Ch 5
Weight Management

Weight Management Basics

- Controlling body weight is controlling body fat
- More important to consider one’s body composition rather than “weight”
- 55% of American adults are overweight (weighing 10% or more over recommended weight or Body Mass Index (BMI) $\geq 25$)
- 14 year study showed greater risk of heart disease & cancer if overweight

Weight Management Basics - continued

- Slow weight gain over time can also lead to problems
- 22% of American adults are obese (weighing 20% or more over recommended weight or having a BMI $\geq 30$)
- One of the most serious and widespread challenges to health and wellness in the United States

Health Risks of Obesity

- Major risk factor for heart disease
- Increased risk of CVD, hypertension, gallbladder disease, diabetes
- Associated with certain types of cancer
- Complications in pregnancy
- Respiratory problems
- Joint disease

Factors Influencing Obesity

1) Genetic:
   genes influence body size and shape, body fat distribution, and metabolic rate; can account for 75%-80% of percent body fat in children

1) Environmental:
   lifestyle choices: European vs. USA studies

2) Metabolism and Energy Balance:
   energy in (as food) versus energy out (resting metabolism, energy to digest food, physical activity)

Metabolism and Energy Balance

- Metabolism: the sum of all the vital processes by which food energy & nutrients are made available to and used by the body
- Resting Metabolic Rate (RMB): the energy required to maintain vital body functions while the body is at rest (e.g. respiration, heart rate, body temperature, blood pressure)
- High RMB means you burn more calories at rest and can take in more calories
Resting Metabolic Rate (RMR)

- RMR accounts for 55-75% of daily energy expenditure; 5-15% required for digestion; 10-40% energy expended in physical activity
- Factors affecting RMR
  - Heredity – inherited from parents
  - Gender – males tend to have higher RMR – more muscle
  - Lifestyle – an ongoing commitment
- Exercise increases RMR

Explanations for Overweight

- To maintain current weight: **Calories in = Calories out**
- We control the food taken in and the energy expended
- Weight cycling (yo-yo dieting): Even small losses in weight (if maintained) can be helpful

Hidden Calories

- "Reduced" fat foods – fat often replaced with sugar – Need to check the labels
- Regular sodas – a 12 oz. soda may have 150-200 calories – plain H₂O is better
- Alcoholic beverages – wine has about 100 calories; beer or cocktail has about 150 calories; wine coolers about 175 calories – Substitute "light" or non-alcoholic versions
- Fruit juices/drinks – can be high in sugar – more than the "plain" fruit
- Muffins – Large, high in fat, 300-500 calories – better to choose whole grain breads, bagels, English muffins
- Condiments – Most have about 100 calories/tablespoon – use herbs, spices, lemon juice

Changing Your Energy Balance

- For weight loss, a negative calorie balance must be created by expending more calories than are consumed
- Increasing physical activity increases calories expended
- Changing diet can decrease calories consumed
### Dietary Guidelines for Weight Management
- Control consumption of calories (average intake increased 100-300 calories/day over past 10 years), fat (no more than 66 grams in 2000 cal. diet), sugar/refined carbs. (may trigger overeating), protein (excess will be stored as fat)
- Monitor portion sizes (smaller than you want; follow MyPlate examples)
- Increase intake of complex carbohydrates – pasta/potatoes (avoid high-fat toppings/sauces)
- Develop regular eating habits

### Portion Sizes
- 1 cup = woman’s fist or tennis ball
- 1 ounce = 1 thumb or 4 stacked dice
- 1 ounce snack food = 1 handful nuts or candies
- 1 ounce snack food = 2 handfuls of chips/pretzels
- 3 ounces = palm of hand; deck of cards; audio cassette tape
- 1 teaspoon = 1 thumb tip
- 1 tablespoon = 3 thumb tips or ½ ping-pong ball
- ½ cup rice = ice cream scoop or 1/3 soda can
- 1 medium potato = computer mouse

### A Healthy Lifestyle for Weight Management
#### Diet and eating habits:
- Eat a moderate number of calories & watch portion sizes carefully
- Limit intake of dietary fats and added sugars
- Increase your intake of complex carbohydrates
- Limit protein intake to recommended levels
- Eat small, frequent meals (3-4 + healthy snacks); don’t skip meals – leads to problems
- Maintain a structured pattern of eating

#### Physical Activity and Exercise:
- Engage in moderate CRE exercise (70% THR) of medium to long duration (90-150 minutes/week) as part of your exercise program
- Include weight training as part of your exercise program

#### Thoughts and emotions:
- Develop realistic goals for yourself and your behavior
- Think positively about yourself, and praise yourself for your accomplishments
- Positive self-talk

#### Coping strategies:
- Develop healthy ways of dealing with stress, boredom, fatigue, and loneliness that don’t involve food
- Deal positively with the stresses and challenges of life
Strategies for Weight Management

- Doing it alone – can be successful; 64% successful w/o joining a group; limit loss to ½-2 lbs/week; early wt. loss is H₂O – later loss is fat
- Diet books:
  * High protein, low carb diets (Sugar Busters, The Zone, Dr. Atkins’ New Diet Revolution) put body at risk for heart disease, colon cancer; wt loss is due to loss of H₂O & protein; reason they work is low number of calories taken in

- Diet aids – Seeking a quick solution to a long term situation can lead to problems
- Diet pills with phenylpropanolamine hydrochloride (PPA) can cause CV side effects, dizziness, headaches, rapid pulse, heart palpitations
- Ephedrine (ephedra) - appetite suppressant & stimulant to heart & nervous system - serious problems - elevated BP & HR
- Commercial programs: only 10-15% success rate in keeping weight off; check into the costs (foods/supplements) & risks of the program

- Prescription drugs: some caused heart valve problems (fen-phen); only for serious weight problems; need lifestyle changes
- Surgery: May be necessary for those 100% or more overweight; can have serious side effects
- Psychotherapy: if eating disorder is diagnosed; may need the help of a therapist
- May need professional help if 20% - 40% overweight

Body Image

- Picture of the body as seen through the mind’s eye
- Negative body image can cause significant psychological distress
- Eating disorders characterized by dissatisfaction with body image and body weight (8 million suffer)

Anorexia Nervosa: effects 1-3 million; 95% female ages 12-18; characterized by intense fear of gaining weight or becoming fat; self-esteem is tied to their evaluation of their body/shape

Bulimia Nervosa: (binge & purge); becoming a problem for young (11-12) & old (40-60); places serious stress on body

binge-eating disorder: uncontrolled eating leads to feeling of shame, guilt, depression; feel rigid dieting is only solution, but can’t/don’t follow through
To Safely Gain Weight

• Program should be gradual and include strength training exercise & high carb/high calorie diet changes
• Limit fats and include complex carbohydrates (60-65% daily calories from carbs)
• Usually enough protein in “regular” diet
• Don’t skip meals; add 2-3 snacks to diet
• Could use sport drink with 60% of calories from carbohydrates; but don’t substitute for meals

Guidelines for Healthy Weight Management

✓ Assess motivation and commitment
✓ Set reasonable goals
✓ Assess current energy balance
✓ Increase level of physical activity
✓ Make changes in diet and eating habits
✓ Put plan into action (keep a log of what eaten & exercise)
✓ Think positively

Cardiorespiratory Endurance

1) The ability of the body to perform prolonged, large-muscle, dynamic exercise at moderate-to-high levels of intensity
2) Key health-related component of fitness

Ch 6
Cardiorespiratory Endurance

The Cardiorespiratory System

➢ Cardio:
  ➢ heart and blood vessels
  ➢ transports oxygen, nutrients, and wastes among vital organs and tissues
➢ Respiratory:
  ➢ lungs, air passages, and breathing muscles
  ➢ supplies oxygen and removes carbon dioxide

Energy Production

➢ Metabolism
  ➢ the sum of all chemical processes necessary to maintain the body
  ➢ metabolic rate depends on an individual’s level of activity
➢ Energy from food = fuel for the body
  ➢ carbohydrates - quick source of fuel
  ➢ fats - long term fuel
  ➢ proteins - primarily build new muscle and tissue
ATP (adenosine triphosphate)

- The basic form of energy used by cells
- Three energy systems:
  1. immediate
  2. nonoxidative (anaerobic)
  3. oxidative (aerobic)
- Individuals generally use all three systems in combination while exercising

Benefits of Cardiorespiratory Endurance (CRE) Exercise

- Improved cardiorespiratory functioning:
  - increases blood flow to skeletal muscles
  - decreases blood flow to digestive organs
  - increases ventilation
  - increases cardiac output
- Improved cellular metabolism:
  - increases capillaries in the muscles
  - trains muscles to work more efficiently
  - may prevent damage to cells

More Benefits of Cardiorespiratory Endurance Exercise

- Reduced risk of chronic disease:
  - cardiovascular disease
  - cancer
  - diabetes
  - osteoporosis
- Better control of body fat
- Improved immune function
- Improved psychological and emotional well-being

Developing a Cardiorespiratory Endurance (CRE) Program

- Set realistic goals
- Choose sports and activities
- Determine frequency, intensity, and duration of training
- Allow time for warm-up and cool-down
- Maintain with at least 3 days of exercise per week

Frequency, Intensity, and Duration for Cardiorespiratory Endurance (CRE) Training

- Frequency
  - 3-5 times per week
- Intensity
  - target heart rate (THR) zone or rating of perceived exertion (RPE) value for experienced exercisers (p. 220 – Fig. 6.9)
  - increase gradually
- Duration
  - total duration of 20-60 minutes per day
Using Your Target Heart Rate Zone

1. Estimate Maximum Heart Rate (MHR)
   \[ \text{MHR} = 207 - (0.7 \times \text{age}) \]
   \[ \text{MHR} = 207 - (0.7 \times 20) = 193 \text{ bpm} \]

2. Heart Rate Reserve (HRR)
   \[ \text{HRR} = \text{MHR} - \text{RHR (Resting Heart Rate)} = 193 - 68 = 125 \text{ bpm} \]

Exercise Intensity:
60\% TI = (HRR \times 0.60) + \text{RHR} = 143 \text{ bpm}
80\% TI = (125 \times 0.80) + 68 = 168 \text{ bpm}
3. Start at 60\% or below if you have been sedentary

Cardiovascular Health

Major Forms of Cardiovascular Disease (CVD)

1. Hypertension
2. Atherosclerosis
3. Heart disease and heart attacks
4. Stroke
5. Congestive heart failure

Major Risk Factors That Can Be Changed

1. Tobacco use (1 pack /day = twice the risk of heart attack as non-smokers; 2+ packs/day triples the risk; Smokers more likely to die from heart attack)
   Women who smoke & use the "pill" = 39 times more likely to have heart attack & 22 times more likely to have a stroke

2. High Blood Pressure (Hypertension)

Major Risk Factors That Can Be Changed

3. Unhealthy cholesterol levels (HDL = “good” cholesterol – helps bring unused cholesterol back to liver for recycling; LDL = “bad” cholesterol – excess leads to blockage of arteries - Best way to lower – cut total fat (saturated) intake; increase fiber
4. Physical inactivity (25% of adults don’t exercise & 60 \% don’t reach recommended amount of exercise) Exercise is the “magic bullet”
5. Obesity (30\% above recommended weight)

Contributing Risk Factors That Can Be Changed

1) Diabetes – Can lead to increased risk factors for CVD
2) Triglyceride (Blood Fats) levels – 400mg/dl = high; Best way to lower: Lose weight; exercise; increase fiber; lower simple sugars & refined carbohydrates.
3) Psychological factors
   stress, chronic hostility and anger, suppression of psychological distress, depression, anxiety
4) Social factors
   social isolation, low socioeconomic status
Major Risk Factors That Cannot Be Changed

- Heredity - CVD seems to be inherited
- Aging
  - increased risk (55%) of heart attacks after age 65
- Being male
- Ethnicity
  - African Americans have much higher risks of developing CVD

Dietary Defense Against CVD

- Decrease total fat and cholesterol intake
- Choose unsaturated fats over saturated and trans fats
- Increase fiber intake
- Consume alcohol moderately, if at all
- Follow the DASH (Dietary Approach to Stop Hypertension) diet – high in fruits, vegetables, grains, low/non fat dairy products, low in snacks & sweets

Protect Yourself Against CVD

- Eat heart-healthy
- Exercise regularly
- Avoid tobacco
- Know and manage blood pressure
- Know and manage cholesterol levels
- Develop ways to handle stress and anger
- Know your risk factors

Ch 7
Muscular Strength and Endurance
Benefits of Strength Training

- Improved physical performance (better for everyday tasks; recreational activities)
- Injury prevention (improved posture, body mechanics – e.g. lifting objects; reduce low-back pain)
- Improved body composition (increases fat-free mass and elevates metabolism; aids in preventing diabetes – improved glucose metabolism; and helps modify risk factors of cardiovascular disease)

Benefits of Strength Training

- Enhanced self-image; self-confidence; better looking body
- Improved muscle and bone health with aging (lessens likelihood of osteoporosis; maintains motor nerve connections; enhances “quality” of life – able to do more)

Muscular Strength and Endurance

- Muscular strength
  - the maximum amount of force a muscle can produce in a single effort
- Muscular endurance
  - the ability of a muscle to exert a submaximal force continuously or repeatedly over time

Assessments

Muscular Strength: Repetition Maximum (1 RM)
A single effort of maximum amount of weight a person can lift one time – Bench press & leg press
Grip dynamometer – to assess grip strength
Muscular Endurance – maximum number of “repetitions” of muscular contraction (e.g. crunches or push-ups) or maximum time a contraction can be held (flexed arm hang)

Physiology of Weight Training

Myofibrils make up muscle fibers.

Hypertrophy - increased muscle fiber size occurs when wt. training causes the number of myofibrils to increase

Bundles of muscle fibers make up muscles. When muscles contract – myofibrils slide across one another & the muscle shortens & causes movement

Types of muscle fibers
- slow-twitch fibers (fatigue-resistant; endurance activities)
- fast-twitch fibers (contract more rapidly and forcefully, fatigue more quickly; strength and power activities)
Types of Weight Training Exercises

**Isometric** (static) - application of force without movement – Best used in rehab setting under direction of a physical therapist
- Joint and angle specific – Strength gain limited to the angle worked
- No real relevance to the way muscles are used
- Disadvantage is the elevation in blood pressure during the exercise and the decrease in the heart’s ability to pump blood to muscles & brain

**Isotonic** (dynamic) - application of force with movement - constant load on muscle throughout the range of motion – Only as strong as weakest angle
- Two types of isotonic contractions:
  - CONCENTRIC contraction – Muscle shortens
    - (“Up” phase of a biceps curl)
  - ECCENTRIC contraction – Muscle lengthens
    - (“Down” phase of a biceps curl)

**1) Constant** (free weights) and **Variable Resistance** (“Nautilus” type machines) – Most common isotonic exercises
**2) Eccentric loading** (“Negatives”) - No good data for benefits
**3) Plyometrics** – Develops “explosive” strength – Sudden eccentric loading followed by concentric contraction (Jumping from bench to ground and then back to the bench)
**4) Speed loading** – Rapid movements of weight to simulate a sport action (sprinting)
**5) Isokinetic** – Exerting force at constant speed against an equal force from a strength training machine (e.g. Cybex)

Body weight exercises are sufficient for most beginners to improve strength or tone muscles.
- Can achieve good results without use of costly machines or weights
  - e.g. push-ups, pull-ups, crunches, sit-ups, dips, lunges

Weight Training Exercises
- Weight to use when beginning – depends on current level of fitness
- Need to determine a 1 RM (repetition maximum)
- For “strength” gains – use about 80% of 1RM or heavy weight and low repetitions (1-5)
- For “toning” or endurance – use about 40%-60% of 1RM or light weight and high repetitions (15-20)
- For a “general” program use a weight you can lift 8-12 repetitions using 70% 1 RM
- No optimal number of “sets” (a group of repetitions) determined - but most work toward 3 sets.
Weight Training Exercises
- Begin with appropriate warm-up (light weight & about 10 reps if doing multiple sets) and end with cool-down.
- Allow for rest between sets
  - 1-3 minutes for toning or general program
  - 3-5 minutes if lifting “heavy”
- Try to identify about 8-10 exercises to work entire body
- ACSM recommends 2-3 days/week for training
- Can work specific body parts if becoming serious, but allow 1 day’s rest before reusing that body part.

Weight Training Safety
- Use proper lifting technique and full ROM
- Receive instruction if unsure of technique
- Keep weight close to body
- Use legs to “pick-up” weights – hips tucked in & back straight
- Don’t “twist” while lifting
- Don’t “bounce” the weight against/off your body

Weight Training Safety
- You control the weight – don’t let it control you
- Use spotters and collars with free weights
- Use common sense with weight machines
- Keep away from moving parts and weight stacks

Weight Training Safety
- Never hold your breath when lifting (Valsalva Effect) – Exhale when exerting the force
- Avoid “thumbless” grips
- Avoid moving parts on machines – Watch where you put your hands
- Make sure seat is adjusted properly – avoid awkward positions

Supplements and Drugs
- Supplements taken to improve performance and appearance
- Taken to:
  1. enhance muscle size,
  2. speed recovery from injury,
  3. prevent effects of “overtraining”,
  4. increase ability to train,
  5. control body fat, body water, reduce appetite
Supplements and Drugs

- Anabolic steroids – synthetic testosterone
  - Do work BUT at a price
  - Liver damage & tumors
  - Alteration of heart muscle
  - Susceptibility to CV disease (lowers HDL)
  - Increased risk of cancer
  - Altered reproduction ability (men and women)
  - Mood changes - aggressive behavior (“Roid” Rage)
  - Increased risk of AIDS through sharing of needles

- Growth Hormone – taken to increase muscle mass and strength in athletic contests –
  - Speeds protein synthesis and stimulates muscle growth factors
  - Very expensive and with serious side effects
  - Prolonged use elevates blood sugar
  - High insulin levels
  - Heart enlargement & increased blood fats
  - Could lead to “acromegaly” – large bones in head, face, & hands and diseases of heart, nerves, bones, & joints

- Protein & amino acid supplements taken to accelerate muscle development, decrease body fat, and stimulate human growth hormone
  - Little scientific proof of benefits
  - Diet changes can produce some of the desired results without excessive costs

- Creatine Monohydrate – taken to aid in recovery from strenuous exercise
  - Can aid in short term, high-intensity, repetitive exercise
  - No benefit for aerobic activities
  - Long term effects not known – especially in adolescents (same as when steroids began to be used inappropriately)
  - Ephedrine – an over-the-counter stimulant to aid in training and overcoming fatigue – serious heart related problems (arrhythmias, chest pain, abnormal rhythms, & death) for many taking for first time – Now banned

- Appetite suppressants and thermogenic drugs (metabolism effecting) - all very dangerous
  - Can lead to heart rhythm disturbances, heart valve damage, psychiatric disturbances, cardiac arrhythmias
  - Most supplements have a BIG price to pay for their use
  - None will help “change a weak, untrained person into a strong, fit person” – Only hard work will produce those results

Ch 8
Muscular Flexibility
Complete Lab 8A in your text.

Instruments for the assessments are only available on campus.

Flexibility: the ability of a joint to move through its full range of motion (ROM)
80% of all low back problems are caused by improper alignment of the spine & pelvic girdle – i.e. due to a lack of flexibility and weak abdominal muscles (core).
Over $1 BILLION dollars lost by businesses because of employees suffering from low-back problems.

Two types of flexibility:

1) **Static**: The ability to assume and maintain an extended position at one end or point in a joint’s ROM;
   Dependent upon structure of a joint & tightness of muscles, tendons, & ligaments that are attached

2) **Dynamic**: The ability to move a joint through its ROM with little resistance
   Dependent upon static flexibility and strength, coordination, and resistance to movement
   Can be important in daily activities & sport

Promotes good joint health
Slow joint deterioration
Can improve the elasticity in tissue making it easier to move
Improves quality of life -especially as you age
Problem can be made worse by arthritis
May prevent low-back pain and injuries
Reduces frequency and severity of injuries
Overstretching can decrease the stability of the joint

*Reduced soreness? (Delayed Onset of Muscle Soreness) - injury to muscle fibers and surrounding tissue; action causes inflammation - causes release of proteases (enzymes that break down proteins) & causes pain/discomfort - muscles will produce proteins that prevent soreness in future workouts - you will become sore again if not regularly working out)*

Improves performance in sports and other activities
Contributes to good posture
Promotes relaxation

Joint structure - Different for joint types (hinge – finger & knee; ball & socket - shoulder & hip)
   Primary determinant - can be limited by heredity
Muscle tissue’s elasticity and length can be lengthened if stretched regularly
Important for connective tissue to stretch
Nervous system activity
Stretch receptors control the length of muscles
Proprioceptive neuromuscular facilitation (PNF) technique may improve flexibility
Contraindicated Exercises

- Most strength and flexibility exercises are relatively safe to perform
- Some exercises (contraindicated) can be hazardous if performed incorrectly
- Contraindicated exercises may cause harm because of excessive strain on muscles and joints; in particular the spine, lower back, knees, neck, or shoulders
- A list of contraindicated exercises are provided in the textbook (e.g. plow, bridge, double leg lift, deep knee bend, hurdler’s stretch, hero stretch, quad stretch, ballistic bar stretch)

Muscle Tissue and Flexibility

- Muscle tissue can be stretched to increase flexibility
- Connective tissue is most important part of muscle tissue for flexibility – can rupture if “overstretched”
- Types of connective tissue:
  - collagen (white fibers) for structure and support
  - elastin (yellow fibers) are elastic and flexible
  - titin (a structural protein) also plays role in flexibility

What Determines Flexibility?

- Joint structure - Different for joint types (hinge – finger & knee; ball & socket - shoulder & hip)
  - primary determinant - can be limited by heredity
- Muscle tissue’s elasticity and length can be lengthened if stretched regularly
- Important for connective tissue to stretch
- Nervous system activity
  - stretch receptors control the length of muscles
  - proprioceptive neuromuscular facilitation (PNF) technique may improve flexibility
Stretching Techniques

- **Static stretching**
  - should "warm-up" before stretching
  - each muscle is gradually stretched and held for 10-30 seconds

- **Ballistic stretching**
  - sudden stretching in a bouncing movement
  - **NOT** recommended

- **Proprioceptive neuromuscular facilitation (PNF)**
  - muscle is contracted (6 sec.), then stretched (10-30 sec.)
  - causes soreness, requires partner

**Dynamic Stretching**
- Speed of movement, momentum, & active muscular effort is used
- Does **not** require bouncing motions
- Examples: Exaggerated kicking action; walking lunges; arm circles
- Stretching force needs to be controlled

**Proprioceptive Neuromuscular Facilitation (PNF)**
- Contract-and-Relax method; performed with a partner
- The range of motion is slowly increased
- Muscle is isometrically contracted (4-5 sec.), then stretched (10-30 sec.)
- The isometric type of contraction helps muscle to relax
- May cause soreness, requires partner; takes more time/session

Alternative Methods of Stretching

- **Pilates**: incorporated yoga, martial arts, and calisthenics into light resistance exercises using machines with springs or elastic cables to work the entire body.
- **Yoga**: Stimulates the mind/body relationship to enhance one's well-being. Incorporates breathing techniques and body alignment movements that increase blood flow and energy to body tissues.
- **Tai Chi**: slow-moving form of martial arts
  - Stresses suppleness and elasticity vs. hardness & force
  - Improves balance, strength, and improved ROM

Low Back Pain

- 85% of Americans have low back problems
- Most common site for injury - lumbar area – since it carries most of the body’s weight
- Underlying causes: weak muscles; excess body weight; poor posture; poor biomechanics
- "Slipped" disk – a damaged intervertebral disk – may bulge out between vertebrae against a nerve causing pain, numbness, loss of muscle function, muscle spasms
Low Back Pain - Prevention

- Be physically active
- Strengthen muscles in abdomen, along spine (erector spinae) and sides, hips, and thighs
- Stretch often using spinal exercises through a functional range of motion
- Regularly strengthen the core of the body
- Avoid sitting (over 50 minutes) or standing in one position for lengthy periods of time
- Use a firm mattress
- Sleep on your back with a pillow under the knees or sideways with the knees drawn up and a small pillow between the knees

Developing A Flexibility Program

- Active and passive stretching
  - safest technique is active static stretching
  - add occasional passive assist
- Intensity and duration
  - hold each stretch for 10-30 seconds
  - Only to the point of mild discomfort or tightness
  - There should be NO pain
  - at least 2-4 repetitions of each stretch
  - rest for 30-60 seconds between stretches
- Frequency
  - minimum of 2-3 days per week
  - Ideal is daily

Modified Sit and Reach Test

Hold the final reach for two seconds

Total Body Rotation Test

Measures body rotation. Test is performed on both right and left side.
Shoulder Rotation Test

- Measures shoulder flexibility

Measuring biacromial width

Starting position for the shoulder rotation test

Shoulder rotation test