

Muscle physiology

- ✓ **Muscle fibers:** Type I (slow), Type IIa (fast oxidative), Type IIx (fast glycolytic)
- ✓ **Sliding filament theory:** Actin + Myosin + ATP = Contraction
- ✓ **All-or-none principle:** Muscle fibers contract fully or not at all
- ✓ **Motor unit recruitment:** Size principle (small → large)

Bioenergetics

- ✓ **Phosphagen system:** 0—6 sec, anaerobic, CP + ATP
- ✓ **Glycolysis:** Anaerobic, 6 sec—2 min, lactate as byproduct
- ✓ **Oxidative system:** 2+ min, aerobic, fats + carbs
- ✓ Energy system dominance depends on intensity & duration

Endocrine responses

- ✓ **Anabolic hormones:** Testosterone, GH, IGF-1
- ✓ **Catabolic hormone:** Cortisol (stress, tissue breakdown)
- ✓ Acute hormone response → Resistance training → ↑ anabolic hormones

Legal concepts

- ✓ Negligence = Breach of duty + harm
- ✓ Liability = Coach responsibility to act safely
- ✓ Informed consent ≠ liability waiver

Neuromuscular adaptations

- ✓ Neural adaptations → Early strength gains
- ✓ Rate coding, recruitment, synchronization ↑ with training
- ✓ Myelination & motor unit efficiency improve with practice

Cardiorespiratory

- ✓ Stroke volume ↑ with training → ↑ Cardiac output (Q)
- ✓ $\dot{V}O_2$ max = Max oxygen usage capacity
- ✓ Lactate threshold ↑ with endurance training

Exercise technique

- ✓ **Squat:** Neutral spine, knees track toes, thighs parallel
- ✓ **Deadlift:** Hinge, flat back, bar close to shins
- ✓ **Power clean/snatch:** Triple extension, catch with elbows high

Testing and evaluation

- ✓ Validity = Measures what it's supposed to
- ✓ Reliability = Consistency
- ✓ **Typical order:** non-fatiguing → agility → max strength → sprint → endurance
- ✓ **1RM prediction formula:**
Weight × (1 + (0.0333 × reps))