

# Analysis of Fundamental Movements

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# Fundamental Movement Patterns

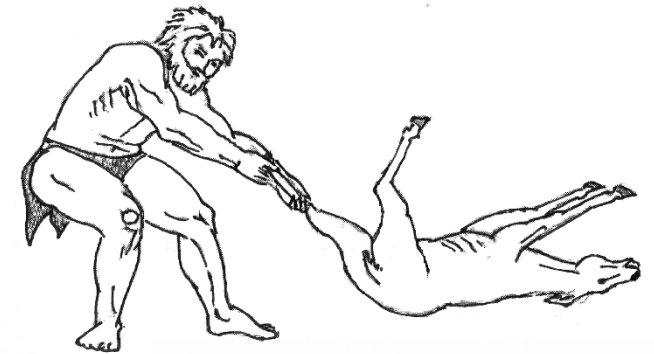
- PHAC 3040 will focus on the following fundamental movement patterns



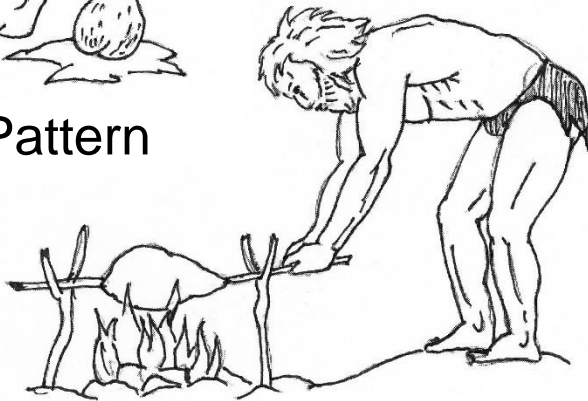
Squat Pattern



Lunge Pattern



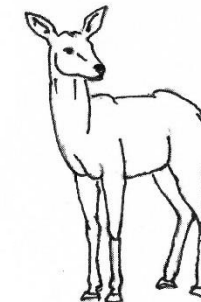
Pull Pattern



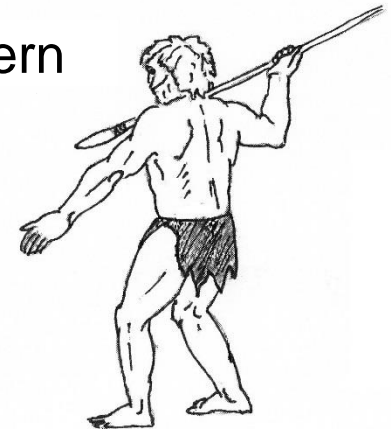
Bend Pattern



Push Pattern



Twist Pattern



# Fundamental Movement Patterns

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Squat Pattern

# Squat Pattern

- Flexibility is very importance
  - Shoulder and mid-back
  - Hip / knee / ankle
- Important to be able to perform body weight squats first
- Muscles targeted: lower extremity and back!
  - Variations: back, front, and sumo squats



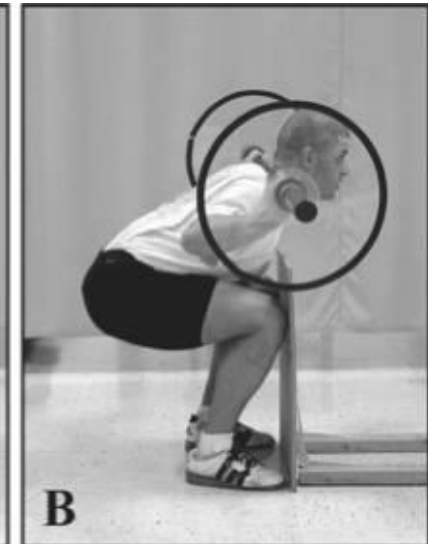
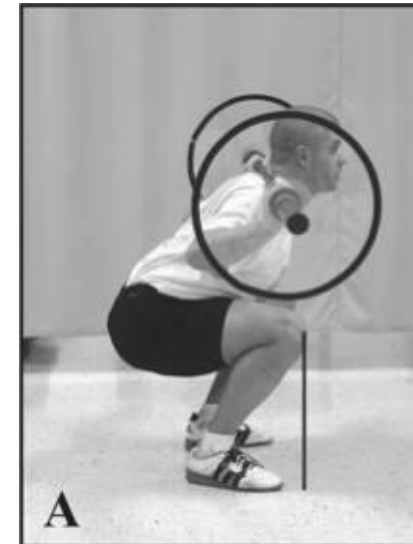
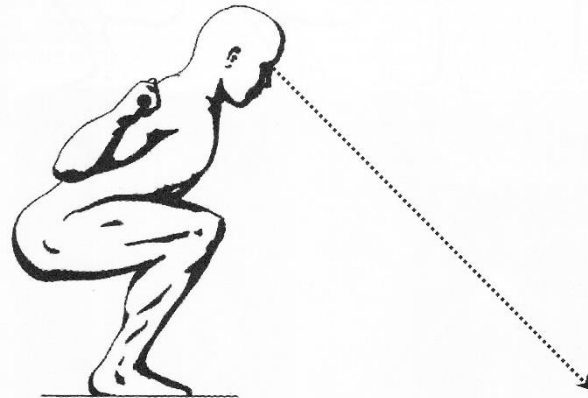
# Squat Pattern

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- Starting Position
  - Racked bar height ~mid-chest
  - Grip width slightly wider than shoulder width
  - Scapula retracted [important to activate the lats]
  - Bar should rest across the deltoid and upper trapezius muscles
    - Never on cervical spine
  - Feet position ~shoulder width or slightly wider
    - Slightly externally rotated to optimize hip joint mechanics

# Squat Pattern

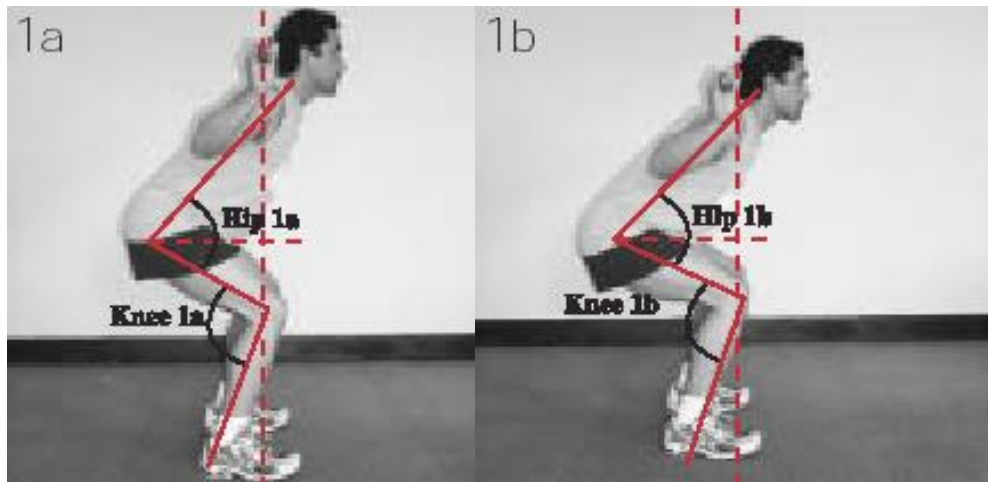
- The Descent
  - Rigid torso, braced abs, motion begin at the hips, followed by the knees
  - Weight should be balanced b/w forefoot and heels
  - Knees should track over foot regardless of stance
    - Knees will naturally go beyond the toes (with traditional squat stance)



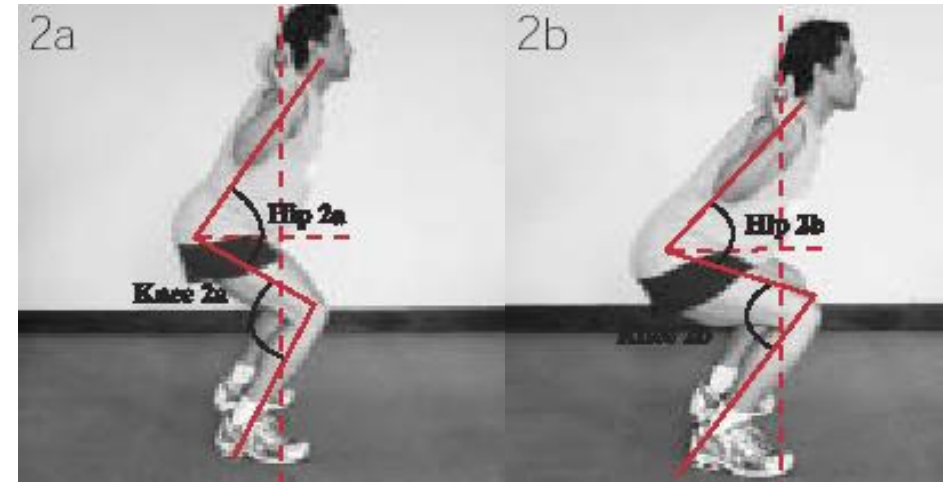


# Squat Pattern

- The Descent
  - Bottom position should have thighs at least parallel to floor.
  - Descent should be slow and under control at all times.



Restricted knee position

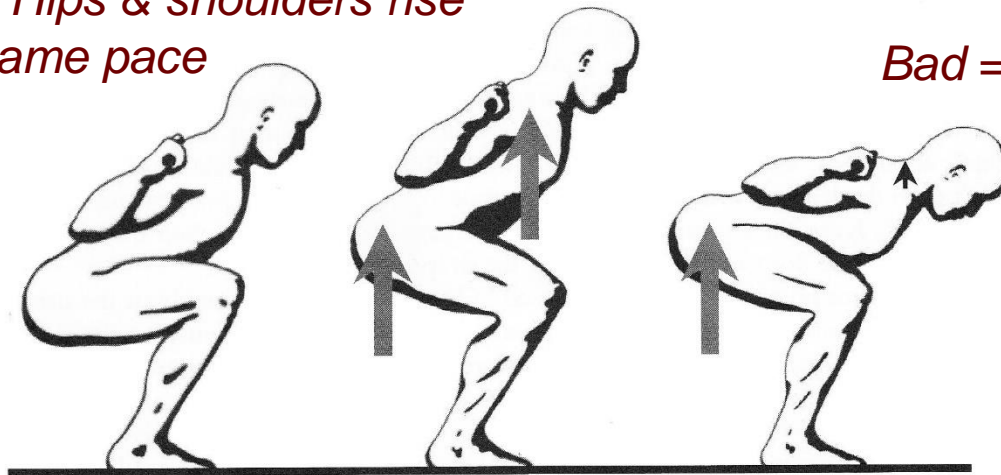


Unrestricted knee position

# Squat Pattern

- The Ascent
  - Speed: faster than the descent
  - Hips should remain under the bar as much as possible
  - Avoid: pronation (medial rotation) and adduction (bringing knees together) of knees while ascending
  - Slow exhale through the sticking point

*Good = Hips & shoulders rise  
at the same pace*



*Bad = Hips rise faster than  
shoulders*



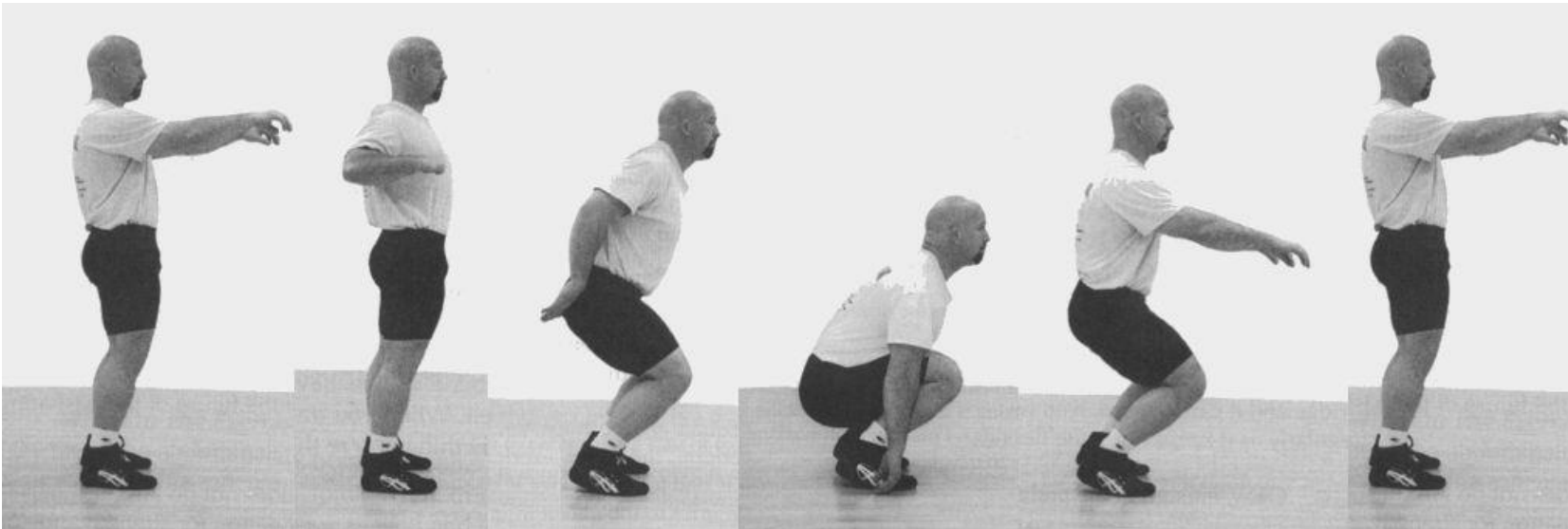
# Squat – Safety

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- Back position / stability is of prime importance
  - Rounded back results from:
    - Poor isometric back strength
    - Poor flexibility of the shoulders, mid-back, hips and ankles
    - Poor movement initiation technique
- Knee injuries result from either:
  - Foot rotation (bottom – up)
  - Poor hip stabilizers (top – down)

# Squat Pattern Bodyweight Exercises

- Breathing squats
  - Exhale on the way down
  - Inhale on the way up
- Hindu squats
  - Used by Indian wrestlers for centuries to build explosive lower body strength, power, speed and endurance



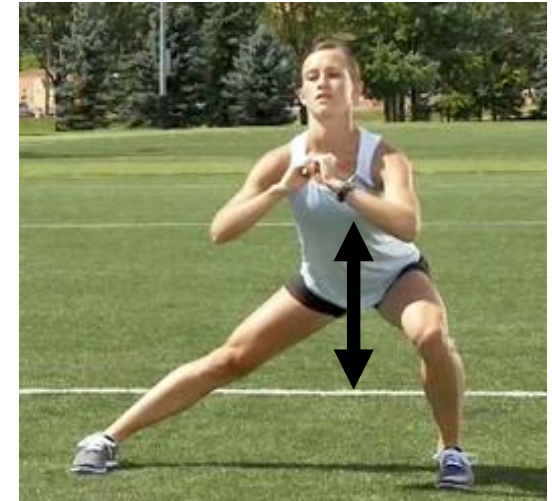
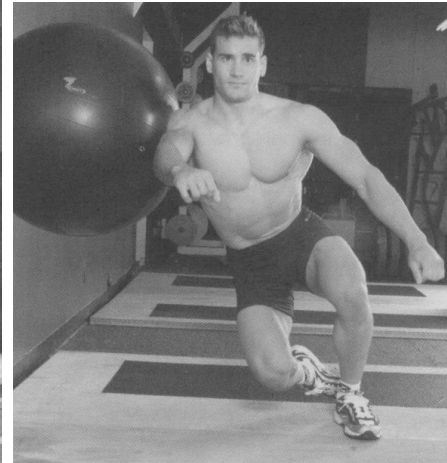
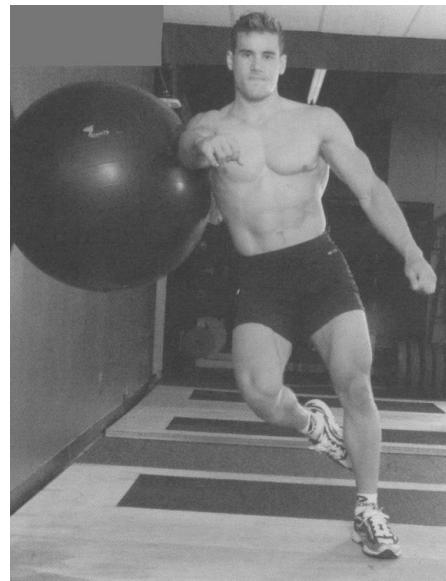
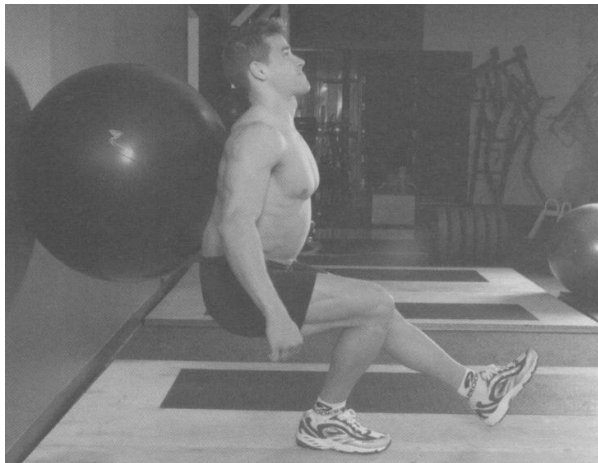
# Squat Pattern Bodyweight Exercises

- Breathing squats
  - Exhale on the way down
  - Inhale on the way up
- Hindu squats



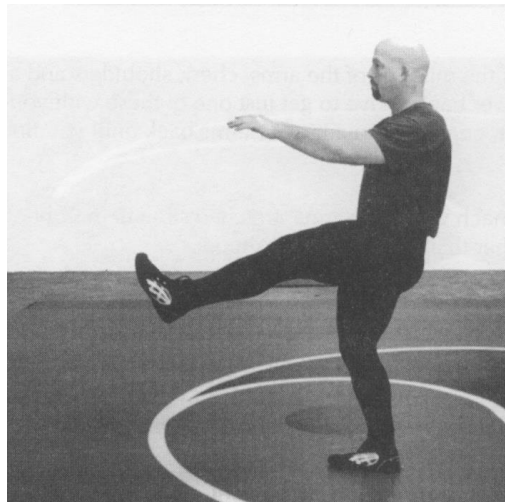
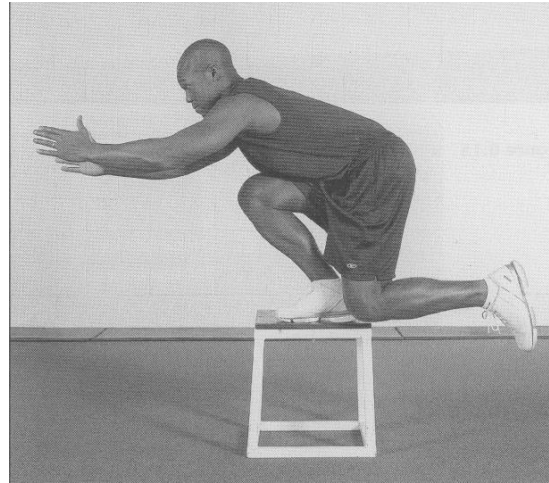
# Squat Pattern Bodyweight Exercises

- Single leg squats
  - Lateral offset stance
  - Front and back variation with Swiss ball



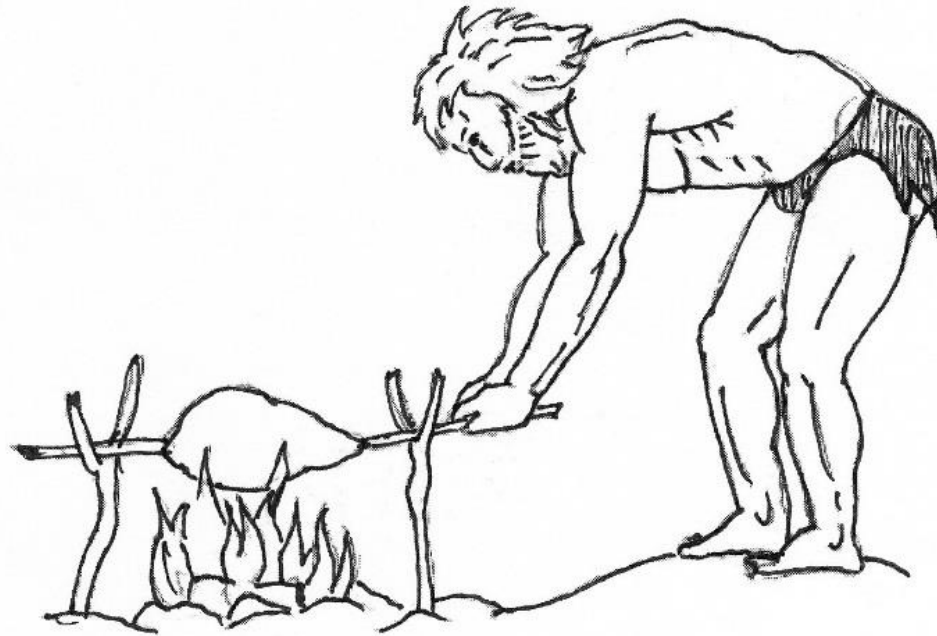
# Squat Pattern Bodyweight Exercises

- Single leg squats
  - Skaters squat
  - Pistols



# Fundamental Movement Patterns

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Bend Pattern



# Bend Pattern

- Deadlift
  - Basic technique
    - Starting Position:
      - ‘Narrow’ foot stance (~shoulder width)
      - Pronated grip, hands slightly outside of knee
        - Alternating can be used w/ experience

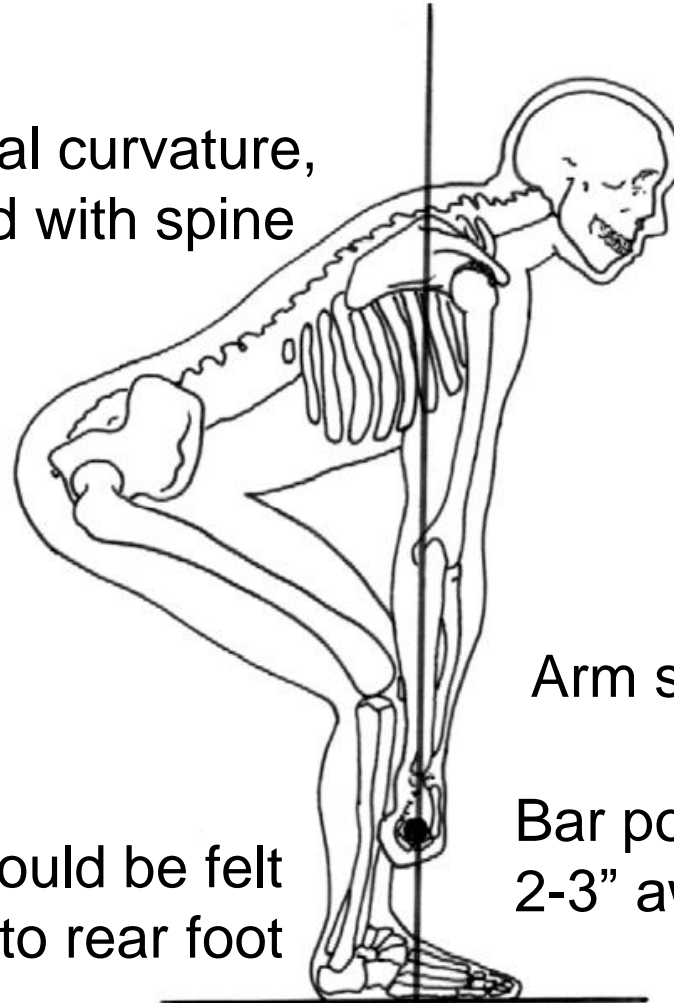




# Deadlift Position

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Normal spinal curvature,  
head aligned with spine



Shoulders slightly beyond bar:

- Scapula over bar
- Scapula retracted and depressed
- Important to activate the lats

Arm slopes about  $10^{\circ}$  down

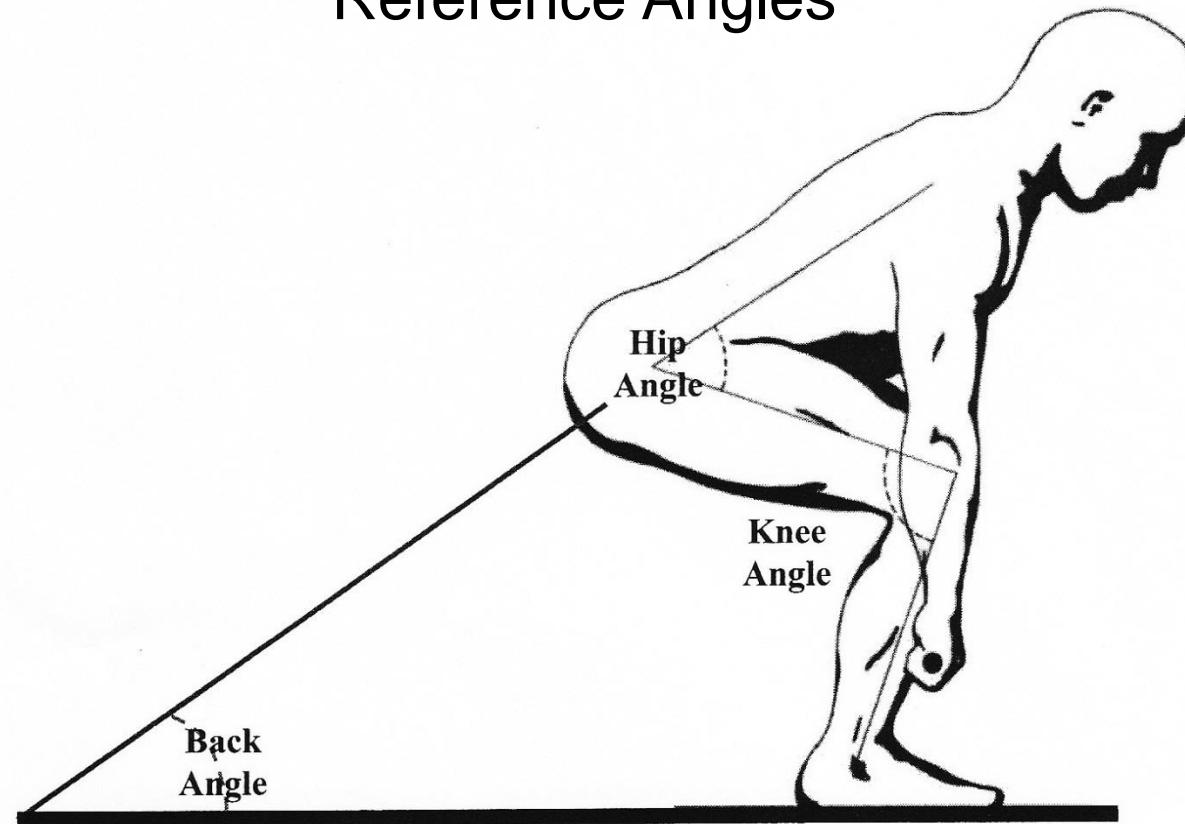
Pressure should be felt  
mid- to rear foot

Bar positioned mid-foot,  
2-3" away from shins

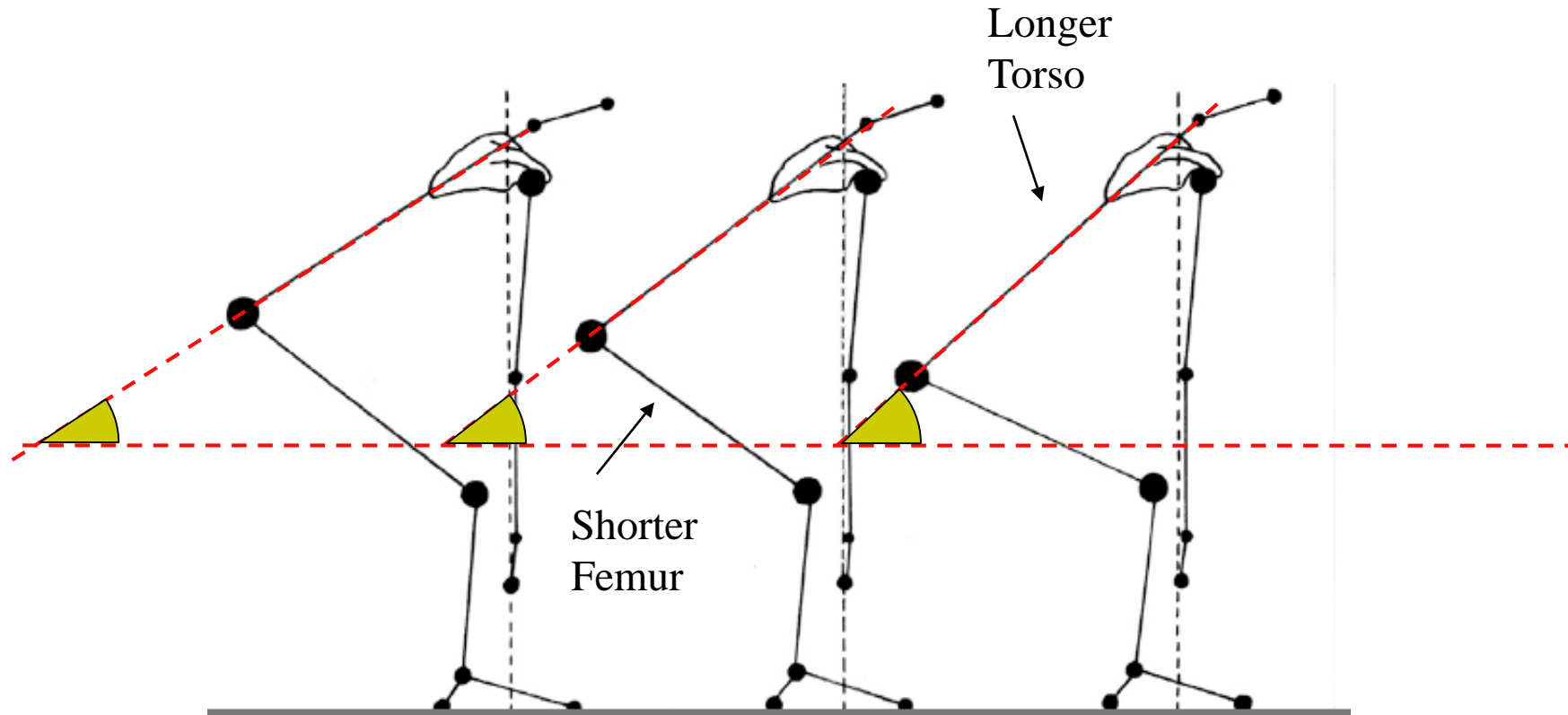
# Deadlift Position

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## Reference Angles



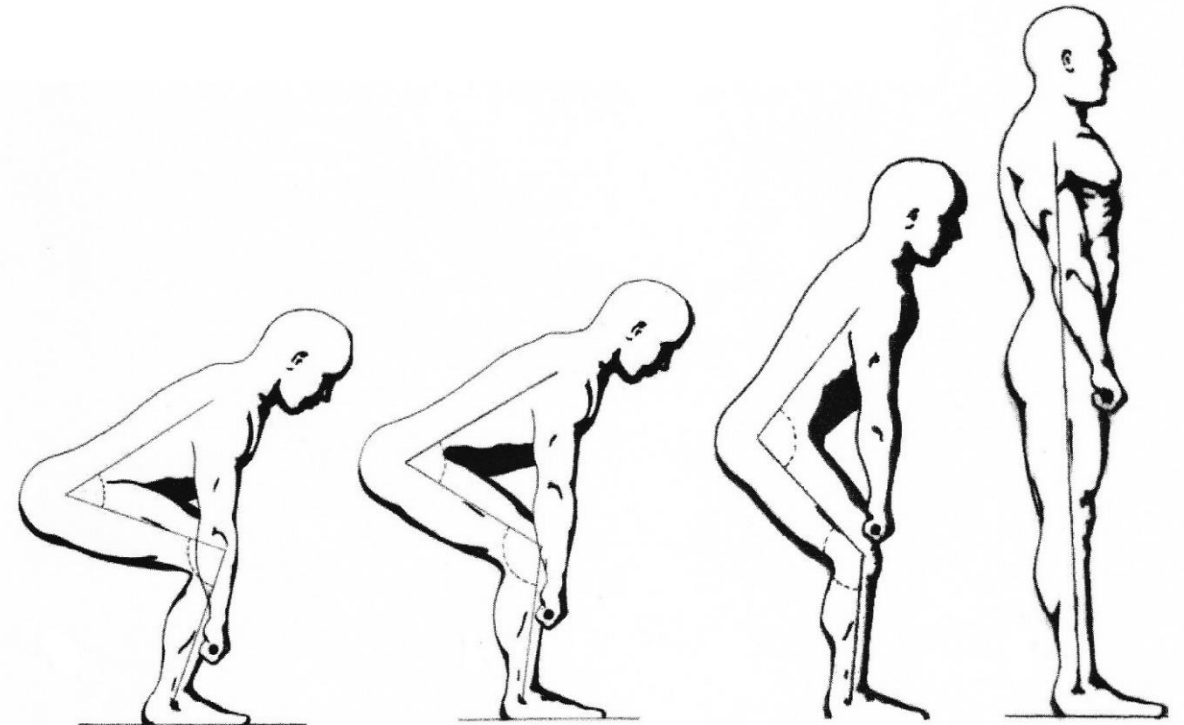
# Deadlift Position



The effect of different variations of back/femur dimensions on back angle in the starting position.

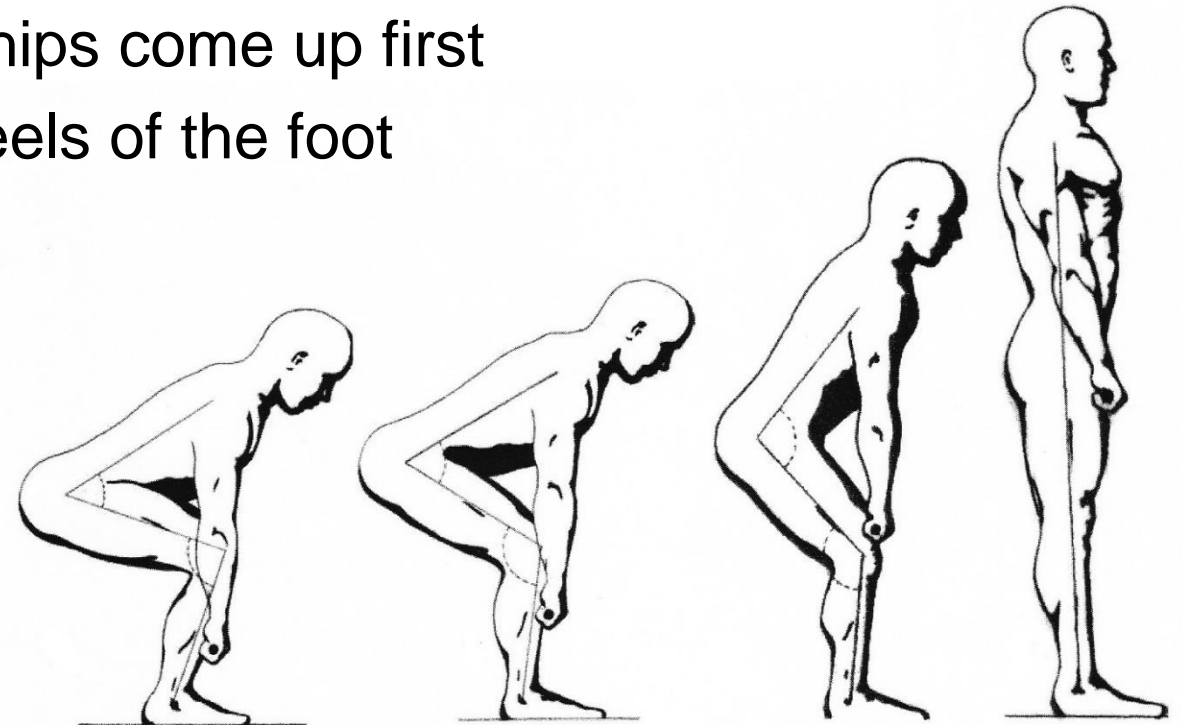
# Deadlift Lifting Sequence

- Starting Position
  - Inhale and brace the abdominals
  - Chest out (i.e. externally rotate humerus, retract and depress scapula)
  - Wiggle your toes



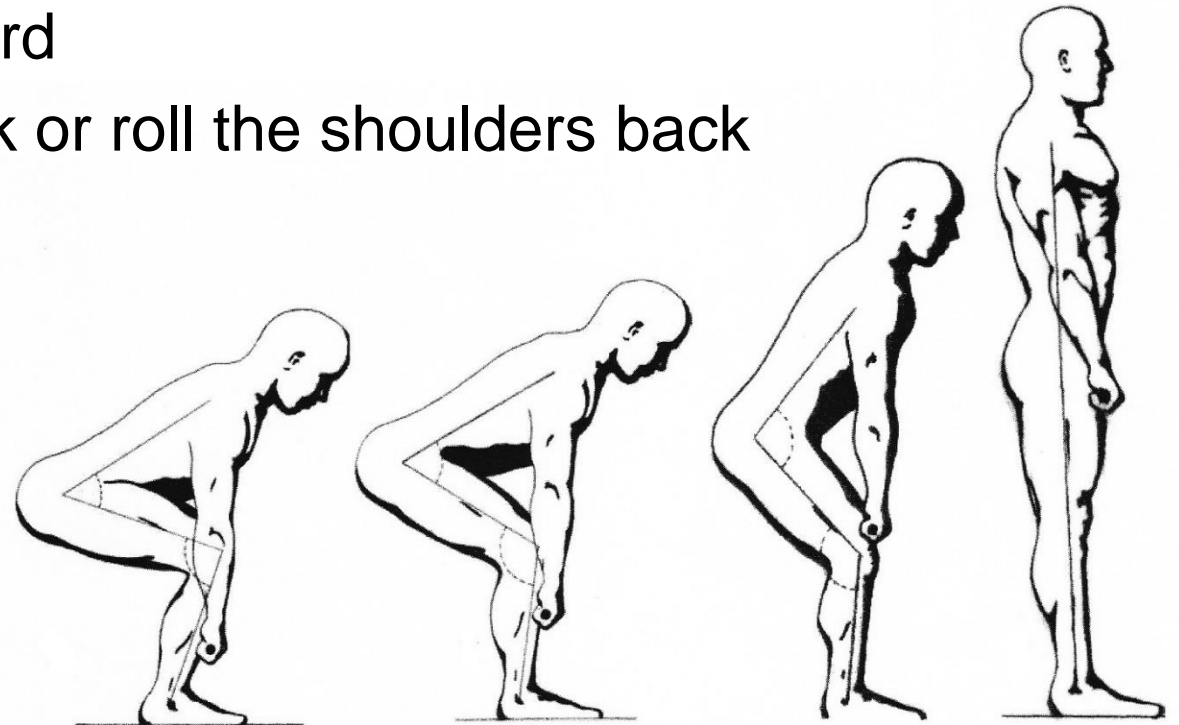
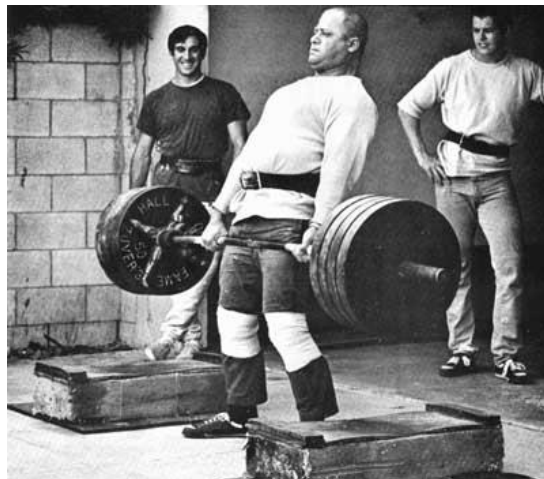
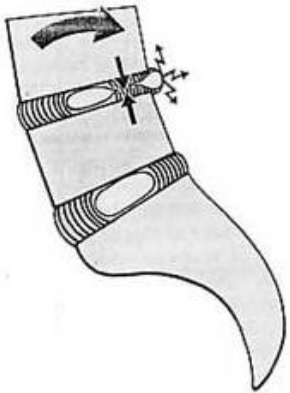
# Deadlift Lifting Sequence

- First pull
  - Aim is to pull straight up using the hips
  - Knee angle first to change while maintaining back angle
  - Back musculature acts as a stabilizer
    - Common fault is to have the hips come up first
  - Pressure should be felt on the heels of the foot
- Transition
  - Once the bar is over the knees, both the back and hip angles begin to change significantly



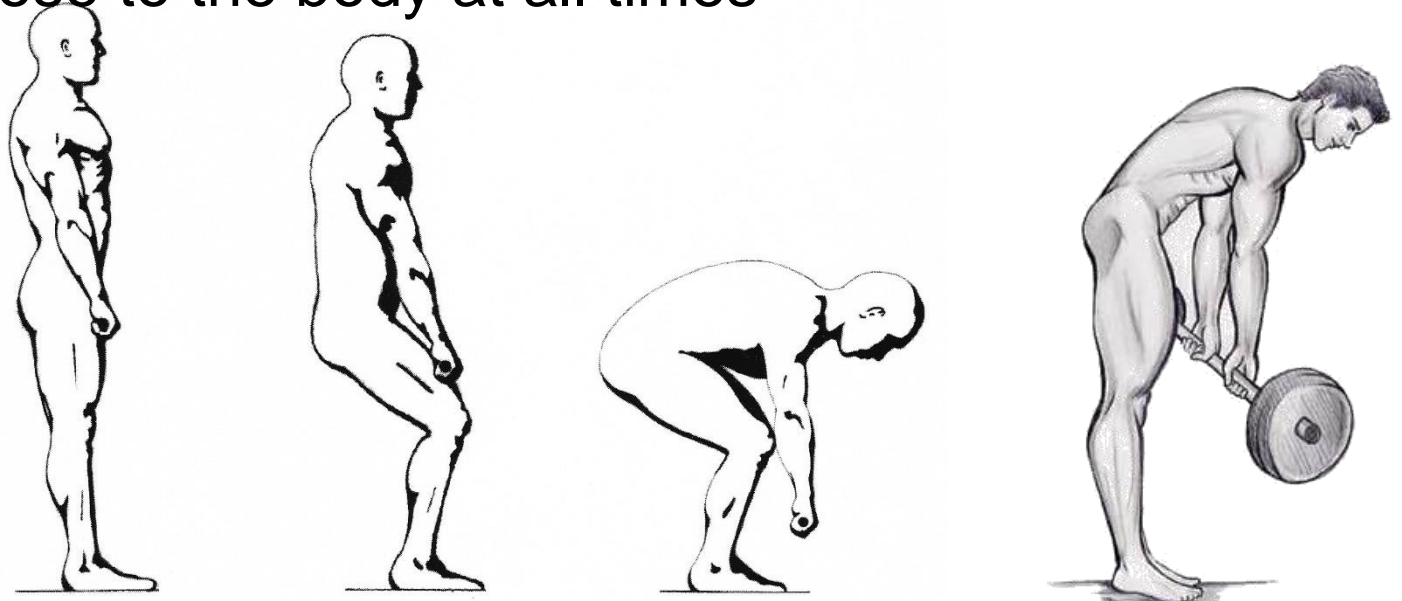
# Deadlift Lifting Sequence

- Second Pull
  - Back muscles are called in to stand erect
  - Bar stays in contact with the thighs at all times
  - Finish with body completely locked out standing straight: shoulders back, chest up, and eyes looking forward
  - No need to hyperextend the trunk or roll the shoulders back



# Deadlift

- The decent
  - Injuries are very common during the decent
  - Do not sit or round the back
  - The hips will lower the weight to the knees, the knees will then take over bringing the bar down to the floor
    - The bar should be close to the body at all times





# Deadlift – Safety

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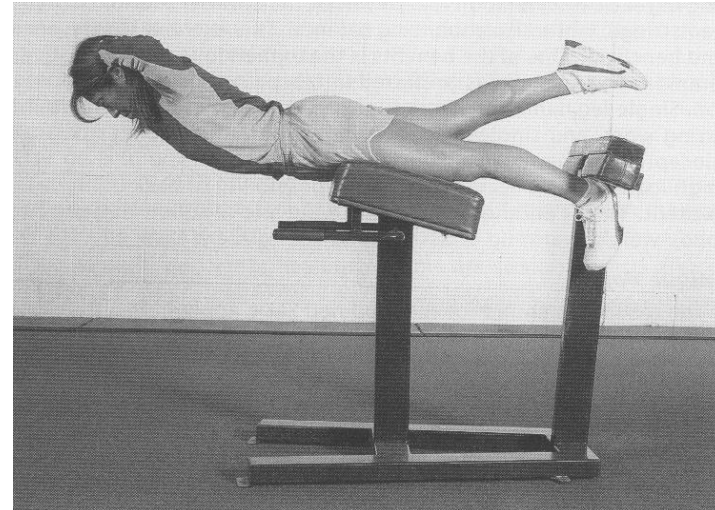
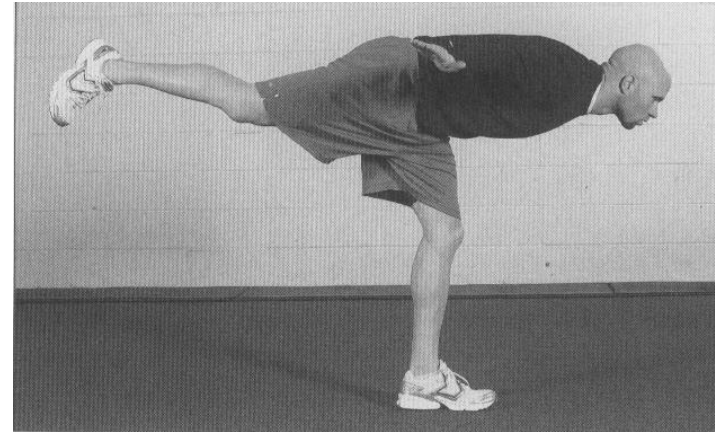
- ❑ Risk of lumbar spine injury becomes significant if:
  - The back is rounded excessively at anytime or
  - Simultaneously rounded and rotated
- ❑ Back safety:
  - Maintain 'normal' anterior pelvic tilt is maintained
    - ❑ Neutral lumbar curvature
  - Flat lumbar spine is ok
  - Slightly hollowed mid-back
    - ❑ Normally occurs w/ near-maximal weights



# Bend Pattern Bodyweight Exercises

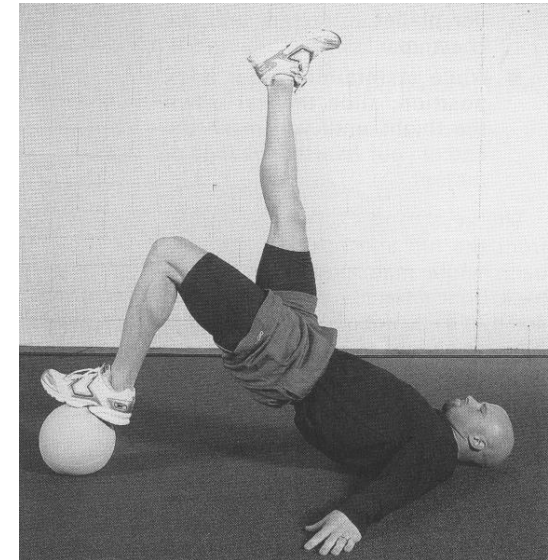
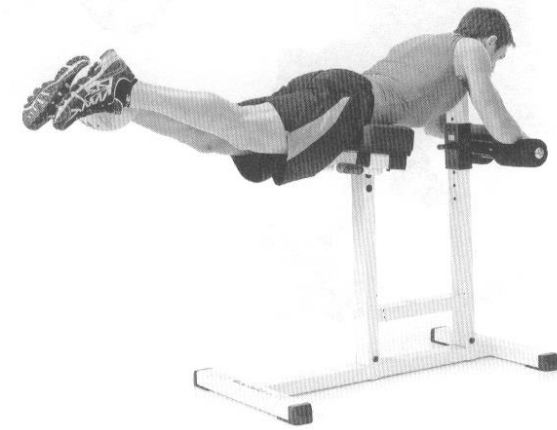
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- Single leg deadlift
- Back extension
  - Important to maintain rigid torso
  - Progression: 2 legs → 1 leg



# Bend Pattern Bodyweight Exercises

- Hip extension
  - Important to maintain rigid torso
  - Progression: 2 legs → 1 leg



# Fundamental Movement Patterns

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Lunge Pattern

# Lunge Pattern

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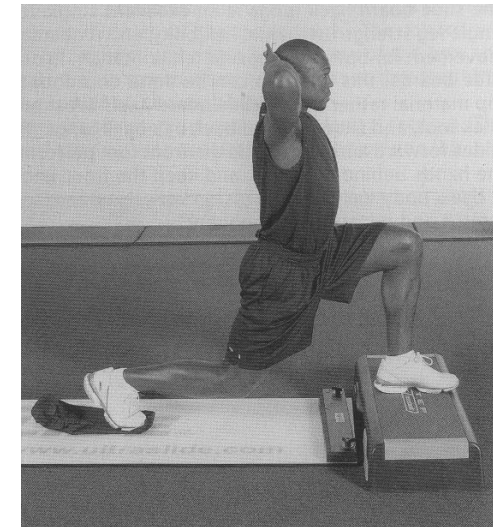
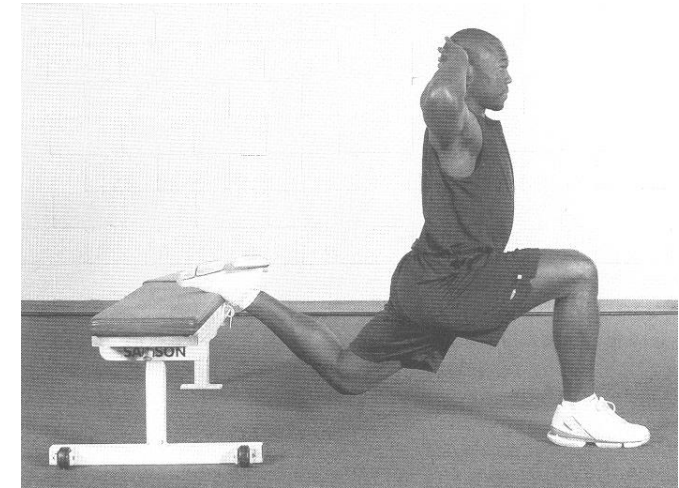
- Torso
  - Should remain vertical (note any exaggeration in lumbar curvature)
  - Resist rotation
- Front knee should track over central axis of the foot (2<sup>nd</sup> toe)
- Back foot / leg should not be allowed to rotate





# Lunge Pattern Bodyweight Exercises

- ❑ Static (split squat) or dynamic (taking a step):
- ❑ Lunge forward, backward, lateral
- ❑ Clock pattern
- ❑ Elevated Front or Back foot
- ❑ Vary speed and depth of lunge
- ❑ Asymmetrical loading with KB



# Fundamental Movement Patterns

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Push Pattern



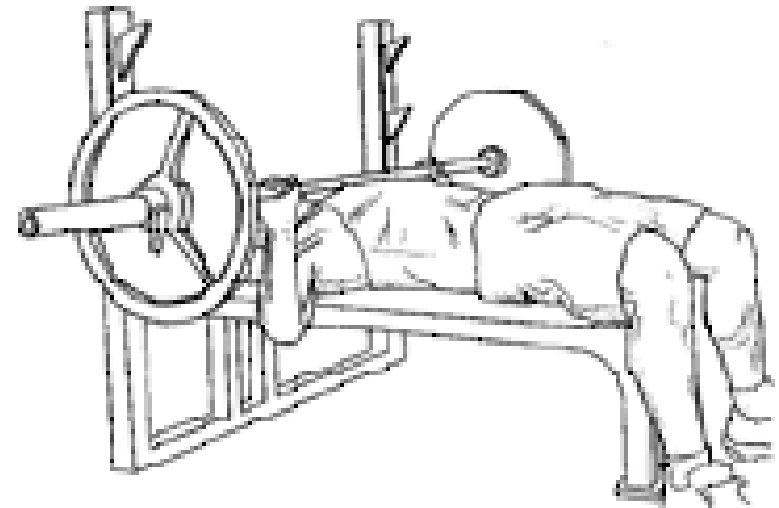
# Push Pattern

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- Bench Press

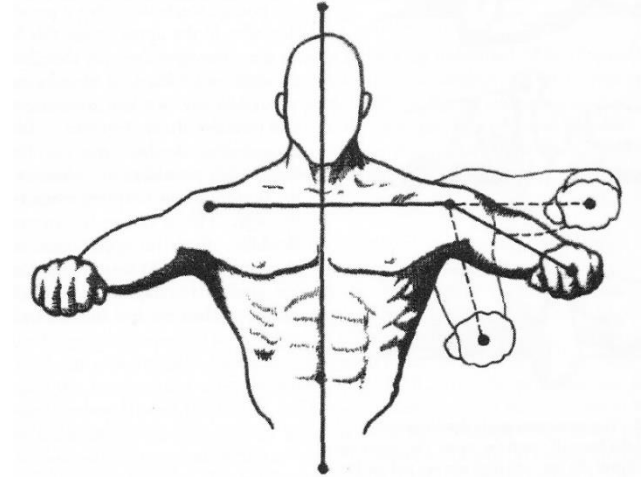
- Starting Position

- *Closed* grip width: ~1.5 times shoulder width
    - Eyes under the bar when racked
    - Setting the shoulders: scapula retracted and depressed, chest high
    - Feet flat on the floor, knees under hips
    - Lower back neutral or slightly arched position



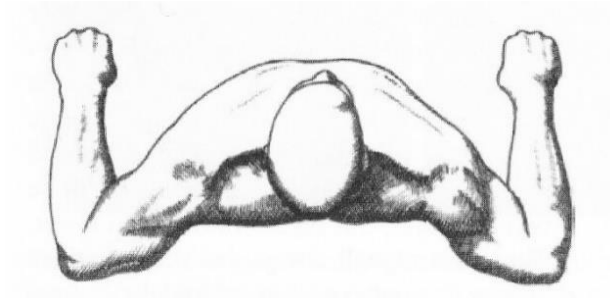
# Bench Press

- The Descent
  - Slow and under control
  - Upper arm should be  $\sim 35^\circ$  to  $45^\circ$  away from the torso
    - Minimizes shoulder joint stress (any less or more from target angle drives humeral head anteriorly)
    - Optimal line of pull for chest musculature



# Bench Press

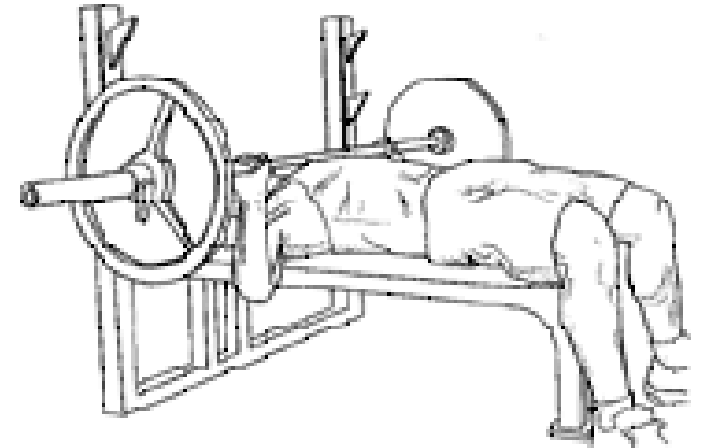
- The Descent
  - Target for bar: lower chest
    - Upper chest (“bodybuilding style”) places tremendous stress on shoulder jt.
  - Elbows should be under the bar at all times
  - Forearms vertical in the bottom position
  - Never bounce off the chest



# Bench Press

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- The Ascent
  - Speed, faster than descend
  - Performance tips:
    - Tight grip
    - Stretching the bar (spreading the hands apart)
    - Pressing body away from bar vs lifting the bar
  - Exhale slowly through sticking point
- Sticking points:
  - Close to the chest
  - Close to lockout



# Push Pattern – Horizontal Bodyweight Exercises

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- Hindu pushups and dive bomber pushups
  - Bomber: similar motion to hindu except elbows bend on the way back
- Diamond pushups
  - Hands under chest (a little more narrow than shoulder width)
  - Keep elbows close to torso
  - Caution, may produce hand pain



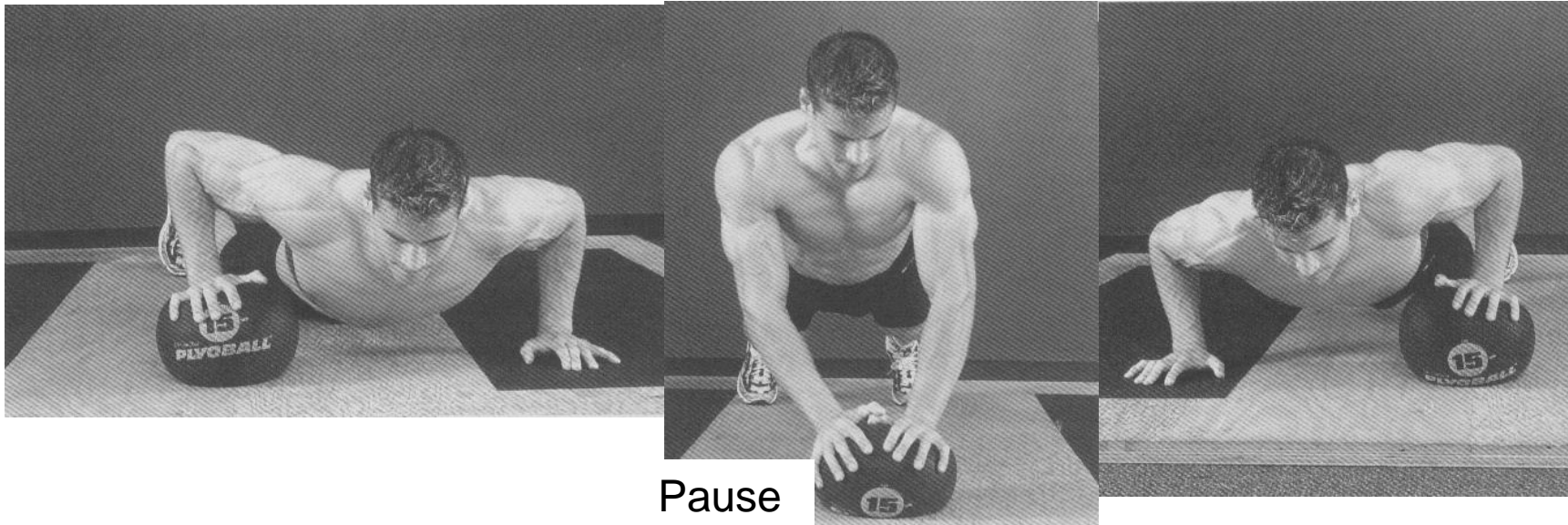
# Push Pattern – Horizontal Bodyweight Exercises

- Sawing action
  - 2 hands close (diamond position) – slide forward & backwards
  - 1 hand on slide board



# Push Pattern – Horizontal Bodyweight Exercises

- Other push variation
  - Wide arm stance
  - One arm forward, one arm back
  - Uneven surface (one hand on medicine ball)
  - Walkovers





# Push Pattern – Vertical Bodyweight Exercises

- Dips
  - Dip stand or Rings
  - Torso should lean forward to reduce shoulder stress

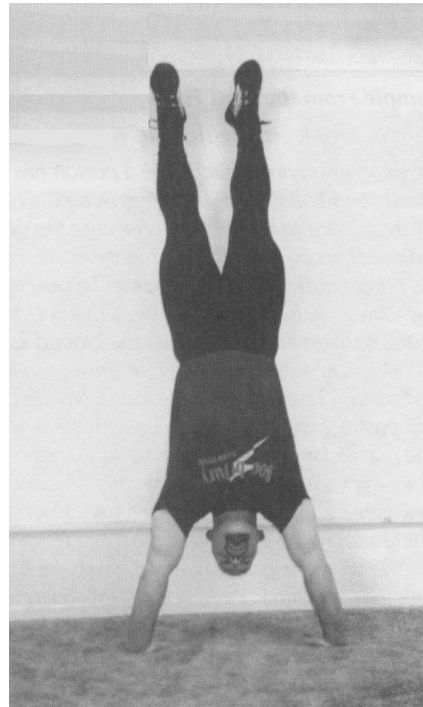
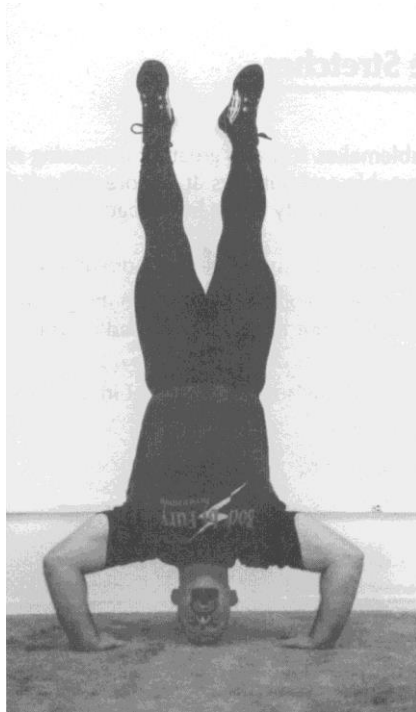


- Side-to-side jackknife pushups



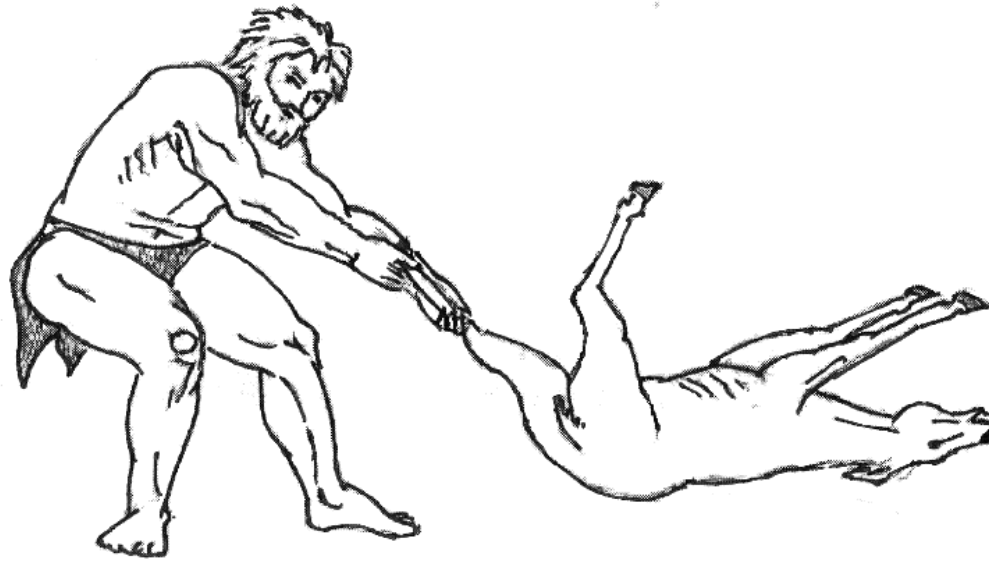
# Push Pattern – Vertical Bodyweight Exercises

- Handstand pushup
  - Using wall
  - Band assisted



# Fundamental Movement Patterns

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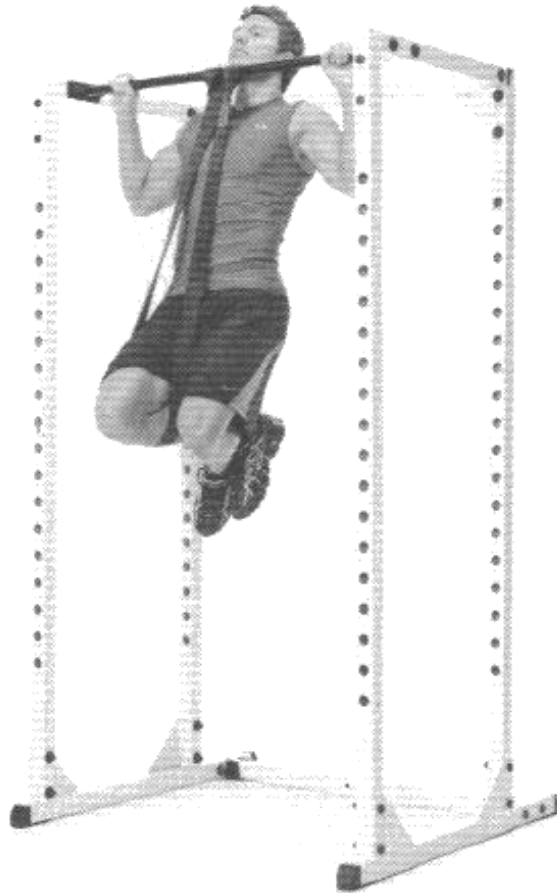


Pull Pattern

# Pull Pattern

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- If unable to use bodyweight, rubber bands offer best alternative



# Pull Pattern – Vertical Bodyweight Exercises

## □ Chin-up versus Pull-up



Regular



Wide



Off-Set or  
Alternating Grip



Close or  
Narrow



Mountain Climber  
or Commando

# Pull Pattern – Vertical Bodyweight Exercises

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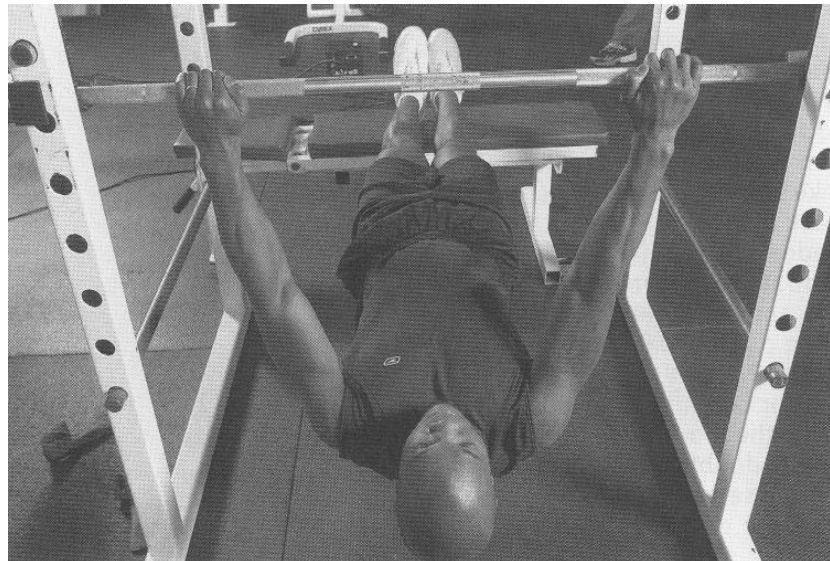
- Variations
  - Side-to-side technique
  - Alter leverage by pushing forward w/ hands





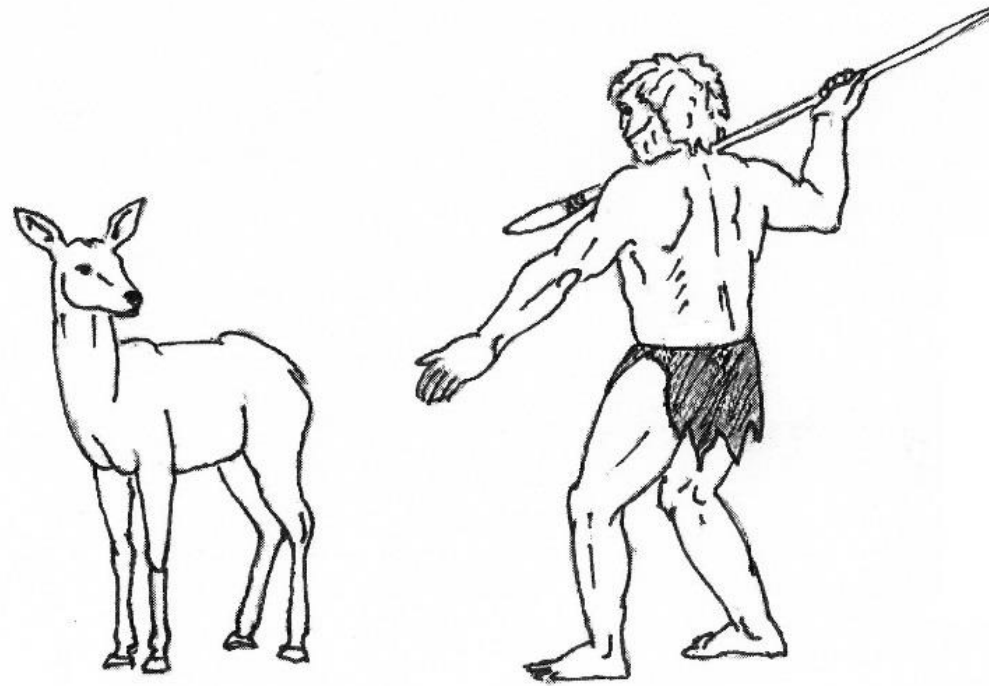
# Pull Pattern – Horizontal Bodyweight Exercises

- Variation:
  - Rope climb
  - Inverted T-row
  - Front lever pull



# Fundamental Movement Patterns

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Twist Pattern

# Rotation Pattern Bodyweight Exercises

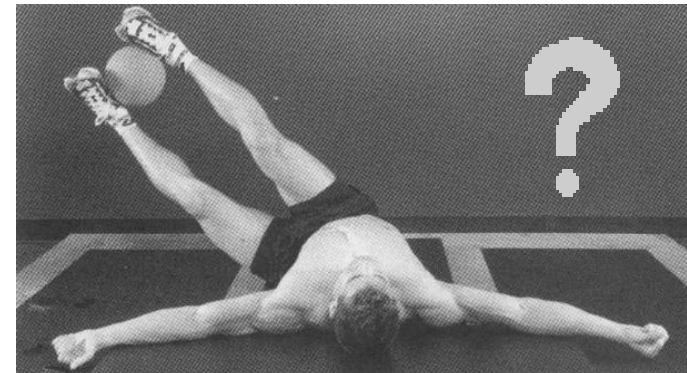
- Will invariably include some form of pushing or pulling motion
  - Rotation is an integrated motion
- Drills may have the:
  - Lower body fixed and the upper body rotating
  - Upper body fixed and the lower body rotating
    - Questionable value, mechanics not usually encountered



90-90 Tuck position



Hydrants



# Rotation Pattern Bodyweight Exercises

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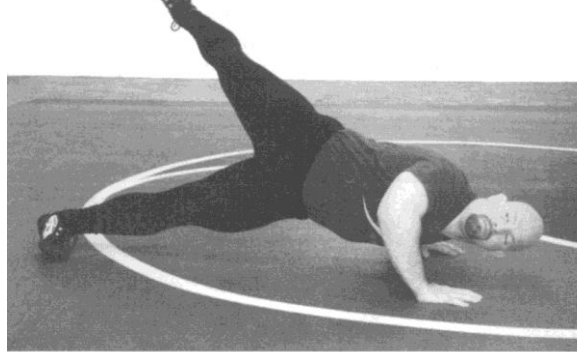
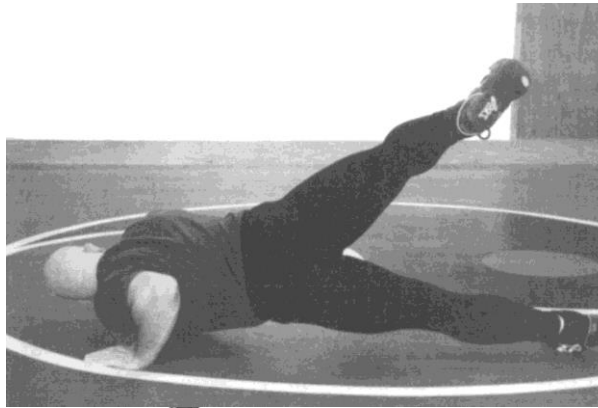
- Posture is difficult to maintain with some exercises
  - Russian twist and Swiss ball rotation



# Rotation Pattern Bodyweight Exercises

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- ❑ Rotational pushup, one leg in the air (push motion)
- ❑ T push and hold (push motion)





# Rotation Pattern Bodyweight Exercises

- ❑ 1-arm inverted T-row (pull motion)
- ❑ Ring Lawnmowers (pull motion)

