

Regaining Muscular Strength, Endurance, and Power

I. Basic Concepts

A. Muscular Strength

1. definition =

2. muscle weakness/imbalance –

B. Muscular Endurance

1. definition =

2. tends to increase with muscular strength

3. more important than developing muscular strength and power

C. Power

1. definition =

2. explosive movements requiring strength and speed

D. Overload Principle

1. definition =

E. Progression

1. definition =

II. Factors that Determine Muscular Strength, Endurance, and Power

A. Size of the Muscle

1. direct relationship between muscle size and strength

2. resistance training

3. hypertrophy =

4. atrophy =

III. Slow-Twitch versus Fast-Twitch Fibers

A. Slow-Twitch Fibers (Type 1, Slow-Oxidative Fibers)

1. definition =
2. associated with aerobic activities
3. produce a long-endurance force

B. Fast-Twitch Fibers

1. definition =
2. associated with anaerobic activities
3. produce powerful forces
4. Type IIa Fibers (Fast Oxidative Glycolytic)

a. moderately fatigue resistant

5. Type IIb Fibers (Fast Glycolytic)

a. fatigue rapidly

b. "true" fast-twitch fibers

C. Muscle Composition

1. each muscle contains both types of fibers
2. ratio within a muscle varies among individuals
3. ratio is genetically determined
4. debate over whether types may change with training

IV. Physiology of Strength Development

A. Muscle Hypertrophy

1. Hyperplasia Theory
 - a. animal research only

- b. generally accepted that the number of fibers is genetically determined

2. Capillary Proliferation Theory -

- a. generally accepted that dormant capillaries may fill with blood to meet the increased demand for blood supply, oxygen, and nutrients

3. Myofilament Theory -

- a. most credible theory

- b. myofilaments = small protein filaments

- i. actin → thin myofilament

- ii. myosin → thick myofilament

- iii. crossbridges → fingerlike projections that pull

myofilaments together during muscle contraction

B. Reversibility

- 1. muscle atrophy occurs when resistance training is discontinued
- 2. decrease in muscle strength and muscle mass
- 3. may begin in as little as 48 hours

C. Other Physiological Adaptations to Resistance Training

- 1. ligaments become stronger
- 2. mineral content of bone increases
- 3. maximal oxygen uptake increases
- 4. increased enzyme levels in metabolism

V. Types of Skeletal Muscle Contractions

A. Isometric Contraction

1. definition =

B. Concentric Contraction

1. definition =

C. Eccentric Contraction

1. definition =

D. Ecentric Contraction

1. definition =

2. only possible in two-jointed muscles

VI. Techniques of Resistance Training

A. Isometric Exercise

1. definition =

2. advantages:

a.

3. disadvantages:

a.

b.

4. role in rehabilitation

5. technique -

B. Progressive Resistive Exercise

1. definition =

a. concentric contractions -

b. **eccentric contractions** -

2. **equipment**

a. **free weights** -

b. **exercise machines** -

c. **resistive tubing** -

3. **muscles must be overloaded both concentrically and eccentrically**

4. **1:2 ratio of concentric versus eccentric contractions**

5. **variable resistance (accommodating resistance)**

a. **definition** =

b. **length-tension relationship**

6. **terminology**

a. **repetitions**

b. **repetition maximum (RM)**

c. **set**

d. **recovery period**

e. **frequency**

7. **techniques**

a. **DeLorme**

b. **Oxford**

c. **McQueen**

d. **Sanders**

e. **DAPRE (daily adjusted progressive resistive exercise)**

f. **Berger**

8. **muscular endurance training**

9. **role in rehabilitation** -

C. **Isokinetic Exercise**

1. **definition** =

2. **equipment** -

3. **advantages**

4. **disadvantages**

a. **requires maximal effort**

b. **cost**

5. **role in rehabilitation** -

D. **Circuit Training**

1. **definition** =

2. **designed to accomplish many different training goals**

3. **role in rehabilitation** -

E. **Plyometric Exercise**

1. **definition** =

2. **lower extremity exercises** -

3. **upper extremity exercises** -

4. **role in rehabilitation** -

F. **The Kinetic Chain**

1. **Open Kinetic Chain Exercises**

a. **definition** =

2. **Closed Kinetic Chain Exercises**

a. definition =

3. role in rehabilitation -

VII. Differences Between Males and Females

A. Testosterone

1. "male hormone"

2. steroidal hormone necessary for muscle hypertrophy

B. Strength/Body Weight Ratio

1. decreased in women due to percentage of body fat