Free Study Guide for the ACE CPT Exam

Use this study guide as a summary of all the topics from the ACE CPT Textbook. If you want to focus on the specific topics that make it onto the ACE CPT Exam check out our Online Course, Audio Lectures, Practice Tests and Study Guide for the ACE CPT Exam.

Chapter 1 Role and Scope of Practice for the Personal Trainer

I. Health benefits of exercise
   a. Reduced risk of many diseases for children, adolescents, adults, and older adults
   b. Minimum 150 minutes per week of moderate intensity to receive benefits

II. Health professionals
   a. Credentialed to identify, prevent, and treat diseases and disorders
      i. Rehabilitation professionals, nutritional professionals, Physician/Nurse practitioner, Mental health professionals, Licensed Alternative healthcare professionals, and Trainers/Coaches/Instructors

III. Scope of practice
   a. Do's and Do Not's
      i. See table 1-2 and 1-3 of ACE CPT Manual and know it
         1. Do not: diagnose, prescribe, prescribe diets or supplements, treat injury or disease, rehabilitate, or counsel

IV. Referral network
   a. Potential sources
      i. Mind/body instructors, smoking-cessation programs, aquatic programs, support groups, massage therapist
      ii. Supplements and nutrition: www.dietaryguidelines.gov and www.ChooseMyPlate.gov

V. Increasing your value
   a. Continuing education, advanced knowledge, specialization, degrees, additional fitness certifications, new areas of expertise within allied healthcare.

Chapter 2 Principles of Adherence and Motivation

I. Motivation (in regards to exercise)
- a. **intrinsic motivation**: person truly enjoys exercise and the pleasure/emotions and experience that comes from engaging in it. Increases adherence
- b. **extrinsic motivation**: participation for any benefit other than enjoyment such as weight loss, trying to be healthy, looking good, meeting new people. Feelings of tension, guilt, or pressure related to their participation
- c. **self-efficacy**: belief in one's own capability to engage in a physical-activity program

II. Maintaining Client Motivation
- a. **Social support:** a network of family, friends, co-workers, etc who support one's involvement in exercise and acts as a coping strategy for relapse (returning to an unhealthy/inactive state) prevention
  - i. **Strategies for building a social support system**
    1. find a workout partner
    2. ask friends and family to be encouraging, as well as asking them for reminders about goals or appointments
    3. set up "fun" contests
    4. add a social element
    5. find an enjoyable activity
  - ii. Fighting negative social influences
    1. Balance time with unsupportive people and supportive
    2. Set limits on how much time is spent with unsupportive people
    3. Mentally prepare
    4. Mentally review
    5. Explain to them why exercise is important for you
- b. **Assertiveness**
  - i. Honest, straightforward expression of thoughts, feelings, and beliefs
- c. **Self-regulation**

i. Teach clients to take control over their behavior instead of doing it for them

d. **High-risk situations**
   i. Teach clients to be prepared for barriers and relapses and have a plan of action for when high-risk situations occur. Give them coping strategies and more education

III. Influences on adherence and participation

a. Personal attributes
   i. demographic variables, health status, activity history, psychological traits, *knowledge, attitudes, and beliefs*
      1. *locus of control – belief in personal control over health outcomes*
b. Environmental factors
   i. Access to facilities
   ii. Time
   iii. Social support
c. Physical-Activity factors
   i. Intensity
      1. Program too intense causes dropout
   ii. Injury

IV. Feedback

a. Extrinsic feedback: reinforcement, error correction, and encouragement
b. Intrinsic feedback: information that the clients provide themselves based on their own sensory systems (what they feel, see, or hear)
c. Knowledge of results: provides information on progress

V. Leadership Qualities of the Trainer

a. Professionalism
   i. Neat, clean, and non-threatening appearance. Being punctual and prepared
b. Trust and credibility
c. Demonstrates listening abilities
d. Demonstrates excitement for their job
e. Continuing to show clients they care
f. Takes time to think about clients experiences through the clients' eyes

VI. How the Trainer can Help Build Adherence

a. Program Design
b. Role Clarity
c. Goal Setting

i. Avoid too many goals and avoid negative goals
ii. Set short- and long-term goals
iii. Revisit goals on a regular basis

d. Contracts and agreements

Chapter 3 Effective Communication and Coaching Strategies

I. Client – Trainer Relationships

a. **Rapport stage:** mutual understanding and trust in a relationship both verbal and nonverbal
   i. Continues to build over time
   ii. Positive first impressions
   iii. Verbal and nonverbal
      1. Voice quality – inspire confidence, don't sound weak or hesitant
      2. Eye contact – direct and friendly
      3. Facial expressions – try to convey genuine emotion
      4. Hand gestures – too much is distracting, keep hands quiet
      5. Body position – exhibit good posture

b. **Investigation stage**: review clients' health and fitness data, any available test results, medical clearance information, and clients' goals and exercise history
   i. Trainer exhibits effective listening skills in this stage
      1. Encourage
      2. Paraphrase
      3. Ask open-ended questions
      4. Reflect
      5. Summarize
   ii. Respond to difficult disclosures

c. **Planning stage:** trainer designs exercise program with client. Client is now ready to begin working out
   i. Set goals (see tables 3-2 and 3-3 for SMART goal setting suggestions)
      1. **SMART goals – specific, measurable, attainable, relevant, time-bound**
      2. **Process goals –** something client does (complete 3 workouts this week)

3. **Product goals –** something achieved like weight loss or personal best on a lift

ii. Form and discuss alternatives
iii. Form a plan
iv. Evaluate the exercise program
v. Motivational interviewing
    1. Ask probing questions
    2. Listen effectively
    3. Provide educational information
    4. Keep the conversation friendly
    5. Build self-confidence
    6. Encourage

d. **Action stage:** Client begins working out
    i. Trainer must have ability to effectively teach new motor skills at this point
    ii. Set up self-monitoring systems
    iii. Individualize teaching techniques
        1. Tell, show, do
        2. Remind beginners that it takes time to improve motor skills
        3. Introduce new skills slowly and clearly
        4. Allow clients the opportunity for focused practice
    iv. Provide feedback
        1. Reinforce what was done well, correct errors, motivate clients to continue practicing and improving
    v. Using effective modeling
    vi. Behavioral contracts

II. Effective Communication

a. Cultural competence – ability to communicate and work effectively with people from different cultures
b. Enhancing adherence
    i. Show empathy and continue to build rapport
    ii. Professional boundaries

III. Learning Strategies

a. **Cognitive learning stage –** use tell, show, do and provide opportunity for practice. Stage when clients are trying to understand a new skill.

b. **Associative stage of learning:** clients are mastering the basics and ready for more specific feedback that will help them refine the motor skill.
    i. Trainer must balance giving appropriate feedback with proper amount of feedback
c. **Autonomous stage of learning –** clients performing motor skills effectively and naturally
d. Trainer doing less teaching and more monitoring

Chapter 4 Behavior and Psychology

1. Behavioral Theory Models
    a. Health belief model – The threat of health problems will motivate people to exercise and or engage in healthy behavior.
        i. Perceived seriousness – the more serious the health threat the more likely one is engage
        ii. Perceived susceptibility – ones feeling about their chances of experiencing a health threat
        iii. Cues to action – physical and/or environmental happenings that motivate people to action
        iv. Vocabulary
            1. Sedentary
            2. Hypertension
    b. Self-efficacy – subjective perception of one's own ability to succeed
        i. Past performance experience
        ii. Vicarious experience
        iii. Verbal persuasion
            1. Feedback
        iv. Physiological state appraisals
        v. Emotional state and mood appraisals
        vi. Imaginal experiences
    c. Transtheoretical model (TTM) of behavioral change and components, (deals with ones readiness to make change)
        i. Stages of change
            1. **Precontemplation** – sedentary and not considering an exercise program

2. **Contemplation** – still sedentary but considering exercise as important and are beginning to see the negative effects of being inactive
3. **Preparation** – some physical activity, mentally and physically preparing to start an exercise program
4. **Action** – engaging in regular exercise but have been doing so for less than 6 months
5. **Maintenance** – regular exercise for longer than 6 months

ii. Process of change (very important for trainers)
   1. **Table 4-1**

iii. Self-efficacy

iv. Decisional balance – refers to the number of pros and cons perceived about adopting and/or maintaining an exercise program

2. Principles of behavioral change
   a. Operant conditioning – process in which behaviors are influenced by their consequences
      i. Antecedents – stimuli that precede a behavior and often signal the likely consequences of the behavior
      ii. Stimulus control – when antecedents are manipulated in the environment to maximize the likelihood of desirable behaviors
         1. Ex: someone who is consistently late sets an alarm extra early to signal when it is time to get ready to be on time.
      iii. Consequences
         1. Presentation, non-occurrence, or removal of a positive or aversive stimulus
         2. ***positive reinforcement*** - presents a positive stimulus that can increase the likelihood that a behavior will reoccur in the future
         3. ***negative reinforcement*** - removing or avoiding aversive stimuli following undesirable behavior
            a. Also, increasing the likelihood that behavior will reoccur
         4. ***Extinction*** – occurs when a positive stimulus that once followed a behavior is removed and the likelihood that the behavior will reoccur is decreased
         5. ***Punishment*** – decreases the likelihood of the behavior reoccurring

a. Consists of an aversive stimulus following an undesirable behavior
b. Increases fear, decreases enjoyment, use sparingly

b. Shaping
    i. Gradually increasing demands of a skill or behavior followed by positive reinforcement as more is accomplished
    ii. Critical for building self-efficacy
    iii. Too easy=client gets bored, too hard=client feels discouraged, inadequate, and overwhelmed
        1. Both scenarios lead to increased dropout rate
c. Observational learning
    i. Be aware of exercise behaviors of the people closest to clients as they may impact the likelihood of client success.
d. Cognition and behavior
    i. Replacing irrational thoughts with more productive, healthier thoughts by asking questions such as those listed on P.79

3. Behavior-change strategies
    a. Stimulus control
        i. Making adjustments to the environment to increase the likelihood of healthy behaviors
        ii. *Willpower* – ability to ignore temporary pleasure or discomfort to pursue a longer-term goal, a biological function
    b. Written agreements and behavioral contracting
        i. Can be used together or on their own
        ii. Client must have an active role in development
    c. Cognitive behavioral techniques
        i. Goal setting – SMART goals
        ii. Feedback
            1. Intrinsic or extrinsic
            2. As efficacy and ability improve the trainer should reduce external feedback and allow clients to start providing feedback for themselves
            3. There is such thing as too much feedback
        iii. Decision making
            1. Give clients control over their own program participation

2. Trainer should not make every decision and micromanage clients program
3. Give clients knowledge to be successful on their own

iv. Self-monitoring
1. Helps clients keep track of program participation and progress (or lack of progress)
2. Helps identify barriers
3. Requires honesty and self-reflection from clients
4. Journaling

4. Implementing new strategies
   a. Info/data collection never ends
   b. Make minor adjustments accounting for psychological variables
   c. Use feedback and communication to overcome new barriers and be aware of changes occurring with clients
   d. Maximize adherence

Chapter 5 Integrated Fitness Training Model

1. Intro
    a. Activities of daily living (ADL)
        i. Cooking, cleaning, getting dressed, chores around house, work's physical requirements
    b. Chronic disease
    c. Type 2 diabetes
    d. Coronary artery disease
    e. Hypertension
    f. Obesity
    g. Hyperlipidemia
    h. osteoporosis
2. **FITT-VP general recommendations for cardiovascular exercise**
    a. Frequency
        i. 5+ days moderate exercise
        ii. 3+ days vigorous
        iii. Combination of both
    b. Intensity
        i. Moderate and/or vigorous for most
        ii. Light-to-moderate for deconditioned
    c. Time
        i. 30-60 minutes/day for moderate
        ii. 20-60 minutes/day for vigorous
        iii. Less than 20 min/day can be beneficial in previously sedentary
    d. Type
    e. Volume
    f. Pattern
    g. Progression

i. Gradual progression done by adjusting duration, frequency, and/or intensity

3. **FITT-VP recommendations for resistance training**
    a. Frequency
        i. 2-3 times/week for each major muscle group
    b. Intensity
        i. Novice to intermediate = 60-70% 1RM @ moderate to vigorous intensity
        ii. Experience individuals = 80+% 1RM @ vigorous to very vigorous to gain strength
        iii. Older individuals/sedentary individuals = 40-50% 1RM @ very light to light intensity for beginners to improve strength
        iv. Less than 50% 1RM @ light to moderate intensity to improve muscular endurance
        v. 20-50% 1RM to improve power in older adults

4. Functional fitness and health
    a. Stability/mobility training
        i. Ready for ADL's
    b. Balance training
    c. Exercise for improved health
    d. 4-6 weeks of functional training before moving into the fitness domain
5. Integrated Fitness Training Model (IFT)
    a. Training components
        i. Functional movement (FM) and resistance training (RT)
        ii. Cardiorespiratory training
    b. Phase 1
        i. FM and RT – stability and mobility
        ii. Cardiorespiratory – aerobic-base training
    c. Phase 2
        i. FM and RT – movement training
        ii. Cardiorespiratory training – aerobic-efficiency training
    d. Phase 3
        i. FM and RT – load training
        ii. Cardiorespiratory training – anaerobic-endurance training
    e. Phase 4
        i. FM and RT – performance training

ii. Cardiorespiratory – anaerobic-power training

f. 1st session
   i. Health-risk appraisal – measuring HR, BP, height, weight, etc…

g. 1st or 2nd session
   i. Medical clearance if necessary
   ii. Static posture
   iii. Flexibility
   iv. Movement screens

h. Week 1
   i. Static and dynamic balance
   ii. Core function

i. Week 2
   i. Health related assessments – flexibility, body comp., aerobic capacity

j. Week 3
   i. Muscular strength and muscular endurance

k. Varies by needs/goals
   i. Skill-related assessments – speed, agility, coordination, reaction time, power

l. Foundation of IFT Model is Rapport

6. IFT Model components and phases
   a. Functional movement and resistance training
      i. Phase 1 – Stability and mobility training
         1. Introduce low-intensity exercise
         2. Improve muscle balance, muscular endurance, core function, flexibility, as well as static and dynamic balance to improve posture
         3. Neutral position (unique to each individual)
         4. Improve strength and function of muscles responsible for stabilizing spine and COG during movement
         5. Assessments – posture, balance, movement, range of motion of ankle, hip, shoulder complex, and thoracic and lumbar spine
      ii. Phase 2 – Movement training
         1. Bend-and-lift movements (squatting, sitting down and standing up)
         2. Single-leg movements (lunging, stepping forward to pick up off ground)
         3. Pushing movements (forward, overhead, lateral, downward)
         4. Pulling movements (picking up a child)

5. Rotational movements (spiral, reaching across body to pick up object)
6. Planes of motion and anatomical positioning
    a. Frontal – cut body into front and back halves
    b. Sagittal – cut body into left and right halves
    c. Transverse – cut body into top and bottom halves (rotational movements)
    d. Superior – being above a given landmark (head is superior to chest)
    e. Inferior – being below a given landmark (knee is inferior to hip)
    f. Anterior (ventral) – front of body (nose is on anterior aspect of body)
    g. Posterior (dorsal) – back of body (glutes are on posterior aspect of body)
    h. Lateral – outside of given landmark (left ear is lateral to left eye)
    i. Medial – inside of given landmark (belly button is medial to hip)
7. Emphasis on controlled motion and deceleration through eccentric muscle actions

iii. Phase 3 – Load Training
1. Goals addressed
    a. Change in body composition (looking more “toned”)
    b. Muscular strength
    c. Muscular endurance
    d. Muscle hypertrophy
    e. Motor unit recruitment
2. Linear or Undulating periodization
3. Can be in this phase for years (especially if no interest in training for performance)

iv. Phase 4 – Performance Training
1. Improving speed, agility, quickness, reactivity, and power
    a. Power = force x velocity or work/time
    b. Force = mass x acceleration
    c. Velocity = distance/time
    d. Work = force x distance

2. Techniques
    a. Plyometric jump training
    b. Medicine ball throws
    c. Kettlebell lifts
    d. Traditional Olympic-style lifts
3. Goals
    a. Increase rate coding (speed at which motor units stimulate the muscles to contract and produce force)
        i. Maximizing stretch reflex by minimizing transition time between eccentric and concentric muscle actions
    b. Development of type II muscle fibers
        i. High-force, short-duration contractions
        ii. Enhancement of muscle size and definition

b. Cardiorespiratory Training
    i. Phase 1 – Aerobic-base training
        1. steady state training in low-to-moderate ranges below first ventilator threshold (VT1)
            a. talk-test – if one can perform the exercise and talk comfortably in sentences that are more than a few words then they are likely below VT1
            b. RPE of 3-4 on a 0-10 scale
    ii. Phase 2 – Aerobic-efficiency training
        1. Goals
            a. Enhance aerobic-efficiency through increased duration, frequency and intensity
            b. Introduce intervals at or just above VT1 or RPE of 5
    iii. Phase 3 – anaerobic-endurance training
        1. Goals
            a. Improve performance in endurance events
            b. Train fitness enthusiasts for higher levels of cardiorespiratory fitness
            c. Introduce higher-intensity intervals/lactate threshold or tolerance training
                i. Balance of time below VT1, between VT1 and VT2, and at or above VT2

2. Phase 3 training zones
    a. Zone 1 (below VT1)
        i. 70-80% of training time
        ii. Recovery workouts, Warm up, cool down, long-distance workouts
        iii. RPE 3-4
        iv. Several days per week
    b. Zone 2 (from VT1 to just below VT2)
        i. Less than 10% of training time
        ii. Aerobic efficiency
        iii. RPE 5
        iv. 1-2 sessions per week
    c. Zone 3 (at or above VT2)
        i. 10-20% of training time
        ii. Anaerobic endurance
        iii. RPE 7-8
        iv. 1-2 sessions per week
3. Signs of Overtraining
    a. Increased resting HR
    b. Disturbed sleep
    c. Decreased hunger on multiple days
    d. Solution: decrease frequency and intensity and focus on recovery with low-moderate RPE 3-4

iv. Phase 4 – anaerobic-power training
1. Goals
    a. Develop peak power
    b. Increase aerobic capacity
        i. Using intervals well above VT2 or RPE greater than 9
    c. Overload fast glycolytic system
    d. Challenge phosphagen system
    e. Enhance ability to perform work for extended periods above lactate threshold
2. Training zones
    a. Zone 1 (below VT1)
        i. 70-80%

   ii. Recovery workouts, warm-up, cool-down, long distance
   iii. RPE 3-4
   iv. Several days per week
b. Zone 2 (VT1 to just below VT2)
   i. Less than 10%
   ii. Aerobic efficiency
   iii. RPE 5
   iv. 1-2 sessions per week
c. Zone 3 (at or above VT2)
   i. 10-20%
   ii. Anaerobic power
   iii. RPE 9-10
   iv. 1-2 sessions per week
      1. Intervals at near maximal effort
      2. Short duration with long recovery

Chapter 6 Rapport

Rapport: personal interaction a trainer establishes and maintains with a client. Requires effective communication as well as mutual respect and understanding.

3 essential attributes:

- *Empathy* – Understanding/experiencing someone else's situation as if it were your own. Putting yourself in their shoes regardless of personal opinion
  - Separate the meaningful from the unnecessary
  - Identify emotional patterns (client becomes defensive when discussing weight challenges)
  - Be conscious of cultural differences in regards to communication
- *Warmth* – unconditional positive regard, or respect, for another person regardless of their individuality and uniqueness. Communicates safety and acceptance.
- *Genuineness* – authenticity, ability to be honest and open

Building Rapport

1. Stages of building rapport
   a. Rapport – impressions, developing trust, demo warmth, empathy, and genuineness
   b. Investigation – identifying readiness to change behavior
   c. Planning – goal setting, programming, motivation and adherence strategies
   d. Action – instruction, demonstration, and execution of program. Proper feedback
2. Style of communication
   a. Preaching – judgmental, lecture-type of communication by telling clients what they should do. Minimizes chance of rapport
   b. Educating – informative, allows client to make more informed decesions
   c. Counseling style – supportive, collaborative effort to proble-solve and help clients make informed decisions. MOST EFFECTIVE STYLE and recommended when implementing a plan and/or modifying a program design

d. Directing stile – more instructive, trainer provides instructions and directions. Most effective when safety and proper form and technique are essential

Pre-exercise questions

- Ask how their typical week looks, what physical activities they do, business activities such as traveling, time spent away from work, recreational activities, pain during movement, etc…
- Find out as much as possible about their lifestyle, habits, and exercise history

1. Bringing changing and motivational interviewing
    a. Motivational interviewing – client-centered method for building intrinsic motivation to change by exploring and resolving mixed feelings about their health and exercise habits
        i. Helps determine if client is ready for change/current stage of change
2. Health-risk appraisal
    a. Pre-participation screening
        i. Identify signs or symptoms for cardiovascular, pulmonary, or metabolic disease
        ii. Identify risk factors
            1. Positive risk factors (bad things)
                a. Family history
                b. Coronary artery disease
            2. Negative risk factors (good things)
                a. HDL (high-density lipoprotein, good cholesterol) score at or above 60 mg/dl
        iii. Determine if they need medical clearance
        iv. Determine if they need medically supervised program
    b. PAR-Q (physical activity readiness questionnaire)
        i. Minimal health-risk appraisal prerequisite
        ii. Quick, easy, non-invasive to administer
        iii. Limited by lack of detail

Positive risk factors	Criteria	Points

Age	Men 45+ years, Women 55+ years	1
Family history	Myocardial Infarction, coronary revascularization, or sudden death before 55 in father or 1st degree male relative, before 65 in mother or 1st degree female relative	1
Cigarette smoking	Current or quit within 6 months or exposure to environmental smoke (secondhand)	1
Sedentary lifestyle	No doing at least 30 minutes of moderate-intensity physical activity at least 3 days per week for at least 3 months	1
Obesity	BMI 30+ or waist firth 102cm+ (40 inches) for men and 88cm+ for women (35 inches)	1
Hypertension	Systolic BP 140+ mmHg and/or diastolic BP 90+mmhg confirmed on at least 2 measurements or on antihypertensive medication	1
Dyslipidemia	LDL cholesterol 130+ mg/dl or HDL cholesterol less than 40 mg/dl, or on lipid-lowering medication, or if total serum cholesterol is 200+ mg/dl	1
Prediabetes	Fasting plasma glucose 100+ mg/dl but less than 125 mg/dl or impaired glucose tolerance (IGT) where a 2 hour oral glucose tolerance test (OGTT) vale is 140+ mg/dl but less than 199 mg/dl, confirmed on at least 2 separate occasions	1
Negative risk factors	**Criteria**	
HDL Cholesterol	60+ mg/dl	-1

1. Risk Classification
    a. Low risk

i. Asymptomatic
ii. Less than 2 risk factors
iii. Medical exam before moderate or vigorous exercise not needed
iv. Exercise test before exercise not recommended
v. Doctor supervision for exercise test not needed

b. Moderate risk
i. Asymptomatic
ii. 2+ risk factors
iii. Medical exam for moderate exercise not needed
iv. Medical exam for vigorous exercise IS needed
v. Exercise test before exercise not recommended
vi. Doctor supervision for exercise test not needed

c. High risk
i. Symptomatic or know CV, pulmonary, renal, or metabolic disease
ii. Medical exam before moderate and vigorous exercise IS needed
iii. Exercise test before moderate and vigorous exercise IS recommended
iv. Doctor supervision for both submaximal and maximal exercise test IS recommended

d. Moderate exercise = 40%-60% VO2R or 3 to less than 6 METs
e. Vigorous exercise = 60%+ VO2R or 6+ METs
f. Signs and symptoms to be noted
i. Pain/tightness or discomfort (angina equivalent) in chest, neck, jaw, arms, or other areas that may result from *ischemia*
ii. Shortness of breath or difficulty breathing at rest or with mild exertion (*dyspnea*)
iii. *Orthopnea* (dyspnea in reclined position) or paroxysmal nocturnal dyspnea
iv. Ankle *edema*
v. *Palpations* or *tachycardia*
vi. Intermittent *claudication* (pain or cramping in lower extremities associated with inadequate blood supply)
vii. Heart murmur
viii. Unusual fatigue or difficulty breathing with usual activities
ix. Dizziness or *syncope*, most commonly caused by reduced *perfusion* to the brain

2. Evaluation forms

a. Informed consent
    i. NOT a liability waiver
b. Agreement and release of liability waiver
    i. Release trainer from liability for injuries
c. Health-history questionnaire
d. Exercise history and attitude questionnaire
e. Medical release
f. Testing forms

3. Health conditions affecting exercise
    a. Cardiovascular
        i. Atherosclerosis – when fatty deposits from cholesterol and calcium build up on the walls of the arteries
            1. Causes thickening of arteries
            2. Loss of elasticity
            3. Can result in angina and possible myocardial infarction, or heart attack
    b. Respiratory (disease of the lungs possibly resulting in difficult or labored breathing)
        i. Bronchitis
        ii. Emphysema
        iii. Asthma
        iv. Chronic obstructive pulmonary disease (COPD)
    c. Musculoskeletal
        i. Consists of muscles, bones, tendons, and ligaments
        ii. Sprains (involving ligaments which connect bone to bone) and strains (involving tendons which connect muscle to bone)
        iii. Overuse injury (most common)
        iv. Herniated discs
        v. Bursitis
        vi. Tendinitis
        vii. Arthritis
        viii. Atrophy
    d. Metabolic
        i. Diseases that interfere with metabolism or the utilization or energy
        ii. Diabetes

iii. Thyroid disorders
e. Other conditions
i. Hernia
1. Contraindication, must be cleared by physician
2. Aggravated by increased abdominal pressure (Valsalva maneuver)
ii. Pregnancy
iii. Illness or infection
4. Medications (TABLE 6-2)
a. Antihypertensive
i. Beta blockers – limit sympathetic nervous system.
1. Block effects of catecholamine (epinephrine and norepinephrine)
2. Use RPE instead of target HR if client is on beta blockers
3. Lowers resting, exercising, and max exercising HR
ii. Calcium channel blockers
1. No significant change in max exercising HR
2. Can increase, decrease or not effect resting and exercise HR
iii. Angiotensin-converting Enzyme (ACE) Inhibitors
iv. Angiotensin-II Receptor Antagonist
v. Diuretics
1. Increase excretion or water and electrolytes through kidneys
2. Can cause water and electrolyte imbalances leading to cardia arrhythmias
3. May predispose an exerciser to dehydration
4. No significant effect on HR
b. Bronchodilators
i. Relax or open air passages to lungs
ii. Allows for better air exchange
c. Cold medications
i. Stimulate vasoconstriction
5. Conducting cardiovascular assessments
a. Taking a pulse manually
i. Radial artery – anterior (ventral) aspect or wrist on thumb side
ii. Carotid artery – lateral to trachea on neck
b. Resting heart rates
i. Bradycardia (slow HR) = less than 60 BPM

ii. Normal = 60-100 BPM
iii. Tachycardia (fast HR) = over 100 BPM
iv. Overall average 70-72 BPM
    1. Males 60-70 BPM
    2. Females 72-80 BPM
        a. Smaller heart chamber size in women
        b. Lower blood volume in women
        c. Lower hemoglobin in women
v. Body position affects RHR
vi. Digestion increases RHR
vii. Methods for measuring
    1. 12-lead electrocardiogram (ECG or EKG)
    2. Telemetry (commercial HR monitors)
    3. Palpation
    4. Auscultation with stethoscope

c. Procedure for measuring exercise HR
    i. Measure pulse for 10 seconds and multiply counted beats by 6
    ii. Measure pulse for 15 seconds and multiply counted beats by 4
d. Blood pressure
    i. Korotkoff sounds
        1. Sounds made from vibrations as blood moves along the walls of the vessels
    ii. Sphygmomanometer – BP cuff

6. RPE (Rating of perceived exertion)
    a. Borg's Scale
        i. 6-20
        ii. 6 = nothing at all, HR of 60 BPM
        iii. 12 = strong, HR of 120 BPM
        iv. 20 = very, very hard, HR of 200 BPM

CH 7 FUNCTIONAL ASSESSMENTS

1. Static postural assessment
    a. Structural integrity – that state of musculoskeletal alignment and balance that allows muscles, joints, and nerves to function efficiently
    b. Kyphosis-lordosis muscle imbalances
        i. Shortened (facilitated/hypertonic)
            1. Hip flexors, lumbar extensors, anterior chest/shoulders, latissimus dorsi, neck extensors
        ii. Lengthened (inhibited)
            1. Hip extensors, external obliques, upper-back extensor, scapular stabilizers, neck flexors
    c. Flat-back muscle imbalances
        i. Shortened (facilitated/hypertonic)
            1. Rectus abdominis, upper back extensors, neck extensors, ankle plantar flexors
        ii. Lengthened (inhibited)
            1. Iliacus/psoas major, internal oblique, lumbar extensors, neck flexors
    d. Sway-back muscle imbalances
        i. Shortened (facilitated/hypertonic)
            1. Hamstrings, upper fibers of posterior obliques, lumbar extensors, neck extensors
        ii. Lengthened (inhibited)
            1. Iliacus/psoas major, rectus femoris, external oblique, upper-back extensors, neck flexors
    e. Muscle imbalances
        i. Correctable
            1. Repetitive movements, habitually poor posture, side dominance, lack of joint stability/mobility, imbalanced strength programs
        ii. Non-correctible

1. Congenital conditions (scoliosis), some pathologies (rheumatoid arthritis), structural deviations, certain traumas (surgery, amputation, etc…)

f. Deviation 1: ankle pronation/supination
   i. Pronation: arch flattening
      1. Foot movement: eversion
      2. Tibial (knee) movement: internal rotation
      3. Femoral movement: internal rotation
      4. plane of view: from front
   ii. Supination: high arches
      1. Foot movement: inversion
      2. Tibial (knee) movement: external rotation
      3. Femoral movement: external rotation
      4. View: from front
g. Deviation 2: Hip adduction (hip hiking)
   i. Lateral tilt of pelvis, elevates one hip
h. Deviation 3: pelvic tilting (anterior or posterior)
   i. Anterior pelvic tilt: superior, anterior portion of pelvis (ASIS) rotates downward and forward. Saggital view
      1. Dumps water out of the front of the bucket
      2. Associated with: tight hip flexors, sedentary lifestyle, lots of time spent sitting (shortened hip flexor position0
   ii. Posterior pelvic tilt: superior, posterior portion of pelvis (ASIS) rotates downward and backward
      1. Dumps water out of the back of the bucket
      2. Associated with: Tight/over dominant rectus abdominis coupled with tight hamstrings
i. Deviation 4: shoulder position/thoracic spine
   i. Elevation, depression, adduction, abduction, upward rotation, downward rotation
   ii. Observations and suspected tight muscles
      1. Shoulders not level: tight upper trapezius, levator scapula, rhomboids
      2. Asymmetry to midline: laterl trunk flexors (flexed side)
      3. Protracted (forward, rounded): serratus anterior, anterior scapulohumeral muscles, upper trapezius

4. Medially rotated humerus: pectoralis major and latissimus dorsi (shoulder adductors), subscapularis
5. Kyphosis and depressed chest: shoulder adductors, pectoralis minor, rectus abdominus, internal oblique

j. Deviation 5: head position (saggital view)
   i. Forward head position = tight cervical spine extensors, upper trapezius, levator scapulae (saggital view)

2. Movement Screening
   a. 5 primary movements
      i. Bending/raising and lifting/lowering movements (squatting)
      ii. Single-leg movements
      iii. Pushing movements (in vertical/horizontal planes) and resultant movements
      iv. Pulling movements (in vertical/horizontal planes) and resultant
      v. Rotational movements
   b. Bend and lift ***(table 7-9)***
      i. Compensations
         1. Anterior view, Knees move inward
            a. Overactive (tight) hip adductors, TFL
            b. Underactive (lengthened) gluteus medius and maximus
         2. Sagittal view, movement initiated at knees
            a. Indicates quadricep and hip flexor dominance
            b. Insufficient activation of glutes group
         3. Sagittal view, back excessively arches (lumbar and thoracic spine view)
            a. Tight hip flexors, back extensor, latissimus dorsi
            b. Underactive core, rectus abdominis, gluteal group, hamstrings
         4. Sagittal view, back rounds forward (same view focus as 3)
            a. tight latissimus dorsi, teres major, pectoralis major and minor
            b. underactive upper back extensors
   c. Hurdle step ***(table 7-10)***
      i. Compensations
         1. Anterior view, stance-leg hip rotation (inward)
            a. Tight stance-leg or raised-leg internal rotators
            b. Underactive stance-leg or raised-leg external rotators
         2. Anterior view, hiking of raised hip (looking at raised-leg)

            a. Tight stance-leg hip flexors (limits posterior hip rotation during raise)
    d. Shoulder push stabilization ***(table 7-11)***
        i. Compensations
            1. Sagittal view, "winging" during the push-up movement at scapulothoracic joint
                a. Parascapular muscles (serratus anterior, trapezius, levator scapula, rhomboids) are unable to stabilize the scapulae against the rib cage. Can also be due to flat thoracic spine
    e. Thoracic spine mobility ***(table 7-12)***
        i. Compensations
            1. Transverse view, bilateral discrepancy (assuming no previous issues)
                a. Possible side-dominance
                b. Possible differences in paraspinal developments
                c. Possible torso rotation, possible associated with some hip rotation
3. Assessing flexibility and muscle-length
    a. Thomas test (hip flexion/quadriceps length)
    b. Passive straight-leg (PSL) raise
        i. Assess length of hamstrings
        ii. At least 80 degrees of flexion before pelvis rotates posteriorly = normal hamstring length
    c. Shoulder mobility
        i. Flexion and extension
            1. Ability to flex shoulders to 170-180 degrees = good shoulder mobility
        ii. Internal and external rotation of humerus at shoulder test
        iii. Apley's scratch test for shoulder mobility
            1. Ability to touch specific landmarks indicates good shoulder mobility
4. Balance and core
    a. Sharpened Romberg test
        i. Assess static balance by standing with reduced base of support and eyes closed
    b. Stork-stand balance test
        i. Assess static balance by standing on one foot in a modified stork-stand position

c. Mcgill's torso muscular endurance test
    i. Trunk flexor endurance test
        1. *Contraindications*: Test may not be suitable for those with low-back pain, had recent back surger, and/or are in the midst of acute low-back flare up
    ii. Trunk lateral endurance test
        1. Contraindications:
            a. May not be suitable for those with shoulder pain or weakness
            b. May not be suitable for those suffering from low-back pain, had recent back surgery, and/or are in midst of low-back flare-up
    iii. Trunk extensor endurance test
        1. Contraindications:
            a. May not be suitable for those with major strength deficiencies
                i. Individual cannot even lift the torso from a forward flexed position to neutral position
            b. Client with high body mass
            c. Low-back pain, recent back surgery, acute low-back flare-up

CH 8 PHYSIOLOGICAL ASSESSMENTS

Important:

- Identifying signs and symptoms that merit immediate termination of an assessment
- Onset of angina/angina like symptoms/chest pain or discomfort
- Systolic BP drop of 10mmHg or more despite increase in intensity
- Rise in BP, over 250mmHg systolic or over 115mmHg diastolic
- Excessive fatigue
- Lightheadedness, pale skin (pallor), coloration around the mouth (cyanosis), nausea, cold and clammy skin
- Dizziness, confusion, ataxia, syncope
- Leg cramping or claudication
- Request to stop
- Physical or verbal signs of severe fatigue
- Equipment failure

1. Body composition and anthropometrics
    a. Lean and fat tissue
        i. Lean body mass: muscles, connective tissue, bones, blood, nervous tissue, skin, and organs
        ii. Essential body fat for women = 10-13%
        iii. Essential body fat for men = 2-5%
    b. Hydrostatic weighing
        i. Underwater weighing
        ii. The “benchmark” for measuring body composition
        iii. Between 1.5-2% margin of error
    c. Skinfold measurements
        i. Uses subcutaneous body fat
        ii. 6-8% error for untrained/inexperienced trainers

iii. Generally +/- 2-3.5% of hydrostatic measurement
iv. Jackson and Pollock three-site locations
    1. Women = Triceps, thigh, suprailium
    2. Men = chest, thigh, abdominal

d. Body-composition evaluation
e. Programming considerations
f. Other anthropometrics measurements
    i. BMI
        1. Underweight = <18.5
        2. Normal weight = 18.5-24.9
        3. Overweight = 25-29.9
        4. Grade I Obesity = 30-34.9
        5. Grade II Obesity = 35-39.9
        6. Grade III Obesity = >40
    ii. Girth measurements
        1. Sites: abdomen, arm, glutes/hips, calf, forearm, midthigh, upper thigh, waist
        2. Good for clients interested in hypertrophy
    iii. Waist-to-Hip Ratio
        1. Apple-shaped (android), or pear-shaped (gynoid)
        2. At risk
            a. Males >0.95
            b. Females >0.86
    iv. Waist circumference
        1. Hight risk
            a. Males = 39.5-47in (100-120cm)
            b. Females = 35.5-43in (90-109cm)

2. Cardiorespiratory fitness testing
    a. Fitness center or lab assessments
        i. Graded exercise test (GXT)
        ii. VO2 Max
        iii. Determining max HR
            1. 220-age Fox, Naughton, & Haskell (=/- 12BPM)
            2. 208 – (0.7 x Age) Tanaka, Monahan, and Seals (+/- 7BPM)
            3. 206.9 – (0.67 x Age) Gellish et al. (+/- 7BPM)

b. Cycle ergometer testing
    i. Submax VO2
c. Ventilator threshold testing
    i. Tidal volume: volume of air inhaled and exhaled per breath
    ii. Minute ventilation: volume of air breathed per minute
    iii. Anaerobic glycolysis energy system reliant on carbohydrates
        1. Predominated during near-maximal -intensity exercise
    iv. First ventilator threshold (VT1): level of intensity blood lactate accumulates faster than it can be cleared
        1. Faster breathing
    v. Second ventilator threshold (VT2): aka lactate threshold (LT)—occurs at the point where lactate is rapidly increasing at a rate that heavy breathing/hyperventilation is no longer adequate enough to keep up increased acidity occurring with progressively intensifying exercise.
d. Submaximal Talk Test for VT1
    i. Best performed with telemetry (HR strap and watch)
e. VT2 threshold test
    i. Onset of blood lactate accumulation (OBLA): point at which blood lactate accumulates at rates faster than the body can buffer and remove it (usually >4mmol/L)
        1. Referred to as anaerobic threshold or lactate threshold, corresponds with VT2
f. Field testing
    i. Running tests not recommended for those who are deconditioned
    ii. Rockport fitness walking test (1 mile)
    iii. 1.5-mile run test
g. Step tests
    i. Not appropriate for individuals with
        1. Extremely overweight
        2. Balance concerns
        3. Orthopedic problems
        4. Extremely deconditioned
        5. Very short and has trouble with step height

3. Muscular-fitness testing
    a. Muscular-endurance

i. Pushup-test
ii. Curl-up test
iii. Body-weight squat test

b. Muscular-strength
i. Absolute strength: (1RM) most weight one can lift with one repetition
ii. Relative strength: absolute strength/body weight
iii. 1-RM Bench-press test, Leg-press test, squat test
iv. ONLY PERFORM IF individual is in phase 3 or 4 of ACE IFT Model

4. Sport-skill assessments
a. Power
i. ONLY PERFORM IF individual is in phase 4 of functional movement and resistance training component of ACE IFT Model
ii. Standing Long Jump Test
iii. Vertical Jump Test

b. SAQ
i. Phase 4 of ACE IFT Model ONLY
ii. Pro agility test
iii. 40-yard dash

5. Fitness testing accuracy
a. Causes for inaccuracy
i. Client: fatigue, lack of sleep, hydration level, food intake prior to test
ii. Trainer/test technician: inexperience, trying to influence results w/encouragement
iii. Equipment: improper calibration, mismatched to subject, equipment failure
iv. Environment: distractions, privacy, temperature, weather conditions

CH 9 FUNCTIONAL MOVEMENTS, STABILITY, AND MOBILITY

1. Movement
    i. Joint stability: ability to maintain or control joint movement or position
    ii. Joint mobility: range of uninhibited movement around a joint or body segment
    iii. Arthrokinematics: sensory input and motor output based on neurological and physiological systems, as well as proper joint mechanics
    b. Length-tension relationships
        i. Contractile proteins: actin and myosin
    c. Force-couple relationships
        i. Prime mover
    d. Neural control
        i. Reciprocal inhibition: reflex inhibition of motor neurons of antagonists when agonist muscles are contracted
        ii. Synergistic dominance: condition in which the synergist carry out the primary function of a weakened or inhibited prime mover
2. Phase 1: Stability and Mobility Training – reestablish appropriate levels of stability and mobility within the body
        i. Slow-twitch muscle fibers: enhance stabilizer muscle endurance
            1. Allows muscles to stabilize joints for extended periods of time without fatiguing
        ii. Stretching
            1. SMR, static, PNF, dynamic and ballistic
    b. Proximal stability: activating the core
        i. Promote stability of the lumbar spine by improving reflex function of the core musculature
        ii. Deep/innermost layer of core
            1. Vertebral bones and disks, spinal ligaments on front and back of spinal column,

iii. 3 stages
    1. Core function
    2. Static balance
    3. Dynamic balance

c. Proximal stability: core function
    i. Supine drawing-in exercise (centering)
    ii. Quadruped drawing-in exercise with extremity movement

d. Proximal mobility: hips and thoracic spine
    i. Improve mobility of the two joints immediately adjacent to the lumbar spine
    ii. Avoid undesirable or compensated movements
    iii. Monoarticulate: muscle crosses one joint
    iv. Biarticulated: muscle crosses two joints
    v. Exercises –
        1. cat-camel
        2. pelvic tilts
            a. supine bent-knee marches, modified dead bug with reverse knee marches
        3. hip flexor mobility
            a. lying hip flexor stretch
            b. half-kneeling triplanar stretch
        4. hamstring mobility
            a. lying hamstring stretch
        5. hip mobilization with glute activation
            a. shoulder bridge (glute bridge)
            b. supine 90-90hip rotator stretch
        6. thoracic spine (T-spine) mobilization exercises
            a. spinal extension and spinal twists
        7. posterior mobilization
            a. rocking quadrapeds

e. Proximal stability around the shoulder
    i. Improve stability within the scapulothoracic region during upper-extremity movements (push/pull type movements)
    ii. Glenohumeral joint mobility
    iii. Promoting stability within the scapulothoracic region requirements
        1. Thoracic mobility

2. Tissue extensibility (through active and passive structures)
    a. SMR, inferior capsule stretch, posterior capsule stretches, anterior capsule (pecctoralis) stretch, superior capsule stretch
3. Healthy rotator cuff muscle function
4. Muscle balance within the parascapular muscles
5. Ability to resist upward glide and impingement against the coracoacromial arch during deltoid action
6. Closed-chain kinetic (CKC) movements
    a. Distal segment is more fixed during movement
    b. Load and compress joints
    c. Increase kinesthetic awareness and proprioception
    d. Exercises
        i. Shoulder packing, internal and external humeral rotation, diagonals, reverse flys with supine 90-90, prone arm lifts, CKC weight shifts

f. Distal mobility
g. Static balance
    i. Training variables
        1. 2-3 times per week
        2. Do at beginning of workout
        3. 1 set of 2-4 reps, each for 5-10 seconds
    ii. Training conditions
        1. Narrow BOS
        2. Raise COG
        3. Shift LOG
        4. Sensory alteration
        5. Sensory removal
h. Dynamic balance
    i. Body has to react to the changing surface
i. Single-leg stand patterns
    i. Identifying imbalances
    ii. Exercises
        1. Single-leg stands
        2. Static balance on a single leg

3. Phase 2: Movement training for ADLs

i. Valgus: internal rotation between femur and tibia, knees move inward

b. Bend-and-lift
   i. Hip-hinge
   ii. Lower-extremity alignment
   iii. Figure-4 position
c. Single-leg
   i. Half-kneeling lunge rise
   ii. Lunges and lunge matrix
d. Pushing
   i. Bilateral and unilateral presses
   ii. Thoracic matrix
   iii. Overhead press
e. Pulling
   i. Bilateral and unilateral rows
f. Rotational
   i. Wood chops
   ii. Hay bailers

CH 10 RESISTANCE TRAINING (RT)

1. Benefits of RT
    a. Physical capacity – ability to perform work or exercise
        i. After 10 weeks
            1. Increase muscle mass 1.4kg
            2. Reduce fat weight by 1.8kg
    b. Physical appearance and body composition
    c. Metabolic function
        i. Raises RMR = more calories burned daily
    d. Injury risk and disease prevention
        i. Increase bone mineral density (BMD)
        ii. Decrease risk of osteoporosis and pain of osteoarthritis and rheumatoid
        iii. Lowers BP
        iv. Improved lipid profile
        v. Decrease risk of metabolic syndrome
        vi. Decrease depression
2. Physiological adaptations to resistance training: acute and Long-term
    a. Factors that influence
        i. Hormone levels of testosterone and growth hormone increase
        ii. Sex
        iii. Age
        iv. Muscle fiber type – type I (slow twitch), type II (fast-twitch), type IIa and IIx
        v. Muscle length relative to the bone
        vi. Limb length
            1. Muscle force x muscle force arm = resistance force arm
        vii. Tendon insertion point
    b. Muscular strength and hypertrophy
3. Muscular strength/power/endurance relationships
    a. Strength

i. One-repetition max (1-RM)

b. Endurance
   i. Number of repetitions that can be performed with a given submaximal resistance

c. Power
   i. Medium weight with moderate-to-fast movement speed produces most power

4. Training variables
   a. Needs assessment
      i. Health and skill related parameters
   b. Frequency
      i. How many times per week per muscle group
      ii. Beginner = 2-3 sessions per week
      iii. Intermediate = 3-4 sessions per week
      iv. Advanced = 4-7 sessions per week
   c. Exercise selection/order
      i. Multi-joint exercises first (primary exercises)
      ii. Single-joint exercises second (assisted exercises)
   d. Volume
      i. Repetition volume
         1. Volume = sets x repetitions
      ii. Load volume
         1. Volume = exercise weightload x repetitions x sets
      iii. Volume based on goal
         1. General muscle fitness
            a. Sets 1-2, reps 8-15, rest 30-90s, intensity varies
         2. Muscular endurance
            a. Sets 2-3, reps at least 12, rest less than 30s, 60-70% 1RM
         3. Muscular hypertrophy
            a. Sets 3-6, reps 6-12, rest 30-90s, 70-80% 1RM
         4. Muscular strength
            a. Sets 2-6, reps less than 6, rest 2-5, 80-90% 1RM
         5. Power
            a. Single-effort lifts – sets 3-5, reps 1-2, rest 2-5 min, >90% 1RM

        b. Multiple-effort lifts – sets 3-5, reps 3-5, rest 2-5 min, >90% 1RM
    e. Intensity
        i. DOMS – delayed onset muscle soreness
    f. Tempo
        i. Isokinetic
        ii. isotonic
    g. Rest
5. Training principles
    a. Progression
        i. Double-progressive strength-training protocol
            1. Increase reps
            2. Increase weight in 5% increments
    b. Specificity
        i. Appropriate resistance-repetition protocols
        ii. Shot putter vs. rower
    c. Overload
        i. Muscles need to be trained at progressively heavier training loads
        ii. Increase loads by 5% to facilitate further strength development
    d. Reversibility
        i. We lose strength at about one-half the rate that is was gained
    e. Diminishing returns
        i. When we plateau, and need to change the training exercise
        ii. Introduce new exercise for new neuromuscular response and motor-unit activation pattern for progressive strength gains
6. RT periodization models
    a. Macrocycle: overall time frame for a specific periodization program
        i. Typically 6-12 months
    b. Mesocycle: divides macrocycle into a few smaller cycles that progressively lead to the ultimate goal
    c. Microcycle: divides mesocycles into even smaller, more manageable cycles.
        i. Typically 2-4 weeks in length
    d. Linear periodization: consistent training protocol within a training protocol
        i. Changes variable after each microcycle

e. Undulating periodization: provides different training protocols during the microcycles in addition to changing the training variables after each microcycle
f. FIRST: frequency, intensity, repetitions, sets, type
    i. FIRST for movement training
        1. 2-3 sessions per week
        2. Low intensity
        3. Reps 10-20
        4. At least one set
        5. Dependent on client's movement efficiency
            a. Stable position – ground-based standing – multiplanar movements – unsupported postures
            b. Closed-chain for lower body
            c. Open-chain for upper body
    ii. FIRST for muscular endurance
        1. 3 per week
            a. If one cannot do the same amount of reps on 2nd and 3rd workout then frequency is dropped to 2 times per week
        2. 12-16 controlled reps (6sec/rep) at 60-70% 1RM within 75-100 seconds
        3. 2-3 sets with less than 60 seconds rest
        4. Emphasize the 5 basic movement patterns with exercise selection
    iii. FIRST for strength
        1. 72 hours between sessions
        2. 1-6 reps @ 80-90% 1RM for optimal gains
            a. 70-90% for initial stages of strength training
        3. Typically 3-4 sets
        4. Emphasis on 5 basic movement patterns
    iv. FIRST for hypertrophy
        1. 72 hours of recovery for a muscle group before next session to train that muscle group
        2. 6-12 reps @70-80% w/ 50-70 seconds rest, 3-6 sets
        3. Combination of free weights and machines for equipment
    v. Advanced approaches
        1. Supersets: alternating exercise for opposing muscle groups with little rest between sets

2. Compound sets: 2 or more exercises for the same muscles in rapid succession
3. Breakdown training: train to fatigue, then reduce the weight by 10-20% and perform more reps until failure
4. Assisted training: train to fatigue, then have help/manual assistance from a trainer on the lifting phase for 3-5 post fatigue reps

vi. Improving power
1. Plyometrics: quick, powerful movements involving the stretch-shortening cycle
2. Stretch-shortening cycle: active stretch (eccentric contraction) of a muscle followed by an immediate shortening (concentric contraction) of that same muscle
3. Amortization phase: period of time between the eccentric and concentric actions
4. Muscle spindles: sense differences in the rate and magnitude of stretching imposed on a muscle
    a. Invoke involuntary concentric contractions (stretch reflex) when quick stretches are detected

vii. Older adults
1. Avoid holding breath (BP increase)
2. Avoid holding isometric contractions (BP increase)
3. 2 sessions per week (recover slower)

viii. Nutrition
1. Caffeine: enhances athletic performance
2. Anemia: iron deficiency
3. Vitamin B12: metabolism of nerve tissue, protein, fat, and carbohydrate
4. Riboflavin: energy production
5. Vitamin D: calcium absorption, bone growth, and mineralization
    a. Also good for blood clotting, nerve transmission, and muscle stimulation
6. Steroids
    a. Anabolic side effects

i. High BP, rage, gynecomastia (enlarged breast size), decreased testicle size, increased testosterone, facial hair growth, deepening voice in women

b. Androstenedione (precursor to testosterone)
   i. Decreases HDL levels, increases risk of cardiovascular disease, prostate cancer, and pancreatic cancer.
   ii. Increases baldness and gynecomastia as well

CH 11 CARDIO TRAINING

1. Physiological adaptations to short and long term Cardio
   a. Muscular system
      i. Increase in
         1. Size and # of mitochondria
         2. Capillaries around recruited muscle fibers
            a. Enhances delivery of oxygenated blood
         3. Slow twitch fibers for low-intensity cardio
         4. Fast-twitch fibers for high-intensity
   b. Cardiovascular system
      i. Higher cardiac output
      ii. Larger stroke volume
      iii. Hypertrophy of heart
   c. Respiratory system
      i. Increased ventilation of the alveoli
      ii. Increased tidal volume
      iii. inspiration
         1. pull rib cage upward – sternocleidomastoid, scalene, serratus anterior
      iv. expiration
         1. pull rib cage downward – rectus abdominis and quadratus lumborum
   d. Time required to increase aerobic capacity
      i. VO2 max plateau's within 6 months
      ii. Ventilatory threshold (VT) can grow for years
   e. Physiological adaptations to steady-state and interval-based exercise

i. Takes about 3-4 minutes to reach steady state
ii. Rate of O2 uptake (VO2), HR, CO, ventilation, blood lactate concentration, and body temperature reach stable levels (elevated) after a short period of exercise
iii. Interval training yields similar or even greater results
1. Increases tolerance for buildup of lactate (lactate threshold)

2. Components of a cardiorespiratory workout
   a. Warm-up
      i. 5-10 minutes
      ii. Harder conditioning phase or older exerciser needs more extensive warm-up
   b. Conditioning phase
      i. Cardiovascular drift: gradual increase in HR response during steady-state bout of exercise
   c. Cool-down
3. General guidelines for health, fitness, and weight loss
   a. Frequency (in healthy adults)
      i. Moderate intensity = at least 5 days per week
      ii. Vigorous intensity = at least 3 days per week
      iii. Combination of both = 3-5 days per week
   b. Intensity
      i. Moderate = 40-60% VO2R or HRR
      ii. Vigorous = at least 60% VO2R or HRR
   c. Duration
      i. Zone 1 = vt1
      ii. Zone 2 = vt2
      iii. Zone 3 = vt3
      iv. METS
   d. Exercise progression
      i. Fartlek training: sequence of different intensities that stress both the aerobic and anaerobic systems
   e. Karvonen method for finding HR/training percentage
      i. Target HR (THR) = (HRR x %intensity)+RHR
         1. HRR=MHR-RHR
4. Modes/types of cardio exercise
   a. Equipment-based

b. Cardiovascular exercise
c. Group exercise
d. Circuit training
e. Outdoor exercise
    i. In the heat
        1. Peripheral vasodilation: blood brought to surface of skin to reduce internal heat load
        2. Heat exhaustion
        3. Heat stroke
    ii. In the cold
        1. Hypothermia
        2. Frostbite
    iii. Higher altitudes
        1. O2 in air reduced due to partial pressure
f. Seasonal exercise
g. Water-based exercise
h. Mind-body exercise
i. Lifestyle exercise

5. ACE-IFT cardio training phases
    a. Phase 1: Aerobic-base training
        i. Create positive experience
        ii. Focus on steady-state
        iii. Gauge by talk-test
        iv. Progress client when they can sustain steady-state cardio for 20-30 minutes in zone 1/RPE 3-4
    b. Phase 2: Aerobic-efficiency training
        i. Increase duration and introduce intervals
        ii. Increase workload at VT1 and introduce low VT2 (RPE 5)
    c. Phase 3: Anaerobic-endurance training
        i. For those with endurance or performance goals
        ii. Use VT2 threshold test to determine HR at VT2
        iii. Increase focus
    d. Phase 4: Anaerobic-power training
        i. Increase anaerobic power
        ii. Improve phosphagen energy pathways

iii. Buffer large accumulations of blood
iv. Most clients generally wont work in this phase

6. Special considerations
    a. Youth
    b. Older adult

CH12 CASE STUDIES

1. Sharon
    a. Kyphosis and lordosis
        i. Core-activation exercises
        ii. Core stability
    b. Overweight still from multiple pregnancies
    c. Wants to return to pre-pregnancy fitness level
2. David
    a. Athlete
    b. Aerobic and anaerobic endurance
    c. Knee and low-back soreness
3. Jan
    a. High School Volleyball player
    b. Strength and power
4. Stanley
    a. Sedentary adult
    b. No previous experience
    c. Improve overall health
5. Meredith
    a. Very active older adult
    b. Wants to compete with her tennis club
6. Kelly
    a. Professional
    b. Get in shape for wedding

CH13 MIND BODY

1. Science of Mind-body exercise
    - Neuroendocrine interactions with meditation and breathing
        - Corticotropin releasing hormone (CRH) and adrenocorticotropine hormone (ACTH)
            - Bond hypothalamus and pituitary and adrenal glands (HPA axis)
            - Hypothalamus – meditation reduces activation of the HPA axis
            - Adrenal – decreased catecholamine and cortisol production
                - Decreased arousal and hypervigilance
2. Benefits of mind-body exercise
    - Improved muscular strength, flexibility, balance, coordination, increased mental development, increased self-efficacy
    - Yoga research
    - Quigong and Tai Chi
        - Reports of decreases in
            - Incidence of stroke
            - Stroke mortality
            - Increased bone mineral density
            - Improved balance
            - Improved lipid profile
            - Decreased blood pressure
            - Improved effectiveness of cancer therapy
            - Increased psychological well-being
3. Types of Mind-body exercise
    - Criteria
        - Meditative/contemplative
        - Proprioceptive and kinesthetic body awareness

        - Breath-centering or breathwork
        - Anatomic alignment or proper choreographic form
        - energycentric
    - Yoga
        - Integral yoga
            - Emphasizes diet
            - Used in Dr. Dean Ornish's heart disease reversal programs
    - Qigong
    - Tai Chi
4. Contemporary styles
    - Pilates
    - Alexander technique
    - Feldenkrais method
    - Nia
    - ChiWalking and ChiRunning
    - Am. Indian and Alaskan Spiritual Dancing
5. Indications of Mind-body exercise
    - Recommended for those with chronic disease
        - High-normal and stage-1 hypertension
        - Type 2 diabetes
        - Anxiety and depression disorders
        - Arthritis
        - Poor functional capacity
        - Individuals requiring cardiac and/or pulmonary rehabilitation
        - Pain management
        - Anger management
    - Acute Coronary Syndromes (ACS)
        - Yogic breathing and meditation help reduce potential for ACS
6. Personal trainers and Mind-body exercise
    - When to use mind-body exercise
        - Before and during a RT session
        - Yoga-breathing and meditation during warm-up and cool-down phases
        - Incorporating mindful components to low-moderate aerobic or strength exercise
        - Use poses to help build balance and coordination

CH 14 SPECIAL POPULTIONS

1. SOAP Notes
    a. Subjective: client's personal report, symptoms, challenges, progress
    b. Objective: vital signs, anthropometrics, exercise and nutrition log
    c. Assessment: summary of subjective and objective observations
    d. Plan: description of what to do
2. Cardiovascular disorders
    a. Exercise should NOT continue if abnormal signs or symptoms are observed
        i. Angina, dyspnea, lightheadedness, dizziness, pallor, rapid HR above established targets
    b. Clients with documented coronary artery disease (CAD)
        i. Physician-supervised maximal graded exercise test
            1. Determines functional capacity and safe exercise levels
3. Hypertension
    a. 150 min per week may reduce SBP by 2-6mmHg
    b. Acute post-exercise decrease in SBP and DBP
        i. Magnitude of 15 and 4mmHg for SBP/DBP
    c. Medications that alter heart-rate response
        i. Beta blockers, calcium channel blockers
    d. Hydration effected by diuretic medications
4. Stroke
    a. Signs of a stroke
        i. Sudden numbness or weakness of face, arms, or legs
        ii. Sudden confusion or trouble speaking or understanding others
        iii. Sudden trouble seeing in one or both eyes
        iv. Sudden walking problems, dizziness, or loss of balance and coordination
        v. Sudden severe headache with no known cause
    b. Exercise recommendation for someone recovering from stroke

i. Depends on client's condition and loss of function
ii. Can range from stationary cycling, water exercise, or adapted activities if needed
iii. Light to moderate intensity
iv. 3-5 minute bouts
    1. Build up to 30 minutes
    2. 3-5 days per week

5. Peripheral vascular disease
    a. Muscular pain caused by ischemia, or lack of blood flow to the muscle
        i. Results in spasms or blockages (claudication)
    b. Exercise recommendations
        i. Non-impact endurance
        ii. Low to moderate intensity
        iii. 10 minutes or longer for warm up and cool down
        iv. Gradually increase total exercise to 30-60 minutes
        v. Exercise daily
        vi. Avoid cold air or cold water to reduce vasoconstriction
6. Dyslipidemia
    a. Elevated triglycerides
    b. Lowered HDL
    c. Elevated LDL
        i. Role in atherogenesis (early stages of atherosclerosis)
    d. Effects of exercise
        i. Reduce LDL cholesterol by 3-6 mg/dL average
        ii. Non-HDL cholesterol reduction by 6 mg/dL average
        iii. No consistent effect on TG
        iv. No consistent effect on HDL cholesterol
        v. Moderate RT 3x/week may reduce LDL, TG, and non-HDL by 6-9 mg/dL average
            1. No effect on HDL
7. Diabetes
    a. Hyperglycemia: chronically elevated blood glucose
    b. Type 2 diabetes: non-insulin dependent diabetes mellitus (NIDDM)
        i. Most common form
        ii. 90-95% of all diagnosed cases

iii. Presents insulin resistance (cells do not use insulin correctly)
iv. About 75% with type 2 are obese

c. Gestational diabetes (GDM): glucose intolerance that occurs during pregnancy

a. Type 1 exercise guidelines
   i. 3-5x/week (or everyday)
   ii. 55-75% of functional capacity or 11-14 RPE (borg scale)
   iii. Avoid long or high-intensity
      1. Increased risk of hypoglycemia w/ long-duration
      2. Increased risk of hyperglycemia w/high-intensity

d. Potential complications
   i. Avoid exercise when fasting glucose is 250 mg/dL or higher
   ii. Avoid if blood glucose levers are greater than 300 mg/Dl
   iii. Avoid exercise during peak insulin activity
   iv. Hydrate

8. Metabolic syndrome (affects over 25%)
   a. Abdominal obesity, atherogenic dyslipidemia, elevated BP, insulin resistance, prothrombotic state, proinflammatory state
   b. Presence of 3 or more of the following
      i. Waist circumference
         1. Men 40 or more inches (102cm)
         2. Women 35 or more inches (88cm)
      ii. Elevated triglycerides of 150 mg/dL or more
      iii. Reduced HDL cholesterol
         1. Men less than 40 mg/dL
         2. Women less than 50 mg/Dl
      iv. Blood pressure of 130/85 mmHg or more
      v. Fasting blood glucose of 100 mg/dL or more
   c. Primary treatment objective to reduce risk for development of CV disease and type 2 diabetes
   d. Exercise
      i. Low-impact, non weight-bearing for obese
      ii. RPE 11-13 on borg scale or 30-75% VO2R

iii. 200-300 total minutes accumulated throughout the week
    1. Gradually progress from short 10-15 minute bouts
iv. Should participate at least 3-5x/week

9. Asthma
    a. Clients need to have rescue medication with them at all times
10. Cancer
11. Osteoporosis
    a. Bone mineral density that is 2.5 standard deviations or more below the mean for young adults
    b. Osteopenia: less sever, BMD between 1 and 1.5
    c. Increasing BMD
        i. Plyometric exercise
        ii. Weightbearing exercises
    d. Avoid for clients with spinal or other fractures
        i. Spinal flexion, crunches, and rowing machines
        ii. Jumping and high-impact aerobics
        iii. Trampolines and step aerobics
        iv. Abducting or adducting the legs against resistance
        v. Pulling on the neck with hands behind the head
12. Arthritis
    a. Leading cause of disability in US
    b. Two most common
        i. Osteoarthritis
        ii. Rheumatoid arthritis
    c. Classifications
        i. Class 1: completely able to perform usual ADL's
        ii. Class 2: can perform usual self-care and vocational activities, limited in avocational activities
        iii. Class 3: can perform usual self-care, limited in vocational and avocational activities
        iv. Class 4: limited in ability to perform usual self-care, vocational, and avocational activities
13. Fibromyalgia
14. Chronic fatigue syndrome
    a. 1:3 work:rest

15. Low-back pain
    a. Avoid
        i. Unsupported forward flexion
        ii. Twisting at the waist with turned feet, especially when carrying a load
        iii. Lifting both legs simultaneously when in prone or supine position
        iv. Rapid movements
16. Weight management
17. Older adults
    a. Sensory system
        i. CNS
        ii. Visual: relied on for balance
        iii. Vestibular: provides info regarding position of head in space
        iv. Somatosensory: impacts balance and coordination
18. Youth
19. Pre- and postpartum
    a. Pregnant should acquire physicians clearance
    b. Avoid
        i. Extensive jumping, hopping, skipping, bouncing, or running
        ii. Deep knee bends, full sit-ups, double leg raises
        iii. Contact sports
        iv. Bouncing while stretching
        v. Activities where falling is likely
        vi. After 1st trimester
            1. Longer than 5 minutes in supine position should be discouraged
                a. Potential for fetal hypoxia

CH 15 COMMON INJURIES AND CORRECTIVE TECHNIQUES

1. Tissues and common injuries
    a. Muscle strains
        i. Microscopic tears of the muscle fibers
        ii. Grading system
            1. Grade 1 strain: mild strain, tender and painful with possible localized spasms
            2. Grade 2 strain: moderate strain, large number of fibers are injured with more severe pain and tenderness.
                a. Mild swelling, noticeable loss of function and possible bruising
            3. Grade 3 strain: complete tear
                a. Complete loss of muscle function, severe pain, swelling, tenderness, discoloration, and palpable defect
        iii. Hamstring strains
            1. Common among athletes in running and jumping sports
            2. Risk factors: poor flexibility, poor posture, muscle imbalance, improper warm-up, training errors
        iv. Hip strains
            1. Common with explosive sports that require acceleration, deceleration, and change of direction w/ lateral movements
            2. Risk factors: muscle imbalances between hip adductors and abductors
        v. Calf strains
            1. Running and jumping athletes
            2. Risk factors: muscle fatigue, fluid and electrolyte depletion, forced knee extension while foot is dorsiflexed, and forced dorsiflexion while knee is extended
    b. Ligament sprains
        i. Grading system
            1. Grade 1: minimal tenderness, swelling, and impairment. Micro tearing of collagen fibers

        a. Care: RICE
    2. Grade 2: moderate tenderness, swelling, and impairment, decreased ROM, possible instability. Complete tears of some collagen fibers
        a. Care: RICE, physical evaluation
    3. Grade 3: significant swelling and tenderness. Severe impairment. Instability. Complete tear/rupture of ligament.
        a. Care: immobilization w/air splint, RICE, physician evaluation
    4. ACL injury = most common sports-related injury of the knee
        a. Mechanism of injury: deceleration of body combined with twisting, pivoting, or side-stepping maneuver
    5. MCL injury
        a. Mechanism of injury: impact to outer knee with no twisting involved
        b. Most often associated with ACL or medial meniscal injuries

c. Overuse
    i. Tendinitis: inflammation of the tendon
    ii. Bursitis: inflammation of the bursa sac due to acute trauma, repetitive stress, muscle imbalance, or muscle tightness on top of bursa
        1. Common in shoulders, hips, and knees
    iii. Fasciitis: inflammation of the connective tissue
        1. Most common in bottom and back of foot

d. Cartilage damage
    i. Hyaline cartilage: covers the bone
    ii. Menisci cartilage: shock absorbers
    iii. Meniscal injuries = most common knee injury
        1. Combination of loading and twisting of the joint
        2. Occur sometimes with ACL or MCL injuries
    iv. Role of menisci: shock absorption, stability, joint congruency, lubrication, and proprioception
        1. Stiffness, clicking or popping with weightbearing activities, giving away, catching, and locking
    v. Chondromalacia: softening or wearing away of the cartilage behind the patella, resulting in inflammation and pain
        1. Caused by posterior surface of patella not properly tracking in the femoral groove

e. Bone fractures
    i. Stress fracture: minor fracture due to low-impact trauma or repeated microtrauma to a bone region
        1. Commonly confused with shin splints
        2. Signs & symptoms: progressive pain that is worse with weightbearing activity, focal pain, pain at rest, local swelling
    ii. High-impact trauma: most common during car accidents or high impact sports
        1. Disabling and require immediate medical attention

2. Reaction to healing
    a. 3 phases
        i. Inflammatory phase
            1. Last up to 6 days
            2. Immobilize injured area and begin healing process
            3. Increased blood flow (brings O2 and nutrients to rebuild)
        ii. Fibroblastic/proliferation phase
            1. Begins approx.. at 3 days
            2. Lasts roughly 21 days
            3. Fills wound with collagen + other cells to eventually form a scar
        iii. Maturation/remodeling phase
            1. Begins approx. at day 21
            2. Can last up to 2 years
            3. Remodeling the scar
            4. Rebuilding of bone
            5. Strengthening of tissue
    b. Inflammation
        i. Pain, redness, swelling, warmth, loss of function
3. Managing injuries
    a. Pre-existing injuries
        i. Are they ready for exercise?
        ii. Do they need to be cleared by a medical professional?
    b. Program modification
    c. Acute injury management
        i. RICE
            1. Rest/restricted activity

2. Ice
3. Compression
4. elevation

4. Flexibility and musculoskeletal injuries
    a. Contraindications to consider for injury prevention
        i. Joint swelling (effusion)
        ii. Osteoporosis or rheumatoid arthritis
        iii. History of corticosteroid use
        iv. Fracture site that is healing
5. Upper-extremity injuries
    a. Shoulder strain/sprain
        i. Modify overhead activates to acceptable % of ROM for their injruy
        ii. Prevent impingement of shoulder structures
    b. Rotator cuff injuries
    c. Elbow tendinitis
        i. Lateral and medial epicondylitis or “tennis elbow”
        ii. Avoid high repetition activity
    d. Carpal tunnel syndrome
        i. Repetitive wrist and finger flexion
        ii. Flexor tendons are strained
        iii. Narrowing of carpal tunnel due to inflammation
        iv. Compresses median nerve
        v. More common in females
6. Lower-extremity injuries
    a. Pes cavus: high arches of feet
    b. Pes planus: flat feet
    c. Greater trochanteric bursitis
        i. Painful inflammation of the greater trochanteric bursa
        ii. Common in female runners, cross-country skiers, and ballet dancers
        iii. Signs and symptoms
            1. Walking with a limp due to pain and weakness
            2. Myofascial tightness
            3. Decreased muscular strength
        iv. May benefit from aquatic exercise
    d. Iliotibial band (IT) syndrome

i. Repetitive overuse condition
ii. Occurs when distal portion of IT band rubs against lateral femoral epicondyle
iii. Caused by training errors in runners, cyclists, volleyball players, and weight lifters
    1. Overtraining, improper footwear or equipment use, changes in running surface, muscle imbalance, structural abnormalities (pes planus, knee valgus, leg-length discrepancy), failure to stretch correctly

e. Patellofemoral pain syndrome (PFPS)
    i. "anterior knee pain" or "runner's knee"
    ii. Often confused with chondromalacia
    iii. 16-25% of all running injuries
f. Infrapatellar tendinitis
    i. "jumpers knee"
    ii. Inflammation of patellar tendon
    iii. Common in basketball, volleyball, and track and field
    iv. Management
        1. Avoid activities that will aggravate (plyo's, sitting for long periods of time, deep squats, running)
        2. Modify training variables
        3. Ice or heat
g. Shin splints
    i. Medial stress syndrome (MTSS/posterior shin splints)
        1. Associated with pes planus
        2. Triggered by sudden change in activity
        3. Periosititis (inflammation of the periosteum)
        4. Runners, dancers, and military personnel
    ii. Anterior shin splints
        1. Tibialis anterior, extensor digitorum longus, extensor halluces longus, fascia, periosteal lining
h. Ankle sprains
    i. Mechanism of injury to lateral structures
        1. Inversion with a plantarflexed foot (typically)
        2. About 85% of injuries are to lateral structures of ankle

ii. Medial (eversion) ankle sprains
    1. Rare
    2. Mechanism: forced dorsiflexion and eversion of ankle

i. Achilles tendinitis
j. Plantar fasciitis
    i. Inflammatory condition of bottom of foot
    ii. Most common cause of heel pain and heel spur formation
    iii. Accounts for 10% of running pain
    iv. Intrinsic factors
        1. Pes planus and pes cavus
    v. Extrinsic factors
        1. Overtraining, poor footwear, obesity, unyielding surfaces

7. Record keeping
    a. Medical history
    b. Exercise record
    c. Incident report
    d. Correspondence
        i. HIPPA

CH 16 EMERGENCY PROCEDURES

1. Policies and procedures
    a. Par-q
        i. Identify high-risk individuals
        ii. May need medical referral or modified exercise programs
    b. Informed consent
        i. Risk stratification
            1. obtain medical clearance when necessary
    c. HIPPA
        i. Health insurance portability and accountability act
        ii. Ensures the victim's privacy by putting him or her in control of who has access to personal health information
2. Emergency assessment
    a. Check for ABC's (airway, breathing, circulation and severe bleeding)
    b. Secondary assessment
        i. Head-to-toe assessment (what to look for)
            1. Deformities, abrasions, tenderness, swelling, medical alert jewelry
            2. Take pulse and blood pressure
    c. Calling 911
        i. Life-threatening situation
        ii. Anything that requires immediate medical attention
3. CPR/AED
    a. Ventricular fibrillation: most common rhythm during cardiac arrest (cessation of heart function)
        i. Spasmodic quivering of heart
        ii. Too fast to allow chambers to fill and empty
    b. AED
        i. Converts VF back to normal rhythm
        ii. Ideal to use in first 3-5 minutes
        iii. Good Samaritan law for AED certified

iv. SA node restarts when shock is delivered

c. Dyspnea
   i. Difficult and labored breathing
   ii. Causes = emotional stress, asthma, airway obstruction, and heart problems

d. Signs of respiratory distress
   i. Poor movement of chest wall
   ii. Flaring of nostrils
   iii. Straining of neck muscles
   iv. Poor air exchange
   v. Pale/ diaphoretic (sweaty) skin
   vi. Cyanosis
      1. Blue color around lips, nose, fingernails, and inner lining of eyes

e. Choking
   i. Airway blocked
   ii. Victim becomes hypoxic (oxygen deficient)
   iii. Perform Heimlich maneuver

f. Asthma
   i. Chronic inflammation of the airway
   ii. Wheezing, shortness of breath, tightness in chest, coughing
   iii. Avoid triggers
      1. Allergens and higher intensities of exercise

g. Angina pectoris (heart attack)
   i. Chest pressure or a squeezing feeling
      1. May be mistaken for heartburn or indigestion
      2. Pain can travel to arms (typically left arm), neck, jaw, shoulder, or stomach
      3. Shortness of breath, nausea, cold sweat, lightheadedness
   ii. Most common symptoms for women
      1. Chest pain

h. Syncope (fainting)
   i. Temporary loss of consciousness due to lack of blood flow to the brain
   ii. Causes
      1. Emotional stress, sever pain, dehydration/heavy sweating, overheating, exhaustion, sudden postural changes, violent coughing spells (especially in men)

i. Stroke
    i. 3rd leading cause of death in U.S.
    ii. 1st leading cause of disability
    iii. Results from blockage in brain blood vessel
        1. Aneurysm
            a. Balloon-type bubble in the vessel at a weak spot that can rupture if left untreated
        2. Malformation of blood vessels may also lead to hemorrhagic stroke
    iv. Warning signs
        1. Walking/balance is off
        2. Talking/speech is slurred or face is droopy
        3. Reach/one side is weak or numb
        4. Full or partial loss of vision
        5. Severe headache
j. Diabetes
    i. Type 1: insulin-dependent
        1. Pancreas doesn't make enough insulin
        2. Must inject, pump, or inhale insulin manually (exogenous insulin administration) to have normal levels
        3. May go undiagnosed for years
    ii. Type 2: non-insulin dependent
        1. Normal insulin secretion
        2. Body becomes resistant to insulin
    iii. What happens
        1. Hyperglycemia – blood sugar too high (insulin too high)
            a. Victims become weak, thirsty, and fatigued
        2. Hypoglycemia – blood sugar too low
            a. Victims show signs of headache, hunger, weakness, sweating, or fatigue
        3. Consume 20-30g of carbs at first suspicion of hypoglycemia
    iv. Blood glucose
        1. At least 100mg/dL before resuming activity/prior to exercise
            a. If below a snack high in complex carbs and low in fat is recommended
        2. 250mg/dL w/ketones in urine or 300mg/dL

a. No exercise until blood sugar is under control

k. Heat stress
    i. Heat exhaustion signs and symptoms
        1. Weak, rapid pulse, low blood pressure, fatigue, headache, dizziness, general weakness, paleness, cold/clammy skin, profuse sweating, elevated body core temperature (greater than 104 F, 40 C)
    ii. Heat exhaustion treatment
        1. Stop exercise, move to cool area, lay down and elevate feet 12-18 inches, give fluids and monitor temp.
    iii. Heat stroke signs and symptoms
        1. Hot/dry skin, bright red skin color, rapid/strong pulse, change in mental status (irritable, aggressive, or anxiety), labored breathing, elevated body core temp. (over 105 F, 41 C)
    iv. Heat stroke treatment
        1. Stop exercise, remove clothing, cool body immediately any way possible, give fluids, transport to emergency room immediately
l. Fluid intake during exercise
    i. 2 hours prior
        1. 500-600mL (17-20oz)
    ii. Every 10-20 min during
        1. 200-300mL (7-10oz, based on sweat loss)
    iii. Following exercise
        1. 450-675mL for every 0.5kg body weight lost (16-24oz for every pound)
m. Seizures
    i. Tonic clonic seizure (grand mal seizure): most common
    ii. Occurs with abnormal and excessive electrical activity in the brain
n. Soft-tissue injuries
    i. Abrasion: scrape from fall
    ii. Incision: clean cut to skin usually from sharp edge
    iii. Laceration: jagged tear caused by shear and tensile forces
    iv. Avulsion: sever laceration, skin torn away from tissue
    v. Puncture: penetration of skin by an object
o. Fractures
    i. Signs

1. Deformity, pain and tenderness, grating, crepitus (sound of bone fragments grinding against each other), swelling, disfigurement, severe weakness and loss of function, bruising, exposed bone ends, joint locked in position

p. Spine and neck
    i. Kyphotic: thoracic spine curves posteriorly (rounding upper back/"swimmers back")
    ii. Lordotic: lumbar spine curves anteriorly, hyperextends low back

CH 17 LEGAL GUIDELINES

1. Business structure
    a. Sole proprietorships – business owned and operated by one person
        i. Minimal ongoing paperwork
    b. Partnerships – two or more agree to operate a business and share profits and losses
        i. Should have legal documents to establish rules of operation
        ii. General partnerships – joining of two or more individuals to own and operate a business
            1. Minority partner – owns less of the split between partners
            2. Express partnerships – contract between the parties
            3. Implied partnership – recognized by judicial system if individuals act as partners
        iii. Limited partners – only liable for their direct financial contribution
    c. Corporations – creates a separate entity from the investors and operators of a business
        i. Subchapter S-corporations
            1. Profits flow through the business to the shareholders
            2. Taxed as ordinary income
            3. Most common for personal training business that don't operate as a sole proprietorship or partnership
            4. Shareholders are shielded from personal liability
                a. Cons: limited number of potential investors
                b. Costs of formation and operation
        ii. LLC and LLP
            1. Profits flow through to investors and taxed as ordinary income
            2. Taxes easier that S-corps
                a. Cons: undefined operating standards in states
        iii. C-corps
            1. Limited liability and unlimited number of investors
                a. Cons: cost of formation and operation, double taxation

2. Independent contractors
    a. Hired on short-term basis
3. Employees
    a. Regularly work for their employer
4. Contracts
    a. Offer and acceptance with a agreement of terms
    b. Consideration
    c. Legality
    d. Ability of the parties to enter into a contract with respect to legal age and mental capacity
5. Negligence – must establish 4 elements
    a. Defendant had a duty to protect the plaintiff from injury
    b. Defendant failed to uphold the standard of care necessary to perform the duty
    c. Damage or injury to plaintiff
    d. Damage or injury caused by defendant's breach of duty
6. Vicarious liability
    a. Employers are responsible for the employment actions of their employees
    b. Gross negligence
        i. Recklessness or willful disregard for the safety of others
    c. Contributory negligence
        i. When client fails to notify trainer of potential hazards
        ii. Prevent client from recovering any money, even if trainer is partially at fault
7. Agreements to participate, informed consent, and waivers
    a. Agreement to participate
        i. Trainers should have a process to formally warn their clients about the potential dangers of exercise
    b. Informed consent
    c. Inherent risks
    d. Procedures
        i. Have a stand-alone document for each individual
8. Legal responsibilities
    a. Facilities
    b. Equipment
        i. AED
    c. Supervision

    d. Instruction
9. Scope of practice
10. Liability insurance
    a. Employees and independent contractors
    b. Should cover personal injuries that can occur as a result of a training session
11. Other business concerns with legal implications
    a. Marketing activities
    b. Intellectual property
    c. Transportation
    d. Financing
12. Risk management
    a. Risk identification
    b. Risk evaluation (Table 17-2)

Chapter 18 Personal-Training Business Fundamentals

1. Direct-employee model
    a. Commercial setting, corporate setting, private gyms, etc… working under an employer
    b. Advantages
        i. No overhead for equipment (provided by facility)
        ii. Healthcare benefits
        iii. Promotion opportunities
    c. Disadvantages
        i. Can be a high-pressure sales environment
2. Independent-contractor model
    a. Advantages
        i. Freedom to create your own pay-scale according to the market
    b. Disadvantages
        i. Responsible for marketing costs
        ii. Traveling to clients homes
        iii. May have to rent a space
        iv. taxes
3. Business planning
    a. Executive summary
        i. Business concept
            1. Description of the business
        ii. Financial information
            1. Start-up costs for 1st year
            2. Source of capital
            3. Potential for sales revenue and profits
            4. Expected return on investment (ROI)
        iii. Current business position
            1. Info about the business owners

    iv. Major achievements
  b. Business description
    i. Operating model
    ii. Local fitness market
    iii. Competitors
    iv. Management team
  c. Marketing plan
    i. Communicates how a product/service meets a client's needs
    ii. Develop a target audience
  d. Operational plan
    i. Organizational chart
  e. Risk analysis
    i. Barriers to entry: rental fees, equipment, employees, and marketing
    ii. Financial: capital required to start or expand
    iii. Competitive
    iv. Staffing: managing employees and payroll
    v. SWOT ANALYSIS (strengths, weakness, opportunities, threats)
  f. Decision-making criteria
4. Creating a brand
  a. Identify your market/target demographic
5. Communicating the benefits
6. Marketing for client retention
  a. Use periodization programs
7. Marketing through general communication
8. Choosing a business structure
9. Professional services for starting a business
  a. Attorney
  b. Accountant
  c. Web developer/graphic designer
  d. Insurance broker
  e. Real estate broker
  f. Contractors
10. Financial plan
  a. Use SMART goal setting
  b. Closing ratio: gets one paying client for every 5 talked to = 20% closing ratio

i. Use to determine a goal for how many prospective clients to speak to per week

11. Time management
    a. Working with clients
    b. Client management
    c. Prospecting for new clients
    d. Developing marketing or advertising materials
    e. Other job duties
    f. Exercise
    g. Personal time/home life
12. How to sell personal training
    a. Marketing to potential clients
    b. Asking for the sale
        i. Identify emotional needs
        ii. Effectively address those needs with the client
        iii. Become genuinely interested