Misconceptions
- Strength training reduces flexibility & speed
- Strength training makes you bulky
- Circuit Training provides an aerobic benefit
- Long breaks between exercises decrease their effectiveness

Athletic/Strength Qualities
- Maximum Strength (Force)
- Speed Strength (Force x Velocity)
- Rate of Force Development (Force Generation)
- Reactive Strength (Changing movement or direction or both)
- Muscular Endurance

Relationships of Strength Qualities
- Training to improve 1 quality will enhance the others
- Max Strength = force (f)
- Speed Strength or Power = f x v
  - Force = Power
  - Velocity = Power
- Max Strength = Strength Endurance
- Rate of Force Development = time to peak force
  - Power = Time to Peak Force

Relationships of strength qualities

General Adaptations to Strength Training
- Hypertrophy (growth)
- Joint Strength (tendons & ligaments)
- Improved muscle fiber recruitment
  - Improved force of contraction
  - Improved speed of contraction
- Injury prevention (as an end product)

Adaptations to Strength/Power Training
- Improved motor control
- Technique results from the correct application of force in the right direction, the right magnitude and the right sequence
- Improved strength can enhance learning proper technique

**Important Factors in Performance**

- **Strength**
  - Ability to produce force
- **Explosive Strength**
  - Movement involving maximum or near maximum rates of force development
  - Associated with acceleration
- **Power**
  - Work/Time = force x velocity

**Most important aspect of sports performance**

**The Importance of Strength (Force)**

- Force is created by muscular contraction
- Maximum strength = maximum capability of the neuromuscular system to produce force
- Force is the characteristic that causes a mass to accelerate
  - \( F = ma \)
- Force is a major component of power
  - Power = \( F \times V \)
- All movement depends upon force
- Force production results in rate of force development (RFD) and duration
- Dynamic force production also produces a power output and a velocity

- **All athletic action requires force production, rate of force development, speed and power as well as endurance.**

**Why train for strength?**

- Limiting factors in sprinting (after acceleration) are vertical ground reaction forces (VGRF)
- VGRF are influenced by maximum available force and rate of force development
- Dynamic (maximum) peak force is related to maximum strength
- If this is true, then running speed is also related to maximum strength
- Strength training improves maximum strength, power and RFD

**Strength/Power & Performance**

- Research has shown **maximum strength** and **peak power** have moderate to high correlations
- **Peak power** is one of the major determinants in speed
- **Maximum strength** measures are highly correlated with strength/power exercises
  - Squat, snatch, clean
- Measures of **maximum strength** are also associated with sports performance
  - Stronger athletes are more powerful and thus, better performers
If power is so important, why do we train strength?

- Strength (ability to produce force) is the foundation for all other athletic qualities
- Technique is learned through the proper application of force through a specific movement
- Research shows combined strength/power training produces superior gains in power when compared to high velocity/high power and/or heavy resistance training alone

Keys Points in Strength/Power Training

- Training is a long term process
  - Don’t rush
  - Successful programs build a strong foundation
- Variation is the key to success

Different levels of athletes will need different amounts of variation

- 4 year cycles
- Macrocycles (yearly/seasonal cycles)
- Mesocycles (months)
- Microcycles (day to day variation)
- Variation within days

Phases of the Macrocycle

Phases of Training

- Strength Endurance
- General Preparation or Hypertrophy
- Strength (max. strength)
- Power
- Competition or Maintenance
- Recovery or Transition

Implementing a Strength Training Program

- Train to improve the 5 (biomotor) qualities
- Use the weight room for strength training and the track & road for endurance training
- Consider total training volume carefully to avoid overtraining

The Exercises…

Strength Exercises

- Squat
- Leg Press
- Deadlift
- Romanian Deadlift
- Bench Press
- Lat Pulldown

**Squat Series**

**Upper Body Series**

**Explosive Exercises**
- Clean/Snatch Pulls
  - Floor
  - Knee
  - Mid-thigh
- Power Clean/snatch
- Hang Clean/snatch
- Push press/Push Jerk
- Split Jerk

**Olympic Lifts**
- Mid Thigh High Pull

**The Core**

Exercises for Abdominal & Core

- **Frontal movements**
  
  Entail lateral flexion or bending to the left and right side.

  - Standing Dumbbell Side Bends
  - Wavings
  - Lying side crunch

- **Sagittal movements**
  
  Engage flexion and extension of the trunk in forward and backward movement.

  - Three position crunch
  - V-up
  - Lying dumbbell leg raise
  - Lying Swiss ball leg raise
  - Hanging straight leg raise
  - Hanging bent leg raise
  - Incline sit-up
  - Back hyper extension
- **Transverse movements**

  Involve rotary motion or twisting to the left and right.

  - V-up Twist
  - Seated Twist with dumbbell
  - Seated twist with barbell
  - Plate walk
  - Standing twist
  - Twist behind the back
  - Russian twist
  - Swiss ball twist

- **Multi-plane movements**

  - Delivery lift with dumbbell
  - Incline sit-up with twist
  - Walking chop with Medicine ball
  - Cable chop

**Core Exercises**

Dumbbell Circuits

- **Pre-Olympic (Olympic lifting warm-up)**
  - Squat press
  - High pull
  - Jerk
  - Seated twist
  - Delivery lift

**Medicine Ball Exercises**

**Throwers Circuit**
Selected References


Questions??