

ACCELERATION AND MAX SPEED MECHANICS IN THE POLE VAULT

BY: KEVIN BROWN UNIVERSITY OF SOUTH CAROLINA

STATEMENTS MADE ABOUT WHO POLE-VAULTERS ARE AND WHAT THEY DO

- Pole-Vaulters Run down the runway and put the pole in the ground to go over the bar.
- Pole-Vaulters should have Power and flexibility.
- Pole-Vaulters need the Speed of a Sprinter and the gymnastic ability of a gymnast.
- Pole-Vaulters are Sprinters with a stick.

CONSISTENT FACTORS THAT AFFECT THE MAXIMUM HEIGHT A VAULTER CAN CLEAR

- BASED ON MECHANICAL WORK PRINCIPLES
 - Center of Gravity Height at Take-off
 - Velocity at Take-off
 - Amount of Mechanical work done on the pole
- It has been determined that in a 6m vault take-off velocity is responsible for almost 4m of height.
 - Elite male pole-vaulters run at speeds of 9.5 meters per second
 - (Dr. Peter M. McGinnis; “Biomechanics on a Budget”)

MY PREMISE ABOUT POLE VAULTING

- If VELOCITY at take-off has a major affect on pole vault clearance height we must focus on achieving the highest speeds possible in the approach.
- Slow to fast rhythm in the approach run is not an intentional action, but a result of proper acceleration mechanics.
 - Have to be careful of what you think you see not actually being what is occurring. “My Mind Playing Tricks on Me” (Ghetto Boys)
- The Approach is an aggressive action similar to the 100m Sprint.

PARAMETERS OF PROPER ACCELERATION TO MAX SPEED MECHANICS IN THE POLE VAULT

- **Body Position**
 - Hips Tall (Chest up Shoulders back)
 - Balls of Feet
 - Slight Forward Lean (Max Sprint Position)
- **Movement of Legs**
 - Toe Up, Knee Up, Heel Up
 - 90 degree shin angles (Protect throughout the approach)
 - (Most powerful angle that can produce the most force)
- **Speed = Stride Length then Stride Frequency**
 - (Running is pushing action)

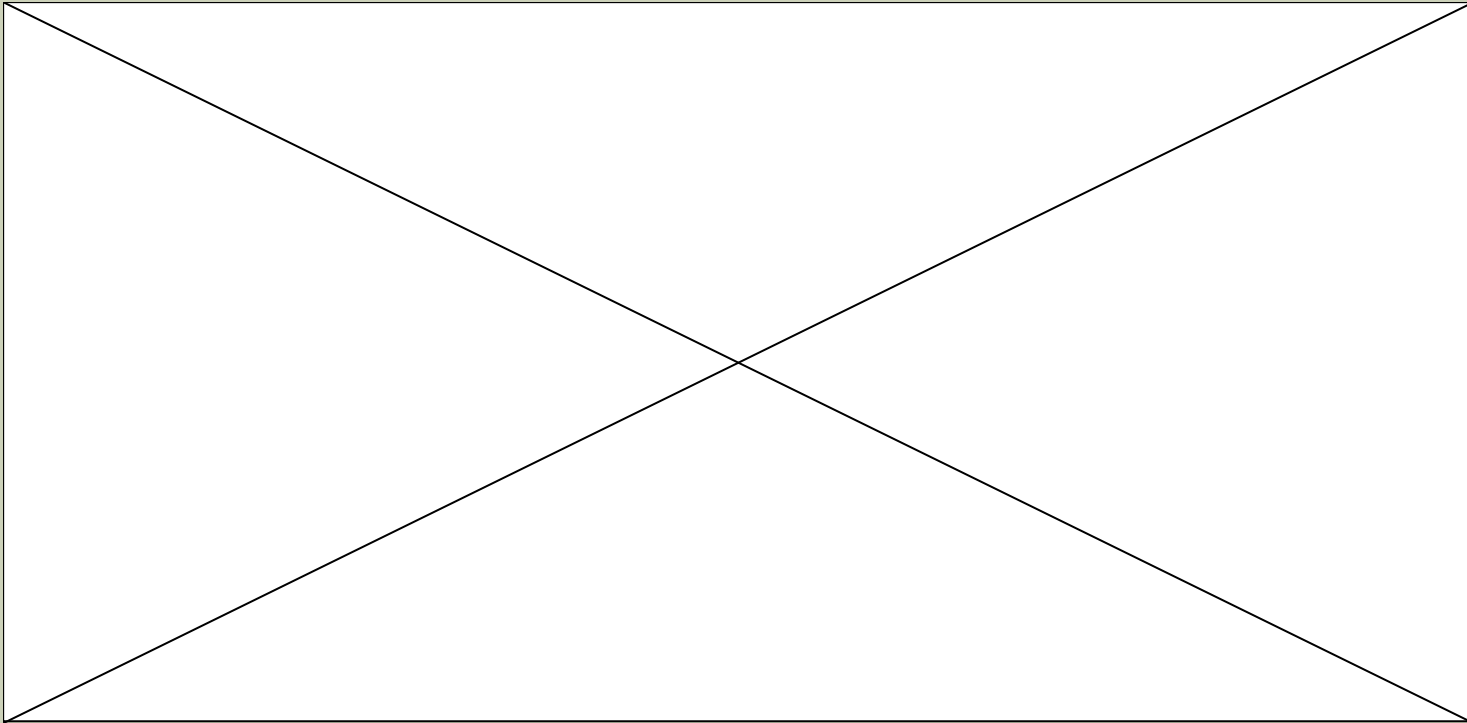
SETTING UP THE APPROACH

■ Must Break Inertia

- Have to create horizontal movement with the hips in the first four steps by pushing or driving out of the back of the approach.
 - (Hip Displacement)
- In this phase of the approach there will be longer ground contact in order to drive or PUSH.
- The athlete must exercise PATIENCE in this part of the approach.

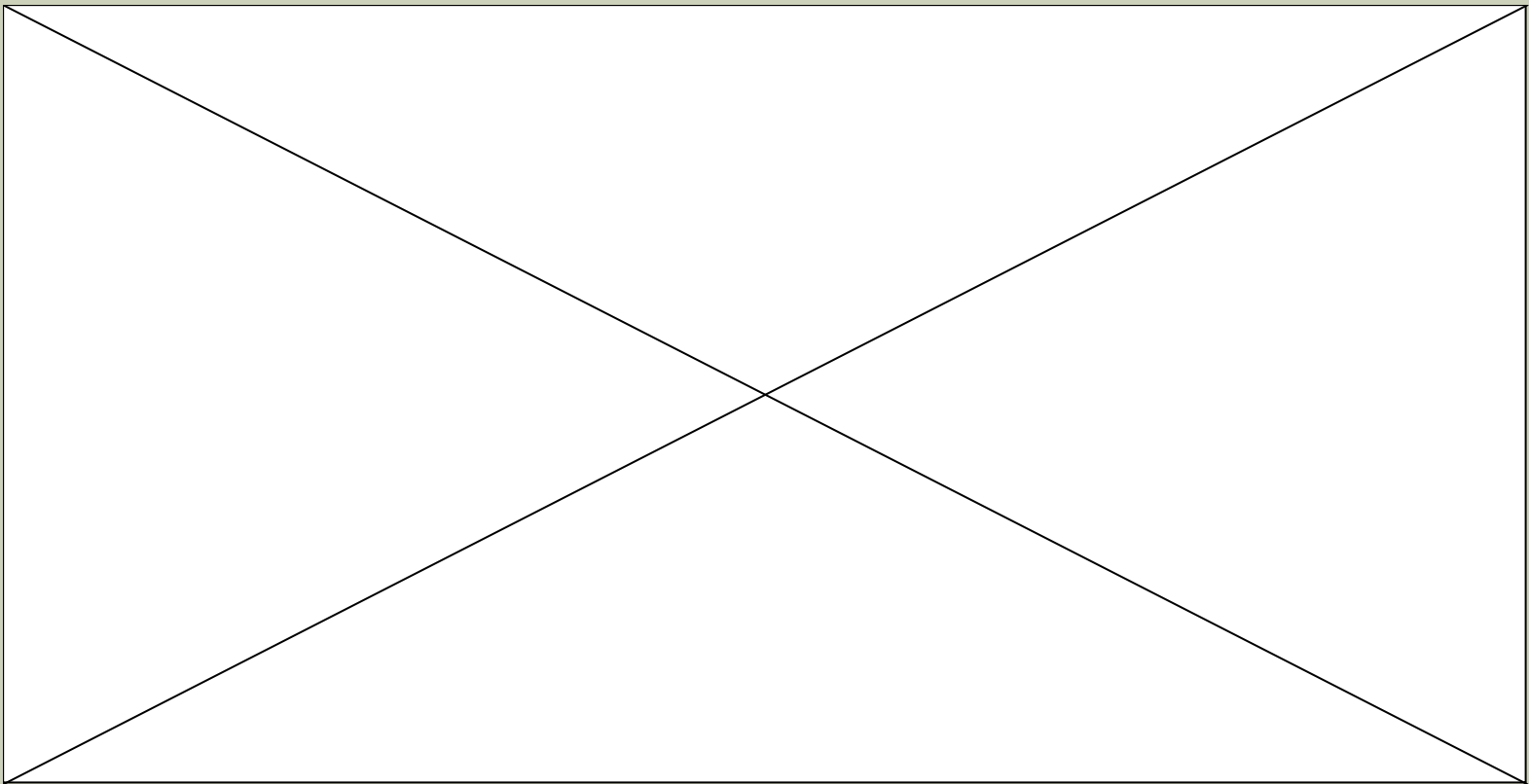
SETTING UP THE APPROACH

- **PUSH and PATIENCE (Hip Displacement)**



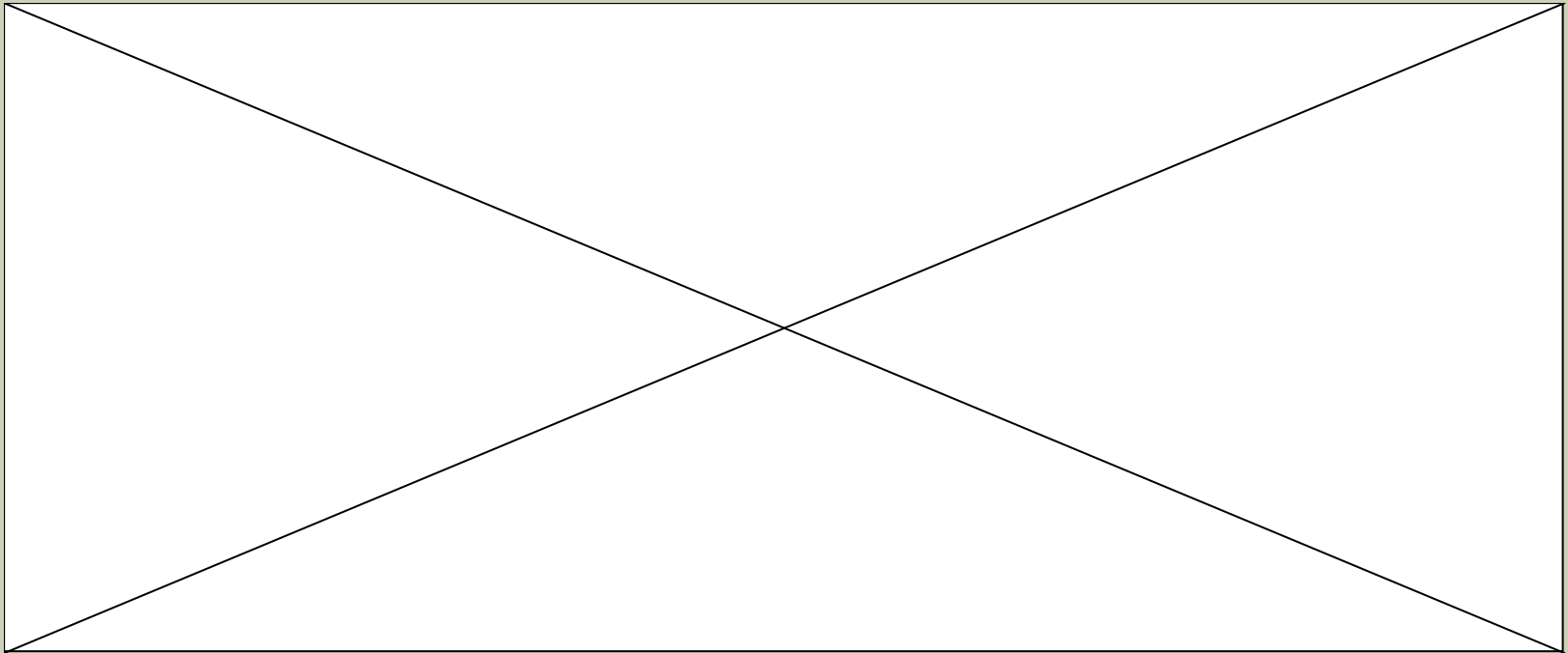
SETTING UP THE APPROACH

- **PUSH AND PATIENCE** Phase similar to the Sprint



SETTING UP THE APPROACH

- Transition to upright running (Max Sprint Position)
 - Athlete must PUSH-UP through the hips to get to this body position



SETTING UP THE APPROACH

■ Stride Frequency

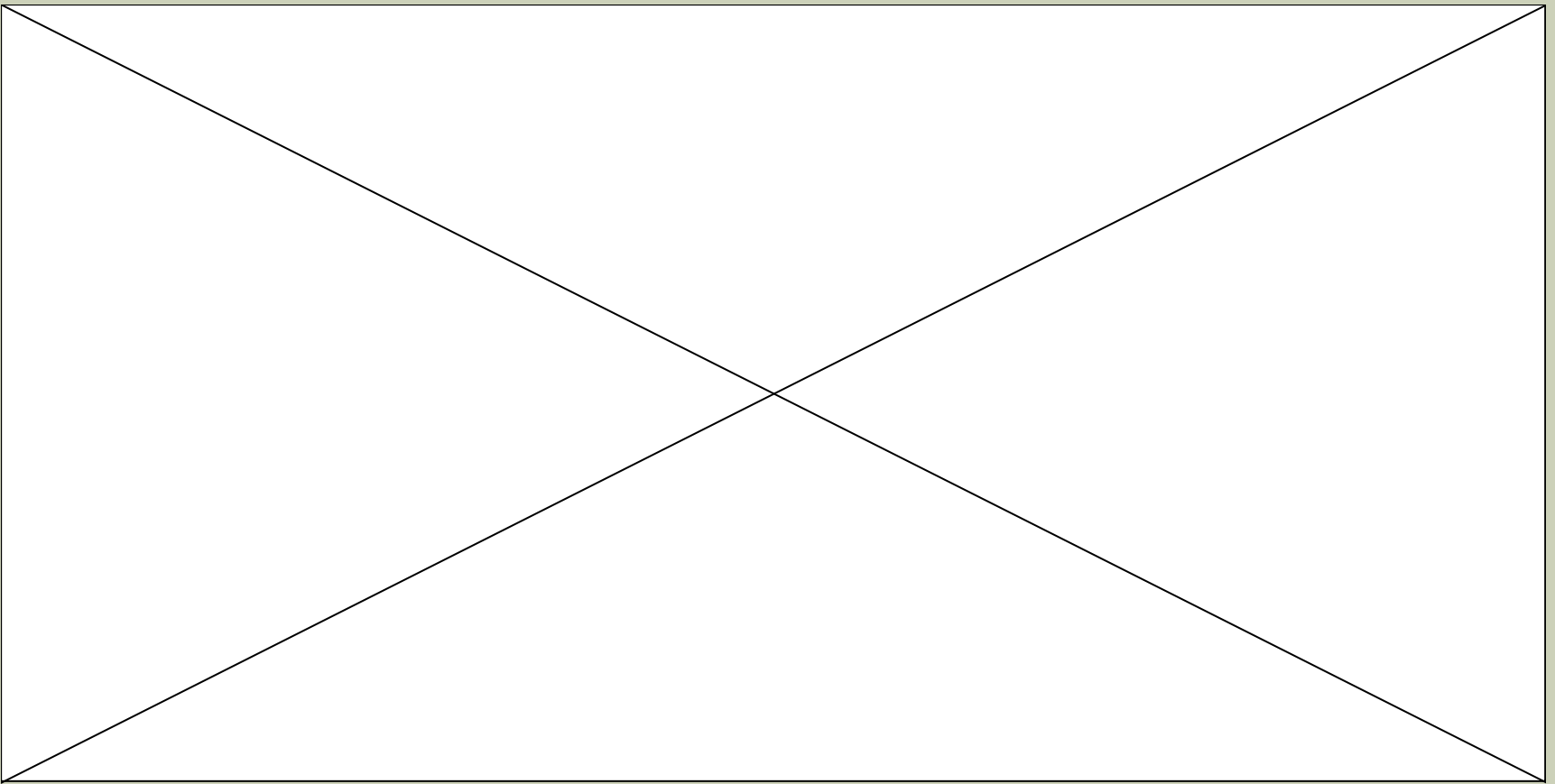
- There is a reduction of ground contact time in this phase. Each stride will get faster and faster.
- The athlete will focus on continuing to run with their knees in front of them protecting 90 degree shin angles concentrating on **PUTTING THE FEET DOWN** underneath their center of mass.

■ Front Side Running Mechanics

- At touchdown the athletes knees will be together with no space in between them.

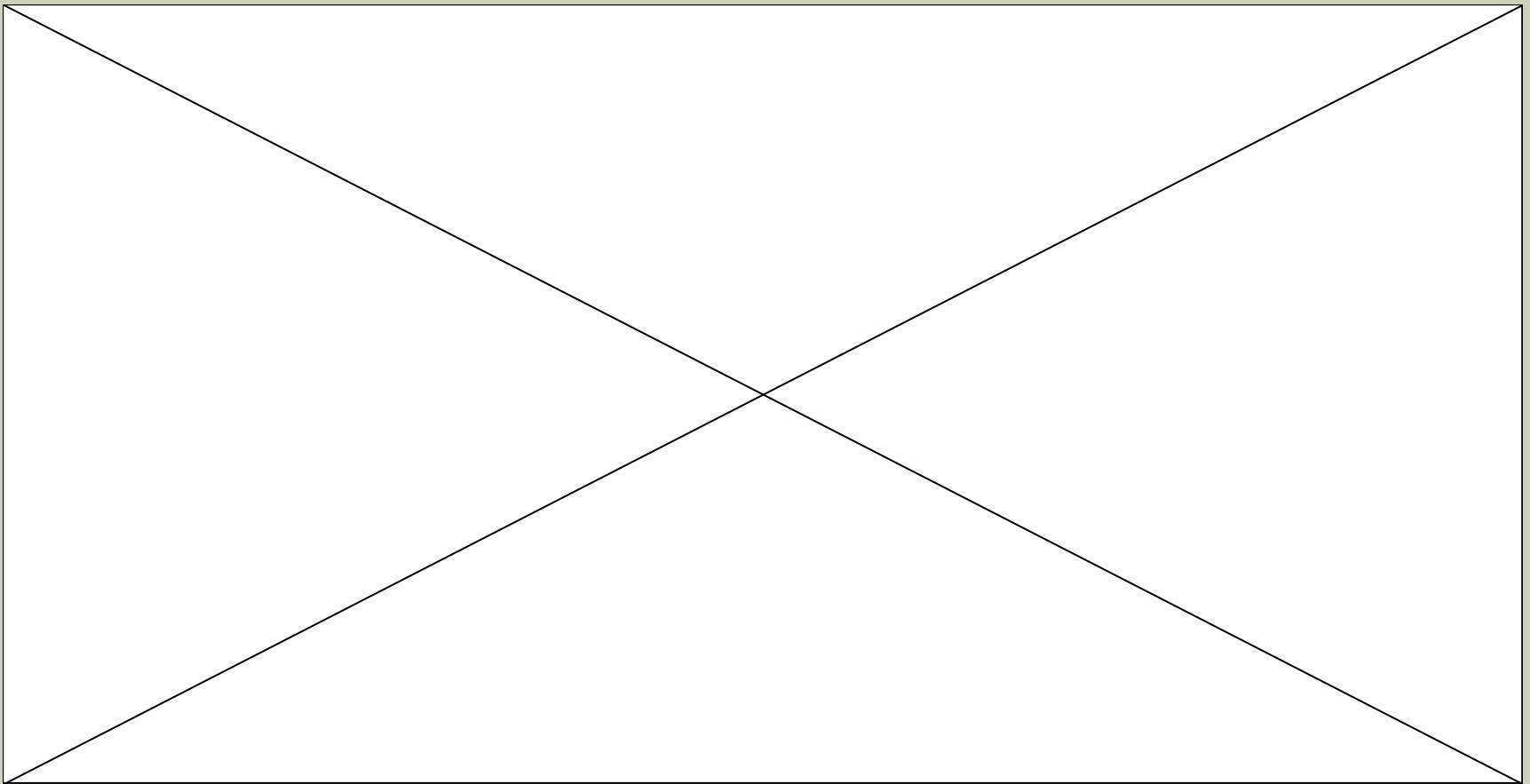
SETTING UP THE APPROACH

- Stride Frequency



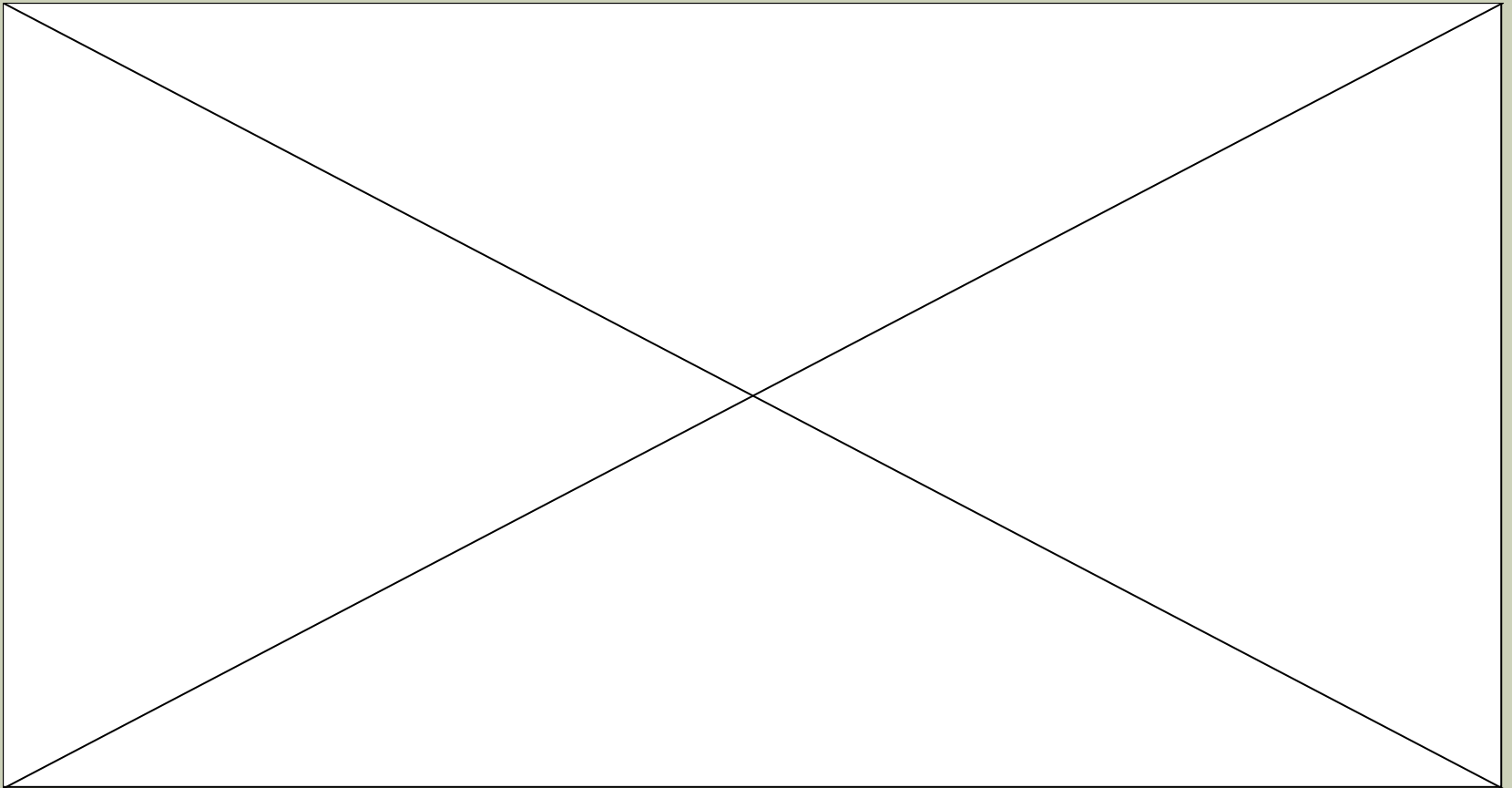
SETTING UP THE APPROACH

- Stride Frequency Similarities to the Sprint Race



SETTING UP THE APPROACH

- Executing the Phases (Knees together at touchdown)



TRAINING THE APPROACH

■ Acceleration Drill

- Set-up sticks at 5 to 5 ½ feet apart. The number of sticks will equal to one more longer than the number of strides in the approach if the athlete's first step in the approach is not their take-off foot. If the first step in the approach is their take-off foot then you will have the number of sticks equal the number of strides
 - Example: 9 left or 18 stride approach use 19 sticks (Non take-off foot start)
 - Example: 9 left or 18 stride approach use 18 sticks (take-off foot start)
- The athlete starts at the beginning of the sticks and run through them placing one foot between each stick. In the beginning of the run the athlete will have to push to increase stride length. At the end of the run the athlete will have to put their feet down quickly moving through the stride cycle as if the sticks are too close.

TRAINING THE APPROACH

- Exercises that assist with training acceleration and max speed mechanics of the approach .
 - Sled Pulls- (Start without Pole then add Pole)
 - Hill Runs
 - Hurdle Hops
 - Bounding- (Alternate leg Bounds)
 - Standing 30m
 - Flying 30m
 - Turnaround 100's
 - Runs on a Crowned Field (Football/Soccer Field)

EXECUTING THE APPROACH

- Once the back end of the approach is properly executed (Push, Patience, Push-up) use of mid marks help guide the coach in continuing to have the athlete accelerate into the take-off.
 - Mid Marks (last six steps, some use last four)
 - (David Johnston : www.oneapproachrun.com)
 - I use the mid mark also as a place in the approach for the athlete to emphasize putting the feet down by playing a game of chase with the pole.
 - Athlete must anticipate the plant and take-off which will cause them to continue to accelerate (Anticipator Drills)

SUMMARY

- The Pole Vault approach is an aggressive action of executing the 4 “P’s” with proper sprint mechanics.
 - PUSH
 - PATIENCE
 - PUSH-UP
 - PUT THE FEET DOWN
- Out of all of the testing that has been done analyzing what affects the Pole Vault clearance, the velocity at take-off is the biggest determining factor of height cleared.

INFLUENCES ON PHILOSOPHY

Dr. Peter McGinnis- Biomechanist

Dr. Ralph Mann- Biomechanist USATF Sprints and Hurdles

Curtis Frye- Head Coach University of South Carolina

Dennis Mitchell- Head Coach University of Akron

Jeff Ward- Former Assistant Coach UNC Chapel Hill

Jim Fleming- Pole- vault Coach

Delethea Quarles- Assistant Head Coach University of South Carolina

James Daniels- Assistant Coach University of South Carolina

Jim BeMiller- Pole Vault Coach University of Tennessee

David Johnston- Assistant Coach East Tennessee State

Earl Bell- Pole Vault Coach

Bill Faulk- Pole Vault Coach

Don Hood- Pole Vault Coach

Jan Johnson- Pole Vault Coach

Bob Fraley- Pole Vault Coach

Brian Yokoyama- Pole Vault Coach

QUESTIONS

Kevin Brown

Assistant Track and Field Coach

University of South Carolina

(803)777-6487 office

(803)543-7649 mobile

Brownk28@mailbox.sc.edu