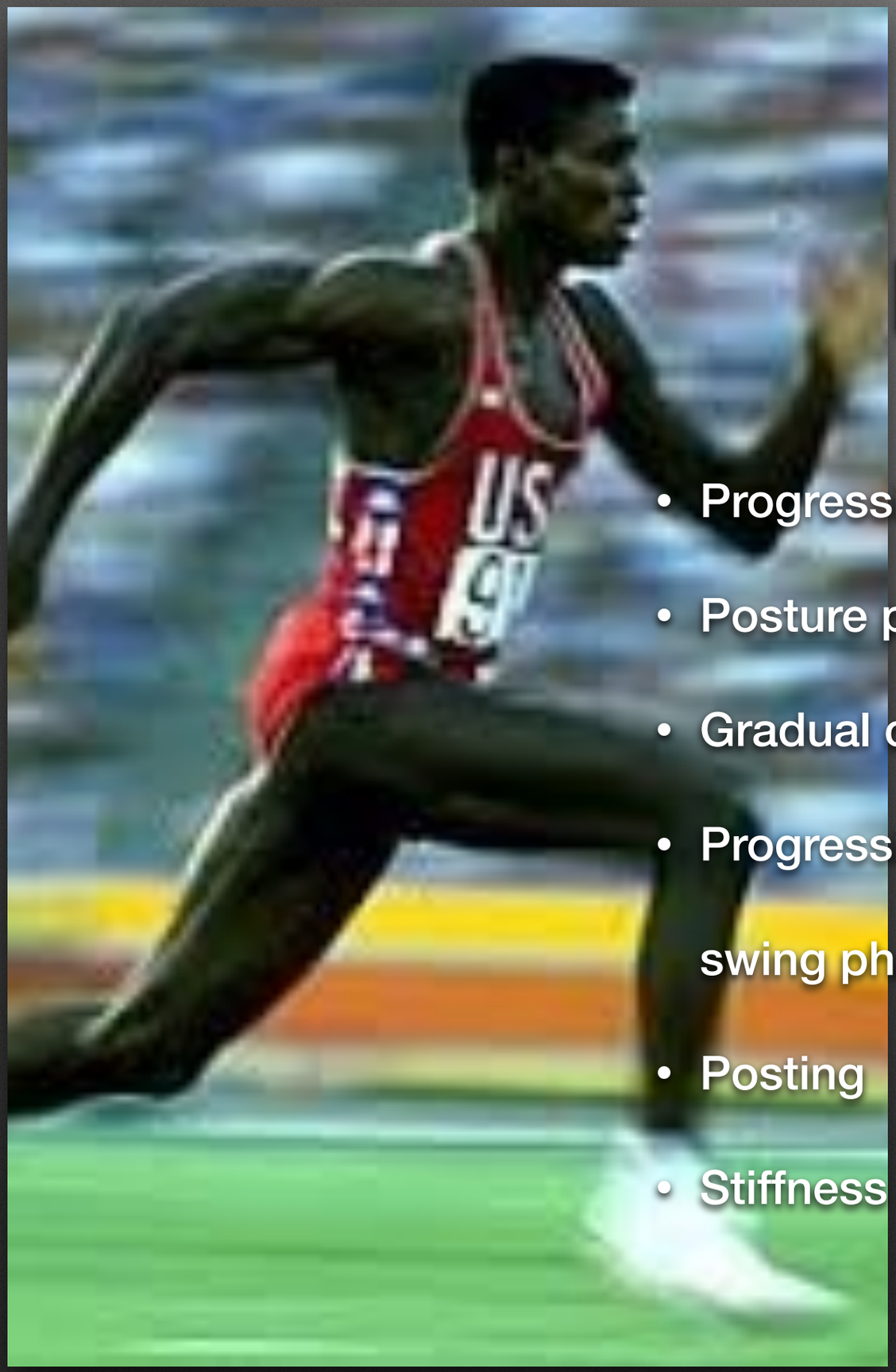
Tracing Common Faults: Result-Cause Relationships

- Stepping Out
- Popping Up
- Lateral Deviation
- Bend at waist instead of entire body lean
- Impatience in drive mechanics
- Incorrect start position
- Any others?

Synthesis

- 2 point
- Rolling
- 3 point
- 4 point
- Blocks

Synthesis



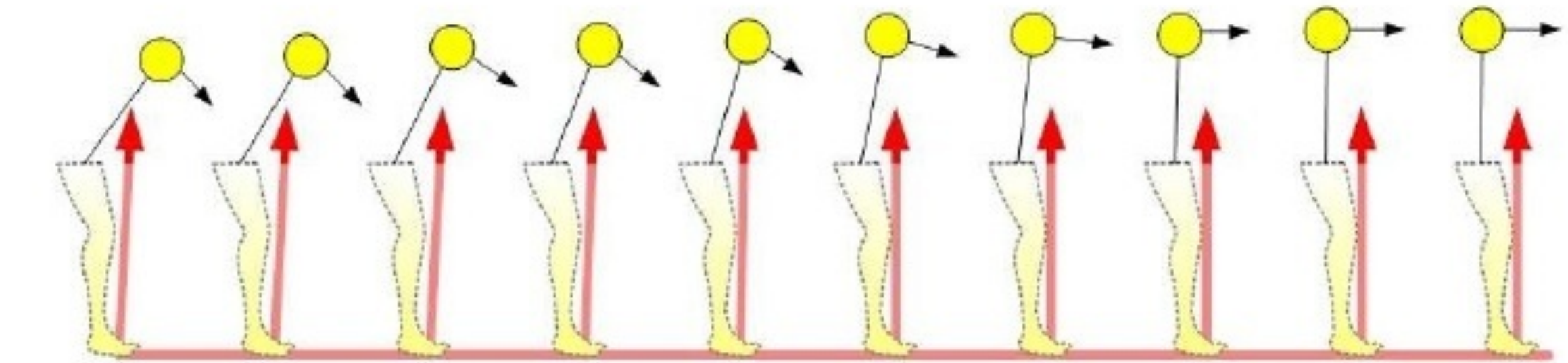
Transition: Looks Like?

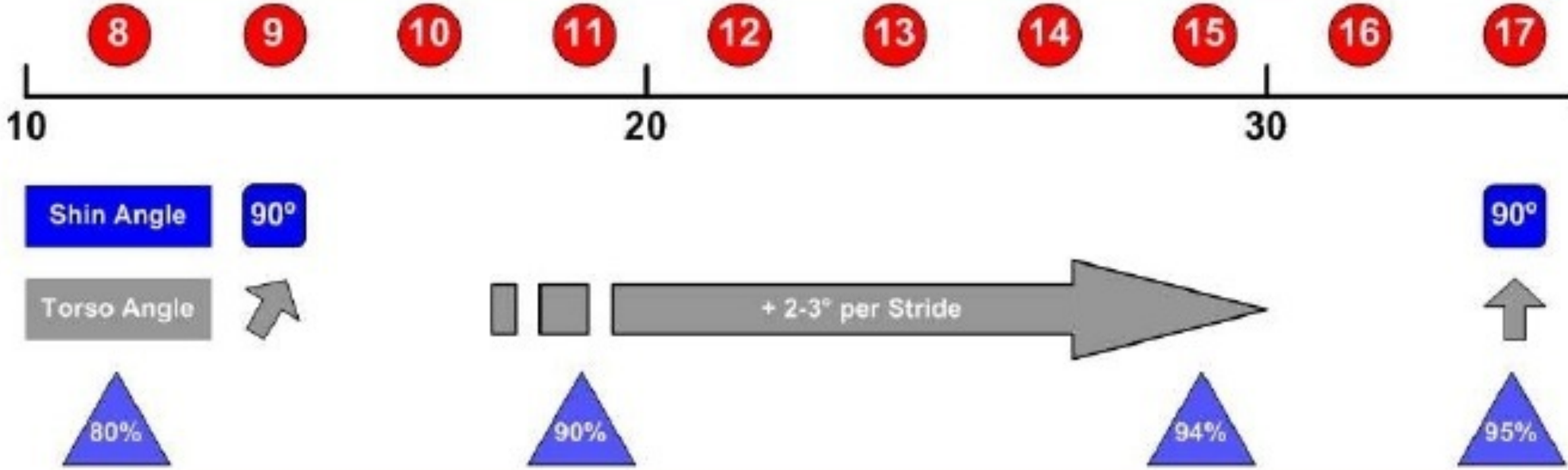
- Progression of body angles to upright
- Posture preserved from accelerative posture
- Gradual changes in limb movement magnitude
- Progressively higher heel recovery during swing phase
- Posting
- Stiffness conserved

Transition: Cues

- Push up to post
- Push yourself tall
- Cheek to cheek
- Step over ankle
- Step over the calf
- Step over the heel

Transition Phase Mechanics





Rate of acceleration slows as forward body lean diminishes

MAX VELOCITY:

LOOKS LIKE?

- PUSHING KINETICS
- UPRIGHT POSTURE (POSTING)
- DYNAMIC ARM SWING
- OCCILATION OF THE SHOULDERS
- HIGH KNEE RECOVERY
- FRONT SIDE DOMINANCE
- RELAXATION IN FACE, SHOULDERS, HANDS
- FOOT CONTACT UNDER HIPS
- VERTICAL SHIN ANGLE AT GROUND CONTACT
- FOOT CONTACT UNDER HIPS
- PRE-ACTIVATION PRIOR TO GROUND CONTACT
- NEUTRAL ALIGNMENT OF HEAD, NECK, SPINE, PELVIS

MAX VELOCITY:

CUES

- Slam elbows down
- Step over the knee
- Feel everything in front
- Run tall and bounce
- Push up…or…Push Down
- Feel the feet under you
- Post Up, Stand Tall

Maximal Velocity Mechanics