

Plyometric Training & Youth

Jorge E. Gómez, MD, MS
Clinical Professor, UTHSCA,
Pediatrics & Sports Medicine
Team Physician UTSA
Youth Sports Treatment & Fitness,
PLLC



Agenda

- Plyometrics - definition
- Types of Plyometric exercises
- Appropriate use of plyometrics
- Avoiding Injuries

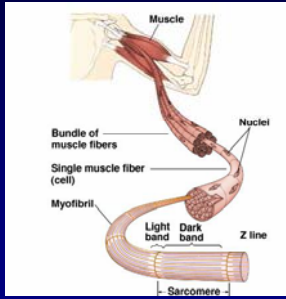


Plyometrics

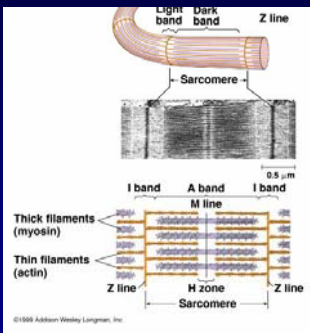
- A system of training to enable muscle to reach maximum force in as short a time as possible; $\text{power} = \text{force} \times \text{velocity}$
- capitalizes on 2 related properties of muscle
 - Muscle elasticity
 - Stretch-shortening cycle



Muscle - How it Works



Muscle Energetics



Schematic Muscle



Stretching Muscle

- Elasticity - when muscle is stretched, it stores energy, like a rubber band.
- Myotatic (stretch-shortening) reflex - nerve endings in muscle sense stretching of the muscle fibers, cause reflex concentric contraction of the muscle that is much faster than volitional muscle contraction



Stretch-Shortening

- Eccentric contraction (landing)
 - Muscle lengthens
 - Elastic energy stored
 - Myotatic reflex initiated
- Concentric contraction



Types of Plyometric Training

- Jumps-in-place
- Standing Jumps
- Multiple Hops & Jumps
- Bounding
- Box Drills
- Depth Jumps



Plyometric Exercises

- Jumps-in-place: example - jumping rope
 - Emphasize quickness, requires athlete to rebound quickly
- Standing jumps: example - broad jump
 - Emphasizes maximal effort
 - Allow full recovery
- Mult Hops/Jumps: example -hopscotch
 - short distances, usu for speed



Bounding



- Requires "expert" ability to stabilize joints
- Tremendous joint forces



Depth Jump



Injury Potential

- Large forces applied to joints, ligaments, tendons
- Poor technique, either from lack of practice or lack of body control, may lead to injury
- Lack of basic strength may lead to injury
- Capacity to add to total training load, leading to overuse injuries



Keys to Avoiding Injury with Plyometric Training

- Exercises should be appropriate for level of athlete
- Establish a sound basis of conditioning
- Recommend fitness testing
- Emphasize maximum effort, full recovery
- Don't use plyometrics to develop aerobic capacity, "toughness", or endurance



Training Considerations



- Age
- Coordination
- Strength
- Competitive Level



Training According to Level

	Elem	MS	HS
Jumps-in-place	X	X	X
Standing jumps	X	X	X
Multiple hops & jumps	X	X	X
bounding		X	X
Box drills			X
Depth jumps			X



Preparation

- Strong quads, calves, hips
- Strength criteria?
- Athlete should master one kind of exercise before moving to the next level
- Strong Core
- Adequate general fitness



Weak Abdominal & Lumbar Musculature

- Increased lordosis
- Increased stress of post. elements, ant. pelvic tilt
- Excessive anterior pelvic tilt, increased femoral int. rot. & adduction



Weak Hip Abductors

- Excessive femoral int. rot., adduction.
- Up the chain - excessive lumbar rotation
- Down the chain - knee valgus, tibial rotation, heel varus



Dorniden (r) and

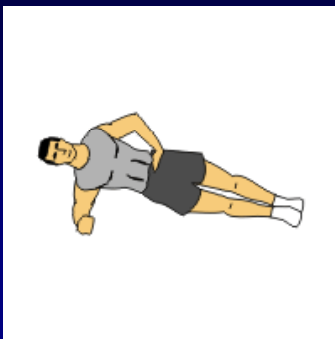


Failure of Traditional Lifts to Develop Core Strength

- Traditional lifts usually done with weight as a goal (how much weight)
- Core muscle endurance is key to injury prevention
- Correlation between strength & endurance
- Core muscle endurance must be developed with repetition & technique, not weight



Side Bridge



Push Ups



V-ups



Lunges



Hip Ups



Side Step-Downs



Adequate General Fitness

- Fitness testing
- Use fitness standards
- Useful for
 - Gauging level of readiness
 - Gauging overtraining



Plan the Program

- Off-season - basic conditioning, technique, edurance
 - jumps in place, standing jumps, mult jumps
 - 2-3 times/week, low to mod intensity
- Pre-season - advanced technique, high intensity workouts
 - Multiple hops/jumps, bounding, depth jumps
 - 2x.wk, mod to hi intensity
- In-season
 - 1-2/wk, mod to hi intensity



Warning Signs

- Pain that last more than 2 days
- Pain or discomfort that prevents execution of proper technique



Common Injuries

- Shin splints
- Achilles tendonitis
- Patellar tendonitis
- Heel bruise
- Ankle sprains
- Collateral & cruciate ligament injuries
- Back pain



Summary

- Plyometric training can enhance power in nearly all sports
- Great potential for injury
- Types of exercises should be appropriate for level of athlete
- Emphasis is on quality, not quantity
- Avoid injury by establishing sound basic conditioning, allowing full recovery, not using plyometrics to develop aerobic capacity, "toughness", or endurance