OBJECTIVES

1. Physiology is concerned with how the athlete's body responds and adapts to exercise and training programs.
2. The importance of proper nutrition cannot be overemphasized as a determinant of athletic performance.
3. To be successful as a coach, it is necessary to understand how the body functions and use this knowledge in daily coaching.

I. ANATOMY AND PHYSIOLOGY

A. Cells
1. Transport messages.
2. Carry chemicals.
3. Support the body.
4. Move the body.

B. Skeleton
1. Different functions.
   a. Support.
   b. Protection.
   c. Movement.

C. Muscles
1. Fiber anatomy.
2. Fiber types.
   a. Fast twitch.
   b. Slow twitch.

D. Muscles' Function
1. Dynamic contractions.
   a. Concentric contractions.
   b. Eccentric contractions.
2. Static contractions.
   a. Isometric contractions.
   b. Joint stabilizer.

E. Nervous System
1. Nerve impulses cause muscular contractions (motor).
2. Sensory feedback.

II. ENERGY SYSTEMS

A. The Aerobic-Anaerobic Split
1. Percentage of aerobic and anaerobic energy in an activity.

B. Aerobic Energy
1. With oxygen.
2. Energy in endurance activities.

C. Anaerobic Alactic Energy
1. CP system.
2. 1st 10 seconds.

D. Anaerobic Lactic Energy
1. Glycolysis.

2. 10 seconds to 1 minute.

E. The Cardio-respiratory System
1. Lungs.
    a. Getting oxygen into blood.
2. The heart.
    a. Circulating oxygenated blood.
3. Blood vessels and blood.
    a. Carrying oxygen, carbon dioxide, and waste materials.

F. Individual Differences
1. Body types.
    a. Endomorph.
    b. Mesomorph.
    c. Ectomorph.

G. Body Composition
1. Lean body weight.
2. Excess fat.

III. GROWTH AND DEVELOPMENT

A. Physical Development
1. Patterns of growth.
    a. Changes in size.
    b. Changes in proportion.
2. Growth spurt.
3. Sex differences.
    a. Sexual development and puberty.
4. Early and late developers.
    a. Peak times for growth.

B. Structure of the Body
1. Bone growth.

C. Children and Exercise
1. Implications for the coach.

D. Developing Control of Movement
1. Maturation.
2. Experience.
    a. Prior skills.
3. Teaching.
4. Difficulty of the task.

E. Children's Basic Movements
1. Stages of learning.
    a. The thinking stage.
    b. The learning stage.
    c. The skilled stage.
2. Basic capabilities.

F. Principles for Structuring Practice
1. Big versus small movements.
2. Simple versus complex tasks.
3. Parts versus wholes.

4. Implications for the coach.
5. Practice versus competition.
6. Implications for the coach.

IV. SOCIAL DEVELOPMENT

A. Self-Image
1. How children see themselves.
2. Influence of others.
   a. Parents.
   b. Other children.
   c. Coach.

B. Ability and Effort
1. When mistakes happen.
2. Implications for the coach.

C. Play, Sport, and Competition
1. Children play.
2. Adult play.
3. Understanding of competition.
4. Implications for the coach.

D. Adapting Athletics for Children
1. Modifying techniques.
2. Adapting equipment.
3. Modifying rules.

V. TRAINING THEORY

A. What is "fitness"?
1. Law of overload.
   a. Training-adaptation.
   b. Stimulus(overload)-fatigue-recovery-overcompensation.
2. Law of reversibility.
   a. Progressive overload = increased fitness.
   b. Insufficient overload = no change in fitness.
   c. Excessive overload = increased fatigue & decreased performance.
3. Law of specificity.
   a. Specific training results in specific response.
   b. Exercise should be specific to athlete and event.
   c. General training before specific.

B. Principle of Individualization
1. Heredity.
   a. Ability varies.
   b. All can reach individual potential.
2. Developmental age.
   a. Chronological age.
   b. Maturity varies.
3. Training age.
   a. Fitness varies.
   b. Years in the sport.

C. *Principle of Variety*
1. Change better than rest.
2. Change type, time, environment.

D. *Principle of Active Involvement*
1. Full participation of athlete.
2. Includes all aspects of lifestyle.

VI. BIOMOTOR ABILITIES - COMPONENTS OF FITNESS

A. *Strength*
1. Maximum strength.
   a. Greatest force muscle can produce.
   b. Most important when great resistance must be overcome (strength events).
2. Elastic strength.
   a. Muscle moves quickly against resistance (power).
   b. Most important in explosive events.
3. Strength endurance.
   a. Force production for prolonged duration.
   b. Most important in middle distance events (duration 2-8 minutes).
4. Development of strength.

B. *Endurance*
1. Aerobic endurance.
   a. Sufficient oxygen to produce energy.
   b. Developed by continuous, or interval running.
   c. Developed before anaerobic endurance.
2. Anaerobic endurance.
   a. Muscles function using stored energy.
   b. Divided into strength and speed endurance.
      i. Strength endurance: force in spite of increased hydrogen ion buildup.
      ii. Speed endurance: speed in spite of increased hydrogen ion buildup.
3. Development of endurance.

C. *Speed*
1. Development of a skill so that the technique is performed at a faster rate.
   a. Performed at maximum or near maximum rate.
   b. Over a short distance.
   c. Long recovery.
2. Components of speed.
   a. Reaction time.
   b. Acceleration.
   c. Top speed.
   d. Speed endurance.

D. *Flexibility*
1. Purpose.
   a. Increases range of motion.
   b. May reduce injury.
2. Types of stretching.
   a. Active.
      i. Can be done in the end position, as static, or dynamic exercise.
      ii. Athlete controls movement.
   b. Passive.
      i. Performed in end position.
      ii. Partner controls movement.

E. Coordination

1. Most readily developed.
    a. Boys 8-13 years of age.
    b. Girls 8-11 years of age.
2. In the mature athlete.
    a. Foundation for event specific skill.
    b. Protects against over development.

VII. DEVELOPING A TRAINING PROGRAM

A. Periodisation

1. Volume and Intensity.
2. Preparation period.
    a. General.
        i. Basic fitness.
        ii. Introduction of technique.
    b. Specific.
        i. Volume, intensity increase.
        ii. Energy system specificity.
3. Competition period.
    a. Intensity high.
    b. Volume low.
    c. Recovery extended.
4. Transition period.
    a. End of season.
    b. Active rest.
    c. Period of evaluation.

B. Planning

1. Long term.
    a. 0-14 years.
        i. General development.
        ii. Basic skills.
        iii. Fun.
        iv. General competition.
    b. 17-18 years.
        i. Begin specific training.
        ii. Weight training if appropriate.
        iii. Age group competition.
    c. 20-21 years.
        i. Specialized training.
        ii. Development of specific skills and techniques.
        iii. Some senior competition.
    d. 24-25 years.
        i. High level training.
        ii. Elite performance levels.
        iii. National senior, and international competition.
2. Microcycle.
    a. Loading depends on training age and fitness.
    b. What stage of training is this cycle.
3. Training session.
    a. Set overall goals.
    b. Set specific goals.
    c. Mix various components of training session.
    d. Design the training session.

i. Warm-up.
ii. Skills unit.
iii. Fitness unit.
iv. Cool-down

C. *Evaluation of Session*
1. Promotes effective planning.
2. Increases individualization.
3. Promotes understanding of training effects.

VIII. NUTRITION

A. *Overview of the Relationship of Nutrition to Performance*
1. Process of getting energy from food.

B. *Calories*
1. Measurement of energy.

C. *Energy Balance*
1. Intake versus expenditure.

D. *Seven Nutrients (Some Provide Calories While Others Don't)*
1. Protein.
   a. Amino acids.
   b. Protein quality.
2. Carbohydrates.
   a. Simple versus complex.
   b. Blood glucose and stored glycogen.
3. Fat.
   a. Source of long-term energy.
   b. Concentrated.
4. Vitamins.
   a. Fat soluble versus water soluble.
5. Minerals.
   a. Sodium, calcium, iron, and iodine.
6. Water.
   a. Proper hydration.
7. Fiber.
   a. Aiding digestion.

E. *Nutrient Balance*
1. Proper nutrient percentages.
2. Weight control.

F. *The Balanced Diet*
1. Practical guidelines.

G. *The Digestive System*
1. Breaking down food.
2. Providing fuel.

H. *Pre-Competition Nutrition*