Plyometric & Agility Training

Chapters 19 & 20

Lecture Overview

- Plyometric mechanics & physiology
- Plyometric program design
- Plyometric safety considerations
- Definitions of speed
- Movement mechanics
- Running speed
- Agility
- Developing speed and agility
- Speed and agility design

Plyometric Mechanics & Physiology

- Power
- Mechanical model of plyometric exercise
  - Series elastic component (SEC)
- Neurophysiological model of plyometric exercise
  - Potentiation & stretch reflex
- Stretch-shortening cycle
  - Eccentric, amortization, concentric phases
**Stretch Reflex**

- **I-Eccentric** Stretch of the agonist muscle
  - Elastic E is stored in the SEC.
  - Muscle spindles are stimulated.

- **II-Amortization** Pause b/t phases I & II
  - Afferent nerves synapse w/alpha motor neurons.
  - Alpha motor neurons transmit signals to agonist muscle group.

- **III-Concentric** Shortening of agonist muscle fibers
  - Elastic E is released from the SEC.
  - Alpha motor neuron stimulate

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**Stretch-Shortening Cycle**

<table>
<thead>
<tr>
<th>Phase</th>
<th>Action</th>
<th>Physiological Event</th>
</tr>
</thead>
</table>
| I-Eccentric | Stretch of the agonist muscle       | • Elastic E is stored in the SEC.  
• Muscle spindles are stimulated. |
| II-Amortization | Pause b/t phases I & II             | • Afferent nerves synapse w/alpha motor neurons.  
• Alpha motor neurons transmit signals to agonist muscle group. |
| III-Concentric | Shortening of agonist muscle fibers | • Elastic E is released from the SEC.  
• Alpha motor neuron stimulate |

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**Plyometric Program Design**

- **Mode**
  - Lower Body
    - Jumps in place
    - Standing jumps
    - Multiple hops & jumps
    - Bounds
    - Box drills
    - Depth jumps
  - Upper Body
    - Throws
    - Push-ups
    - Trunk
  - Upper Body
  - Lower Body
  - Core

- **Intensity**
- **Frequency**
- **Volume**
- **Program Length**
- **Progression**
- **Warm-Up**
  - Marching, jogging, skipping, footwork, lunging
Plyometric Program Design

• Plyometric exercise & resistance training
  – Lower-upper combos
  – Alternate heavy & light
  – Complex training
  – Traditional RT exercises

• Plyometric & aerobic exercise

Safety Considerations

• Pretraining evaluation of the athlete
  – Technique
  – Strength
  – Speed
  – Balance
  – Age
  – Physical characteristics

• Equipment & facilities
  – Landing surface
  – Training area
  – Equipment
  – Proper footwear
  – Supervision
  – Depth jumping

Definitions of Speed

• Speed
• Agility
• Speed-strength
• Speed-endurance
  – Effort distribution
Movement Mechanics

- Impulse (next slide)
- SSC
- Simple vs. functional movement speed
- Reactive ability vs. reaction time
Running Speed

- Stride length & stride frequency
  - Elite vs. novice athletes
- Sprint performance & stride analysis
  - Support & flight phases
- Sprinting technique (checklist - table 20.2, errors & corrections - table 20.3)
  - Drive, stride, & lift
- Sprint training goals

Stride Length-Frequency Interaction

Sprinting Technique
Agility

• General vs. special
• Agility technique
• Similar safety guidelines to plyometrics
• Ability to decelerate from given velocity

Developing Speed & Agility

• Primary training method
• Secondary training methods
  – Assisted sprinting
  – Resisted sprinting
• Tertiary training methods
  – Basic fitness
  – Power
  – Speed-endurance

Program Design

• Running speed & agility training
• Speed-endurance training
• Training variables
  – Exercise interval
  – Exercise order
  – Exercise-relief
  – Frequency
  – Intensity
  – Relief or recovery interval
  – Repetition
  – Series
  – Set
  – Volume