

DESCRIPTION

Exercise Science and Sports Medicine is designed to teach students components of exercise science/sports medicine. Information taught includes exploration of therapeutic careers, medical terminology, anatomy and physiology, first aid, injury prevention principles, the healing process, rehabilitation techniques, therapeutic modalities, sport nutrition, sport psychology, and performance enhancement philosophies.

Total Test Questions: 53

Levels: Grades 11-12

Units of Credit: 1.0

Prerequisites: None

STANDARDS, OBJECTIVES, AND INDICATORS

STANDARD I

❖ EXPLORE THE FUNDAMENTAL ASPECTS OF EXERCISE SCIENCE/SPORTS MEDICINE.

Objective 1: Identify members of the Sports Medicine team.

- I. Recognize the primary members of the sports medicine team to include:
 - a. Coach
 - b. Athlete
 - c. Parents
 - d. Team Physician
 - e. Certified Athletic Trainer
 - f. Allied Health Professionals

Objective 2: Explore a variety of therapeutic careers and describe the job duties and skills, education required, job settings, and potential salary for:

1. Certified Athletic Trainer
2. Physical Therapist
3. Physical Therapy Assistant
4. Physical Therapy Aide
5. Occupational Therapist
6. Occupational Therapy Assistant
7. Exercise Physiologist
8. Orthopedic Surgeon
9. Physician
 - DO
 - MD
10. Physician Assistant
11. Nurse Practitioner
12. Biomechanist
13. Prosthetist



14. Orthotist
15. Podiatrist
16. Chiropractor
17. Sports Psychologist
18. Registered Dietician
19. Certified Strength & Conditioning Specialist/Personal Trainer
20. Emergency Medicine
 - EMT
 - Paramedic

Objective 3: Explain legal issues and legal terminology.

1. Discuss risk management in an athletic setting
 - Collision
 - Contact
 - Non-contact
 - Surfaces
2. Define legal terminology and discuss issues including:
 - Assumption of Risk
 - Battery
 - Commission
 - Omission
 - Failure to Warn
 - HIPAA
 - Informed Consent
 - Liability
 - Malpractice
 - Negligence
 1. Duty of care
 2. Breach of duty
 3. Damage/injury
 4. Proximal cause
 - Standard of Care
 - Statute of limitations
 - Good Samaritan Law
3. Discuss parameters of ethical conduct and associated issues including:
 - Americans with Disabilities Act
 - Cheating
 - Drug testing
 - Fair play and sportsmanship
 - Performance enhancing drugs
 - Scope of practice
 - Title IX (Gender equity in sports)
 - Winning at all costs
4. Review preventative measures to reduce potential risks of litigation.



- Medical History & Preparticipation Physical Examination (PPE)
- Carry liability insurance
- Continuing education
- Demonstrate appropriate documentation (SOAP)
- Follow physician orders and recommendations
- Have an emergency action plan
- Maintain adequate supervision
- Maintain good rapport with the Sports Medicine Team
 - **REQUIRED SKILL** – SOAP Note

STANDARD 2

APPLY MEDICAL TERMINOLOGY.

Objective 1: Identify and utilize anatomical positions, planes, and directional terms.

1. Demonstrate what anatomical position is and how it is used to reference the body.
2. Distinguish between the commonly used anatomical planes and recognize their individual views.
 - Sagittal / Midsagittal Plane
 - Frontal / Coronal Plane
 - Transverse / Horizontal Plane
3. Apply directional terms to their location on the human body.
 - Superior / Inferior
 - Anterior / Posterior
 - Medial / Lateral
 - Distal / Proximal
 - Superficial / Deep
 - Ventral / Dorsal
 - Prone / Supine
 - Unilateral / Bilateral

Objective 2: Demonstrate body movements.

1. Compare and contrast the various movements of the body and their counter-movements.
 - Flexion / Extension / Hyperextension
 - Adduction / Abduction
 - Pronation / Supination
 - Retraction / Protraction
 - Elevation / Depression
 - Rotation / Circumduction
 - External Rotation / Internal Rotation
 - Lateral Flexion (side-bending left or right)
2. Compare and contrast the various movements of the foot /ankle and their counter-movements.



- Inversion / Eversion
 - Dorsiflexion / Plantarflexion
 - Pronation / Supination
3. Compare and contrast the lateral movements of the wrist/hand and their counter-movements.
- Radial Deviation / Ulnar Deviation
 - Opposition
- Objective 3: Define terms associated with Exercise Science.
1. Define the terminology that describes common sports injuries.
 2. Define the concepts related to the injury process.

STANDARD 6

STUDENTS WILL DESCRIBE THE INJURY AND HEALING PROCESS

- Objective 1: Discuss the inflammatory response and the healing process
1. Compare and contrast Acute and Chronic injuries
 2. Discuss the purpose of inflammation
 3. Categorize the stages of acute injury healing and explain the processes involved in each.
 - a. Acute (Inflammation) Phase
 1. Signs and symptoms of inflammation
 1. Heat
 2. Redness
 3. Swelling
 4. Pain
 5. Loss of function
 2. Time frame
 3. Define vasodilation and explain why it occurs
 4. Define hypoxia and explain its role in secondary injury
 - b. Subacute (Repair and Regeneration) Phase
 1. Time frame
 2. Explain what fibroblasts are
 3. Explain what collagen is and its role in scar tissue formation
 - c. Remodeling (Maturation) Phase
 1. Time frame
 2. Define adhesions
 3. Explain Wolff's Law
- Objective 2: Compare and contrast injury classifications
1. Describe first degree injuries
 2. Describe second degree injuries
 3. Describe third degree injuries
- Objective 3: Compare and contrast common fractures
1. Compression
 2. Depressed
 3. Greenstick
 4. Comminuted
 5. Longitudinal



6. Spiral
7. Transverse

STANDARD 4

◆ **Students will explore specific sports injuries of the head and neck and apply athletic injury prevention principles.**

Objective 1: Review the anatomy of the head and neck.

1. Bones

- Frontal
- Occipital
- Parietal
- Temporal
- Mandible
- Maxillae
- Zygomatic
- Nasal
- Cervical Vertebrae

2. Muscles

- Sternocleidomastoid
- Trapezius

3. Structures

- Brain
- Intervertebral discs

4. Nerves

- Cervical plexus
- Brachial plexus

Objective 2: Recognize common injuries to the head and neck to include:

- Concussion
- Subdural hematoma
- Cervical spine fracture
- Brachial plexus injuries
- Nose bleeds

1. Identify the mechanism of injury
2. Identify the signs and symptoms of the injury
3. Indicate appropriate treatment for the injury
4. Describe injury prevention strategies

Objective 3: Describe the basic principles and specialized equipment used in the prevention of athletic injury.

1. Recognize types and functions of protective equipment.

- Helmet, facemask, ear guards
- Mouth guards
- Neck collars
- Padding
- Sports bras
- Compression shorts/cup



2. Discuss the legal ramifications of manufacturing, buying, and issuing equipment.
 - NOCSAE warning
 - Modification of equipment
 - Proper fit and selection
 - Use of defective or worn out equipment

STANDARD 5

◆ Students will explore various aspects of sports nutrition.

Objective 1: Describe the basic components of nutrition and the sources of the following nutrients.

1. Carbohydrates
2. Proteins
3. Fats
4. Vitamins
5. Minerals
6. Water

Objective 2: Examine the importance of fluid replacement and hydration.

1. Examine the importance of water and its role in the body.
2. Explain the correct process of hydration during athletic activity.
 - Identify the dangers of inappropriate hydration techniques.
 - Identify the dangers of dehydration.
 - Compare and contrast advantages and disadvantages of sports drinks.
 - Identify the role of sports drinks in hydration.
 - Discuss the correct chemical make-up of sports drinks.

Objective 3: Identify the components of a pre and post event meal and explain the value of each.

1. Describe recommended nutrient percentages of pre and post event meals.
2. Identify foods that are easily digested.
3. Identify foods that should be avoided.
4. Identify when pre and post event meals should be eaten.
5. Explain the process of carbohydrate loading and discuss when it is most effective.

STANDARD 6

◆ Students will explore the fundamentals of body composition and diseases and disorders related to body issues.

Objective 1: Describe basic body composition.

- Define body composition.
- Compare and contrast the most common methods for analyzing body composition.
 - a. Hydrostatic
 - b. Bod Pod
 - c. Calipers BIA



- d. BMI
 - Describe the parameters of safe weight loss and weight gain.
- Objective 2: Recognize disorders associated with nutrition.

1. Identify signs, symptoms, and effects of Anorexia Nervosa.
2. Identify signs, symptoms, and effects of Bulimia Nervosa.
3. Identify signs, symptoms, and effects of Bigorexia.
4. Identify signs, symptoms, and effects of the Female Athlete Triad.

STANDARD 7

◆ **Students will explore specific sports injuries of the lower extremities and apply athletic injury prevention principles.**

Objective 1: Review the anatomy of the lower extremities.

1. Bones
2. Femur
 - Tibia
 - Fibula
 - Patella
 - Talus
 - Calcaneus
 - Metatarsals
 - Phalanges
3. Joints
 - Tibial Femoral
 - Patello Femoral
 - Talocrural
 - Subtalar
4. Soft Tissues
 - Patellar Tendon
 - ACL
 - MCL
 - PCL
 - LCL
 - Lateral and Medial Meniscus
 - Anterior Tibiofibular ligament
 - Deltoid ligament
5. Muscles
 - Quadriceps
 - Hamstrings
 - Peroneals
 - Tibialis Anterior
 - Tibialis Posterior
 - Gastrocnemius
 - Soleus
 - Achilles Tendon

Objective 2: Recognize common injuries to the lower extremity to include:

- Collateral Ligament Sprains
- Meniscal injury



- Patello-femoral injuries
 - Ankles sprains
 - Plantar Fasciitis
 - Turf toe
 - Thigh contusions
 - Quadriceps/Hamstring strains
 - Medial Tibial Stress Syndrome
1. Identify the mechanism of injury
 2. Identify the signs and symptoms of the injury
 3. Indicate appropriate treatment for the injury
 4. Describe injury prevention strategies
 - Shin Guards
 - Shoes
 - Other sport specific protection devices

Objective 3: Demonstrate theory and principles of prophylactic taping.

1. Analyze the basic principles of prophylactic taping.
2. Identify the necessary supplies and their purpose for prophylactic taping.
 - Athletic tape (various sizes)
 - Underwrap
 - Heel and lace pad
 - Adhesive spray
 - Shark/Scissors
3. Analyze the basic principles of proper tape removal.
4. Explain the terminology associated with prophylactic taping procedures.
 - Anchor
 - Stirrup
 - Horseshoe
 - Spica
 - Heel-lock
 - Checkrein/fan
5. **REQUIRED SKILL**-Competently tape an ankle using the standard prophylactic taping method.
6. **OPTIONAL SKILL**-Competently tape an arch using the standard prophylactic taping method.

Objective 4: Identify principles of protective bracing.

1. Discuss the differences between functional and prophylactic bracing.
2. Identify the function of joint sleeves (compression).

STANDARD 8

Students will examine performance enhancement philosophies.

Objective 1: Define terms associated with performance enhancement.

1. Cardiovascular endurance
2. Muscular endurance
3. Power
4. Speed
5. Strength



Objective 2: Discuss general conditioning principles.

1. Adaptation
2. Overload
3. Specificity
4. Reversibility
5. Periodization

Objective 3: Examine the role the cardiovascular/respiratory systems have on fitness/athletic performance.

1. Describe the anatomy of the cardiovascular/respiratory systems.
 - Heart
 - a. 4 chambers
 - b. 4 valves
 - c. 4 blood vessels
 - Lungs
 - a. Oxygen exchange from alveoli to capillaries
2. Identify vital signs related to the cardiovascular/respiratory system.
 - Describe and accurately measure blood pressure (systolic/diastolic)
 - Describe and accurately measure respiratory rate
 - Describe and accurately measure pulse rate
 - Describe lung volume
 - Describe the importance of cardiac output, stroke volume, and heart rate during exercise
3. Examine different types of tests used to quantify cardiovascular fitness.
 - VO_{2max}
 - Harvard step test
 - 12 minute run test
4. Describe the effects exercise has on the cardiovascular/respiratory systems.
 - Immediate effects of exercise
 - a. Heart rate
 - b. Ventilation
 - Long term effects of exercise
 - a. Heart rate
 - b. Stroke volume
 - c. Cardiac output
5. Compare and contrast aerobic/anaerobic training
6. Examine the importance of a warm up/cool down in a training program.
7. Examine different cardiovascular training methods.
 - Interval
 - Fartlek
 - Circuit
 - Continuous
8. Apply general conditioning principles to improve cardiovascular fitness.
 - Rate of perceived exertion (BORG scale)
 - Target heart rate

Objective 4: Examine the effects of the environment on training and performance.

1. Discuss the effect of high and low altitude.
2. Describe the effects of acclimatization.
3. Recognize the effects of travel on the body.

STANDARD 9



❖ **Students will examine strength training principles, flexibility, and ergogenic aids.**

Objective 1: Examine the role strength training has on fitness/athletic performance.

1. Describe and know the function of the following muscular structures:
 - Fascia
 - Fascicle
 - Fibers
 - Myofibrils
 - Sarcomere
 - a. Actin
 - b. Myosin
 - Neuromuscular junction
2. Sliding filament theory
3. Compare and contrast the difference between slow twitch and fast twitch muscle fibers and the type of athletic performance each influence.
4. Compare and contrast different types of movements related to strength training
 - Isometric/isotonic/isokinetic
 - Eccentric/concentric
 - Closed chain/open chain
 - Plyometrics
5. Identify methods of resistance.
6. Apply general conditioning principles to improve strength.
 - Speed
 - Muscular endurance
 - Power

Objective 2: Examine the importance of flexibility in fitness/athletic performance.

1. Explain the general guidelines of flexibility.
 - Define ROM and how it relates to fitness/athletic performance
 - Identify the benefits of flexibility
 - a. Decrease risk of injury
 - b. Reduce muscle soreness
 - c. Improve muscular balance and postural awareness
 - Demonstrate proper timing of flexibility techniques
 - a. Before activity
 - b. After activity
2. Identify the different methods to increase flexibility and the safety/effectiveness of each.
 - Static stretching
 - a. **REQUIRED SKILL**-Demonstrate the proper techniques of static stretching for all major muscle groups
 - Ballistic stretching
 - Dynamic stretching
 - Proprioceptive Neuromuscular Facilitation Stretching
 - a. Contract/Relax
 - b. Hold/Relax

Objective 3: Compare and contrast the physiological and psychological effects of ergogenic aids.

1. Define ergogenic aid.
2. Recognize the effects and possible dangers of common ergogenic aids.
 - Stimulants



- Narcotics
 - Anabolic steroids
 - Beta blockers
 - Diuretics
 - Human growth hormone
 - Blood doping products
 - Erythropoietin
 - Anesthetics
 - Corticosteroids
 - Creatine
3. Discuss the dangers of energy drinks and their effects on the body.

STANDARD 10

◆ Students will explore specific sports injuries of the upper extremities and apply athletic injury prevention principles.

Objective 1: Review the anatomy of the upper extremity.

1. Bones

- Scapula
- Clavicle
- Humerus
- Radius
- Ulna
- Carpals
- Metacarpals
- Phalanges

2. Joints

- Shoulder
 - a. Sternoclavicular
 - b. Acromioclavicular
 - c. Glenohumeral
 - d. Scapulothoracic
- Elbow
- Wrist
- Metacarpal Phalangeal
- Interphalangeal

3. Soft tissues

- Subacromial bursa
- AC ligament
- Glenoid labrum

4. Muscles

- Deltoid
- SITS (subscapularis, infraspinatus, supraspinatus, teres minor)
- Biceps brachii
- Triceps brachii

Objective 2: Recognize common injuries to the upper extremity to include:

- Clavicle fracture
- Impingement syndrome
- Rotator cuff injuries



- Glenohumeral dislocation
 - AC joint separation
 - Epicondylitis
 - Interphalangeal dislocation
1. Identify the mechanism of injury.
 2. Identify the signs and symptoms of the injury.
 3. Indicate appropriate treatment for the strategy.
 4. Describe injury prevention strategies.
 5. **REQUIRED SKILL**-Competently tape thumb using the standard prophylactic taping method.
 6. **OPTIONAL SKILL**-Competently tape a wrist using the standard prophylactic taping method.

STANDARD II

◆ Students will be able to recognize common injuries and administer injury management.

Objective 1: Explain an injury assessment (HIPS)

1. Identify proper PPE/BSI precautions.
2. Identify the components included in obtaining an accurate history.
3. Identify the components of an inspection.
4. Describe the process of palpation.
5. Describe the purposes of special tests.
 - Range of Motion
 - a. Passive
 - b. Active
 - c. Resistive
 - Stress Tests (structural integrity)
 - Neurological
 - Functional
6. Discuss the decisions that can be made from a HIPS evaluation.
7. Explain a HIPS assessment.

Objective 2: Identify soft tissue injuries and skin conditions.

1. Differentiate signs, symptoms, and treatment for:
 - Avulsions
 - Abrasions
 - Bites
 - Blisters
 - Contusions
 - Lacerations
 - Stings
2. Differentiate signs, symptoms, and treatment for:
 - Ring worm
 - Jock itch
 - Athlete's foot
 - Impetigo
 - MRSA
 - Warts
 - Eczema



Objective 3: Recognize abdominal injuries, bleeding, and shock.

1. Discuss external bleeding.
2. Demonstrate proper procedures to control bleeding.
 - Apply direct pressure with sterile gauze pad
 - Apply a pressure dressing
 - Check circulation
3. Identify signs, symptoms, and treatment of internal bleeding.
4. Identify signs, symptoms, and treatment of abdominal injuries
 - Ruptured spleen
 - Appendicitis
 - Hernia
5. Describe the signs, symptoms, and treatment of shock.

Objective 4: Discuss immobilization techniques.

1. Identify fracture signs and symptoms.
2. Explain the steps to immobilization.
 - Splint in the position found
 - Immobilize the joint above and the joint below
 - Check circulation distal to the injury
3. Explain head/neck immobilization
 - Maintain in-line stabilization
 - Monitor ABC/s
4. **REQUIRED SKILL**-Demonstrate crutch fitting to any size individual

Objective 5: Recognize and provide treatment for environmental conditions.

1. Compare and contrast the causes, signs, symptoms, and treatment of heat illnesses.
 - Heat cramps
 - Heat exhaustion
 - Heat stroke
2. Compare and contrast the causes, signs, symptoms, and treatment of cold exposure.
 - Hypothermia
 - Frostbite

Objective 6: Describe the treatment for the following medical conditions:

1. Seizures
2. Fainting
3. Diabetes
4. Anaphylactic shock
5. Asthma
6. Exertional sickling
7. Sudden cardiac arrest

STANDARD 12

❖ **Students will explain therapeutic modalities and rehabilitation techniques.**

Objective 1: Explore therapeutic modalities.

1. Identify the purpose of therapeutic modalities.
2. Explain how to properly select the use of therapeutic modalities.



3. Identify the Gate Control Theory as a principle of pain management and describe the physiological process of the theory.

Objective 2: Describe the physiological effects, indications, contraindications, and application of the following:

1. Cryotherapy

- Ice packs
 - a. **REQUIRED SKILL**-Prepare an ice bag/pack
- Ice massage
- Ice immersion
- Cold whirlpool
- Chemical coolant
- Describe the R.I.C.E. method for acute injuries
 - a. **REQUIRED SKILL**-Apply a compression wrap to an ankle
 - b. **REQUIRED SKILL**-Apply a compression wrap to a knee

2. Thermotherapy

- Heat packs
- Ultrasound
- Hot whirlpool

3. Electrotherapy

4. Massage

Objective 3: Discuss the components and goals of a rehabilitation program.

1. Identify the general guidelines of a rehabilitation program.

- Individualize each program
- Be as aggressive as possible without causing harm
- Use a variety of equipment
- Common mistakes
 - a. Treat the cause not the symptoms
 - b. Not addressing the contra-lateral side
 - c. Postural defects, anatomical mal-alignment, and biomechanical imbalances
- Appropriate goal setting
- Components of a rehabilitation program

2. Phase I

- Body conditioning/maintain cardiovascular fitness throughout all phases
- Control swelling
- Control pain
- Increase range of motion

3. Phase II

- Restore full range of motion
- Strength, endurance, speed, power in all muscle groups
- Begin skill patterns and proprioception

4. Phase III

- Functional and sport specific skills
- Restore balance and proprioception
- Return to sport

5. Relate the different exercise principles to rehabilitation

- SAID
- Overload



