Basketball Sport Performance
Training & Injury Prevention

© Carl M. Poe, MS., CSCS
Sport Performance Strength, Power & Speed
Conditioning Coach
& Sport Physiologist
Member of NSCA Basketball Strength Coaches
Special Interest Group
Why Perform Strength & Conditioning Training for the Sport Of Basketball?

- Injury prevention........
- Enhanced player performance on the court......
Injury Prevention......

- Injury rate of the player: areas of concern are with the knee joint and foot/ankle
- Chronic - overuse or Acute - stress related
- Stress fractures & tendonitis very common
- Concern with the prepubescent player who is still going through their growth and development: bone, muscle, soft tissue
Injury Rate Study……

- Basketball injury related data was collected: 2005 - 2007 academic year: 100 US High Schools
- Players sustained 1,518 injuries during 780,651 exposures: injury rate of 1.94 per 1000 athletes
- This was greater during competition (3.27) than during practice (1.40)
- Injury rate greater among Girls (2.08) than Boys (1.83)

Injury Rate Study Cont.

- Most common sites of injury:
  - Ankle/foot: 39.7%, Knee: 14.7%, Head/face/next: 13.6%, Arm/Hand: 9.6%, Hip/thigh 8.4%

- Most frequent injury diagnoses: ligament sprains 44%, muscle/tendon strains 17.7%, contusions 8.6%, fractures 8.5%, and concussions 7%.
Injury Rate Study Summary ..........

- Female players sustained a greater proportion of knee injuries 95% of incidence
- Boys sustained fractures 95% incidence
- Finally the most common injury for girls requiring surgery were knee ligament sprains (47.9%).
- Conclusion: injuries varied by gender and type of exposure, for prevention we must target areas of concern!
Needs Analysis of the Sport of Basketball

- **Biomechanics**: what movements are being performed - ex. running, jumping, ball handling, passing, shooting, rebounding, defensive positioning, etc......

- **Common Sites of Injury**: prone areas are - foot/ankle, knee, hip/low back, shoulders

- **Physiological Needs**: % of Aerobic and Anaerobic energy for movement patterns to play a game....
Components of Basketball Supplemental Training

- Dynamic Warm-up
- Cool-down with Flexibility Stretch Training
- Strength Training
- Jump/Plyometric Training
- Speed-Agility-Acceleration Training
- Endurance Conditioning
- Periodization of all Components
- Performance Testing
Dynamic Warm-up

- Goal is to prepare the player for the upcoming practice or game situation.
- Focus should be on increased joint-muscle, soft tissue temperature, thus elevating the body's heart rate or blood flow.
- Also increased respiratory rate for enhanced breathing
- Drill Recommendations: Jump Rope, Foot-work drills, light sprints, low intensity plyometrics
- Progress to “Skill Drills” i.e. ball handling, shooting, defensive movement patterns, etc.
Pre-Practice/Pre-Game Warm-up Cont..

- Should the player perform a “lot” of static or long-held stretches for their warm-up?
- Stretching may “hinder” properties within the muscle tissue for direct responses of “Power”!
- Would only recommend extensive stretching for the “injury prone” player or the player with an “existing” injury condition: Ankle, Hip/Knee area
- Focus should be more on dynamic drills or ballistic movements on the court
Dynamic Drill

Cariocas: Lateral Foot Work.......

[Image of a person running laterally on a basketball court]
Dynamic Drill

Side Shuffle: Jump Block/Rebound…….
Dynamic Drill

Single Leg Lateral Bounds
Dynamic Drill

Speed Push-Ups......
Dynamic Drill

Ankle Rocker Balance-Lower Leg Stretch......
Cool-Down with Flexibility Training

- Why Cool-Down, what is a cool-down?
- Goal is to help the player’s body, physiologically recover from a particular practice or game.
- Main objective is to help with the removal of lactic acid (fatigue waste product) and to stretch to speed up recover.
- Player needs to perform light “aerobic type” activity for approximately 5 minutes to reduce the heart rate, get blood flow to working muscle tissue.
Cool-down Stretch Cont..

- Finally this is the point where the player should spend extensive time of Flexibility Stretching.
- The following areas should be emphasized with Stretching:
  - Foot/Ankle-Lower leg, Hips/Lower back, Upper legs/Quadriceps-Hamstrings, Shoulders/Upper Back, Arms/Wrists, Neck
- Post practice and Post game stretches should be held for approximately 20 - 30 seconds.
Strength Training

- Why does the player need strength for the sport?
- Increased muscular and soft tissue strength is needed for both “Injury Prevention & Skill or Performance Enhancement”!
- Basketball has become such a “Physical” sport with lot of “physical contact” from all positions on the court.
- Very important: Increased muscular strength is a requirement for both power (vertical jump, jump shot, etc) and speed (first step quickness)
Strength/Resistance Training: Key Factors

- A player can benefit from resistance training within 8 - 12 weeks.
- A stronger player can resist muscular fatigue much more effectively.
- A stronger player may be able to “acquire” basketball related skills at a Faster Rate.
- A player can obtain a “quality workout” in as little as 45 minutes in the weight room.
- There has to be an “overload factor” in order to gain strength!
Principle of Overload

- To become more efficient, the body must be overloaded by varying either:
  - Intensity
  - Frequency
  - Duration
Principle of Specificity

- **Specificity**
  - Maximal training benefits w/ exercises most similar to event
  - Training appropriate movement patterns, angles of movements, rate of force development specific to the sport-skill being trained......
Strength-Resistance Training Myths

- *Lifting weights is not recommended for the “younger player”…..
- Lifting weights may “affect” my shot……
- The female player should be treated different as it relates to weight lifting, etc…..
- Players should not lift weights “in-season”…..

*National Strength & Conditioning Association.

Strength-Resistance Training

Mid-Thigh Power Hang Clean
Strength-Resistance Training

Jump Push-Press
Core-Resistance Training

Med Ball Sit-Up with Ball Take-away
Jump/Plyometric/Power Training

- Goal for Power training is to take the added Strength gain that the player acquired from Strength-Resistance Training and begin to perform “Explosive-Quick-Forceful movements for both Lower Body and Upper Body Power!

- You must gain Strength first, before gaining Power! This is for both Safety and Physiological factors.
Benefits of Plyometric Training: Lower, Middle and Upper Body

- Increased Vertical Jump
- Increased Flight Time (time in the air)
- Increased Rate of Force Development which translates into increase speed off the floor
- Quicker first step and acceleration
- Increased velocity of Ball Passing
- Increased Range on the player’s Jump Shot
Key Concerns with Plyometric Training

- Player must be “strong enough” to “tolerate” the stress of the exercise drills.
- Safety is a huge concern: floor, equipment, program design (foot contacts), volume and intensity.
- Extra stress to the ankle/foot joint, knee, hip/lower back areas.
Plyometric Drills:

Medicine Ball Multiple Plyo Box Jumps
Plyometric Drills:

Vertimax Med Ball Rebound Explosive Jump
Plyometric Drills:

Plyometric Modified Push-Ups/Hand Speed
Plyometric Drills:

- Core Strength & Upper Body Power Drill: Med Ball Pass
Plyometric Drills:

Single Leg Medicine Ball Power Chest Pass
Speed-Agility-Acceleration

- Once the player has gained extra neuromuscular strength-speed from the “Strength and Plyometric Phase”, now is a good time for implementing Speed-Agility Training.
- Emphasis should first be placed on “body-weight” straight line, horizontal, diagonal and backwards movement patterns
- Increased Stride Length and Stride Frequency
- Change of Direction and Redirection drills should be implemented (i.e. side shuffle to diagonal shuffle and redirected rotation 180)
Speed-Agility Drill

Bungie Cord Speed Dribble w/Acceleration.....
Speed-Agility Drill

Lane Z-Drill w/Speed Dribble & Defensive Slide....
Endurance Conditioning

- First we have to ask the question: Is playing the game of basketball strictly “aerobic” or “anaerobic” or a combination of “both energy systems”?
- Basically players may have bouts of “6 seconds” of high intense movement on the court either sprinting, jumping, or quick changes of direction.
- This may only account of 15% of the total time during a game.
- Aerobic training may help in recover between the high intense activity on the court.
Endurance Conditioning Cont..

- **NOTE:** Care must be taken not to have the player perform extensive “aerobic conditioning”!
- This can “interfere” with strength-power properties, (I.e. vertical jump, explosive power) within the body
- Conclusion: really no reason to perform endurance drills longer than 30 seconds (as the “bulk” of your conditioning plan)
- Aerobic training my be used for a particular player trying to decrease extra body fat
Examples of Endurance Training....

- Line Drill
- Suicides
- Hill Sprints
- 200m - 400m runs
Vertimax Simulated Sprints for Speed/Endurance....
Periodization: Planning

- Systematic approach with the program design to allow for the following: “Peak” levels of strength, power and speed endurance conditioning at the most important competitive time period of the year.
- Competitive time period can be November - March.
- “Prevent” overreaching and/or overtraining.
Periodization Planning: How Does It Work?

- Variation with the choice of exercises, volume and intensity of training and rest periods within training
- Periods or Phases of Training can be broken down into: (High School Model).....
- Transition: usually April - May
- Off-Season: June - August
- Pre-Season: September - November
- In-Season: November - March
Periods of Basketball Season......

- **Transition or Active Rest**: purpose to recover physically & psychologically from the In-Season competitive phase and training year (maybe emphasize light aerobic activity and stretching)

- **Off-Season**: “base” preparation training of strength, and power
Periods cont........

- **Pre-Season**: training emphasis on sport-specific drills, peak levels in skill training, strength, power, speed and anaerobic endurance.

- **In-Season**: purpose is to “maintain” the player’s physical capacity, skill levels for the entire competitive in-season.
What is Periodization?

- A logical phasic method of manipulating training variables in order to increase the potential for achieving specific performance enhancement goals. Note how Volume decreases as Intensity Increases.
## Training Phase Objectives

<table>
<thead>
<tr>
<th>Variable</th>
<th>PHASE: Objective</th>
<th>GENERAL PREPARATION: Strength-Endurance</th>
<th>SPECIAL PREPARATION: Basic Strength</th>
<th>COMPETITION: Strength &amp; Power</th>
<th>PEAKING/ACTIVE REST: Peaking/Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity</td>
<td></td>
<td>low to moderate</td>
<td>high</td>
<td>high</td>
<td>very high to low</td>
</tr>
<tr>
<td>Volume</td>
<td></td>
<td>high</td>
<td>moderate to high</td>
<td>low</td>
<td>very low</td>
</tr>
<tr>
<td>Repetitions</td>
<td></td>
<td>8-20</td>
<td>4-6</td>
<td>2-3</td>
<td>1-3</td>
</tr>
<tr>
<td>Sets*</td>
<td></td>
<td>3-5</td>
<td>3-5</td>
<td>3-5</td>
<td>1-3</td>
</tr>
<tr>
<td>Sessions/Day</td>
<td></td>
<td>1-3</td>
<td>1-3</td>
<td>1-2</td>
<td>1</td>
</tr>
<tr>
<td>Days/Week</td>
<td></td>
<td>3-4</td>
<td>3-5</td>
<td>3-6</td>
<td>1-5</td>
</tr>
<tr>
<td>Intensity cycle†</td>
<td></td>
<td>2-3/1</td>
<td>2-4/1</td>
<td>2-3/1</td>
<td>—</td>
</tr>
</tbody>
</table>
Summary of Periodization.

- Individualized
- Periodization enhances: strength, power, speed & endurance conditioning
- Head Coach & Strength Coach need to communicate, set training goals with the player or team
- Rest or Recovery periods are critical pre games & periods of intense training: Need to “Taper Off” prior to important games.
Basketball Performance Testing

- Why test?
- To evaluate the supplemental strength program, i.e. “Is the player or team getting Stronger or adding more Power”?
- Motivation factor for the players to continue to train hard and “smart” in the weight room!
- Determine areas of “Deficiency” within the player. Also may determine risk potential for injury i.e. added body fat to a player or specific decrease in power parameters
Basketball Performance Testing cont..

- Example of Performance Tests:
  I. I feel that every competitive player should get an initial “Musculoskeletal” examination from a Sports Medicine Professional prior to play.
  II. -Anthropometry: or Body Girths
      -Body Composition: % body fat using calipers
      -Flexibility: hamstring/lower back
      -Vertical Jump Power: double and single leg
      -Upper Body Power: medicine ball chest throw
Basketball Performance Testing Cont..

- Lower Body Leg Strength: repetition maximum strength test of Back Squats.
- Upper Body Strength: repetition maximum strength test of the Bench Press.
- Speed: 27 meter or Full-Court timed sprint.
- Agility: T- test 9-meter agility test.
- Anaerobic Endurance Power: Basketball Line Drill sprint endurance test utilizing the entire court (four repeat distances on the court).
Basketball Performance Testing Cont..

Vertical Jump Testing
Take Home Message: Summary

- For any sport, Athleticism is crucial
- No player can get stronger, powerful, and quicker just by performing skill work, doing drills on the court and/or playing games
- Time must be spent in the Weight Room, with a “player specific” program design
- With the game of basketball being as “physical as it is”, players need to take time to develop Strength, Power & Speed!
Youth Strength Training for Basketball.....
Take Home Message:
Summary
Athleticism Post-Workout..........
THANKS!

QUESTIONS........?

For information about Basketball Strength, Power & Speed-Specific Training: Private, Group and Team Training, contact......

© Coach Carl M. Poe, MS, CSCS

W: 919.697.6761

E-mail: PoeSportPerform@aol.com