

## Ch 5

### Weight Management

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### 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

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### 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

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### 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

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### 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)

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### 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

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## Resting Metabolic Rate (RMR)

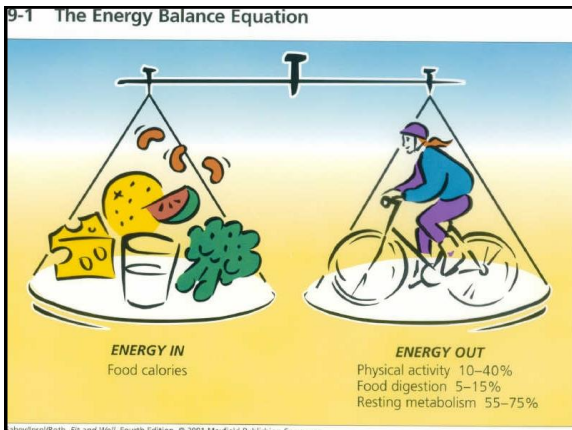
- RMR accounts for 55-75% of daily energy expenditure; 5-15% required for digestion; 10-40% energy expended in physical activity
- Factors affecting RMR
  - ✓ Heredity – inherited from parents
  - ✓ Gender – males tend to have higher RMR – more muscle
  - ✓ Lifestyle – an ongoing commitment
- Exercise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

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## 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

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## Explanations for Overweight

- ⌘ Restrained eating (restricting food intake) leads to overeating (**binge eating** - leads to guilt, shame, etc.) – other causes: emotions, situations, physical states
- ⌘ Psychological factors – Eating becomes a distraction from difficult feelings, used to combat low moods, low self-esteem
- ⌘ Socio-economic factors – obesity goes down as income goes up
- ⌘ Cultural factors – food equates with “love” & caring – part of social gatherings

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## 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 H<sub>2</sub>O 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

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## 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

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## 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

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## 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 1/2 ping-pong ball
- 1/2 cup rice = ice cream scoop or 1/3 soda can
- 1 medium potato = computer mouse

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## 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

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## A Healthy Lifestyle for Weight Management

- 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

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## A Healthy Lifestyle for Weight Management

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

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## A Healthy Lifestyle for Weight Management

- 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

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## 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 H<sub>2</sub>O – 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 H<sub>2</sub>O & protein; reason they work is low number of calories taken in

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## Strategies for Weight Management

- \* **Low fat, high-carbohydrate diets** are hard to follow (New Hilton Head Metabolism Diet & Pritikin Weight Loss Breakthrough)
- \* **"Magic" & fad diets** can be dangerous (The Cabbage Soup Diet; Diet based on blood type)

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## Strategies for Weight Management

- **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 <sup>21</sup>

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## Strategies for Weight Management

- **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

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## 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)

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## Body Image

- Anorexia Nervosa**: affects 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

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## 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

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## 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

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## Ch 6

### Cardiorespiratory Endurance

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## 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

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## 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

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## Energy Production

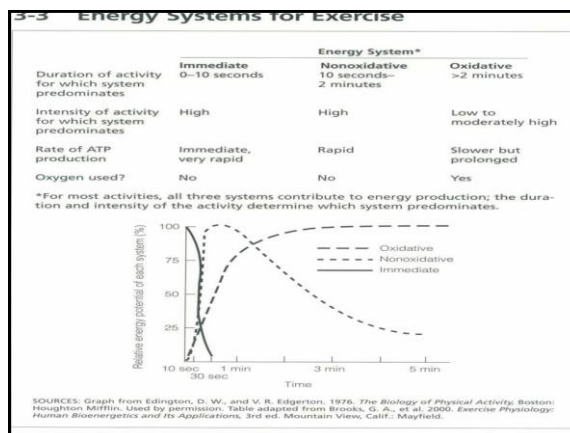
- ⌘ Metabolism
  - the sum of all chemical processes necessary to maintain the body
  - **metabolic rate** depends on an individual’s level of activity
- ⌘ Energy from food = fuel for the body
  - carbohydrates - quick source of fuel
  - fats - long term fuel
  - proteins - primarily build new muscle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

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## 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

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## 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

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## 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

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## 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

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## 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

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## Using Your Target Heart Rate Zone

1. Estimate Maximum Heart Rate (MHR)
2.  $MHR = 207 - (.7 \times \text{age } 20) = 193 \text{ bpm}$
3. Heart Rate Reserve (HRR)

HRR = MHR - RHR (Resting Heart Rate) = 193-68=125 bpm

Exercise Intensity:

60%TI = (HRR X .60) + RHR = 143 bpm

80% TI = (125 x .80) + 68 = 168 bpm

3. Start at 60% or below if you have been sedentary

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## Cardiovascular Health

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## Major Forms of Cardiovascular Disease (CVD)

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

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## 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 like to have a stroke
2. High Blood Pressure (Hypertension)

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## 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)

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## 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

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## 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

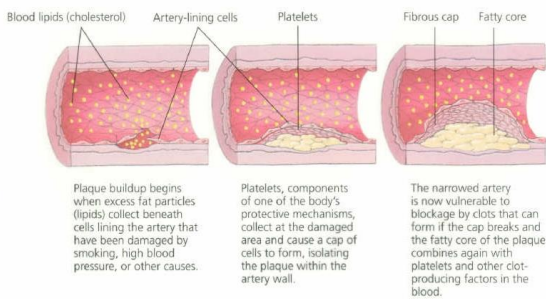
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## Dietary Defense Against CVD

- 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

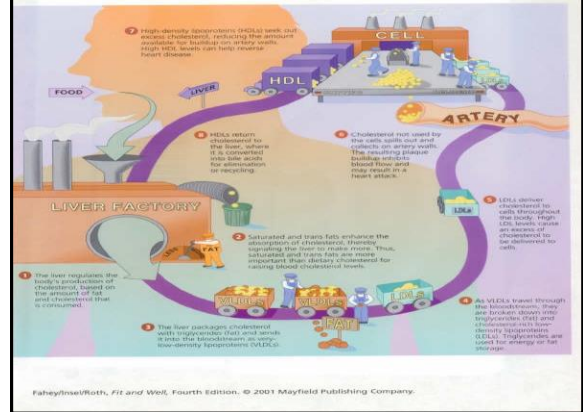
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### 11-3 Stages of Plaque Development



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### 11-2 Travels with Cholesterol



## 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

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## Ch 7

### Muscular Strength and Endurance

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Link to [Ch. 7 Strength and Endurance Lab](#)

Link to [1 Rep MAX Assessments](#)

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## 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)

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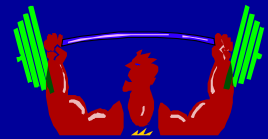
## Benefits of Strength Training

- ⌘ 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)

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## 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



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## Muscular Strength and Endurance

### 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)

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## Physiology of Weight Training

Myofibrils make up muscle fibers.

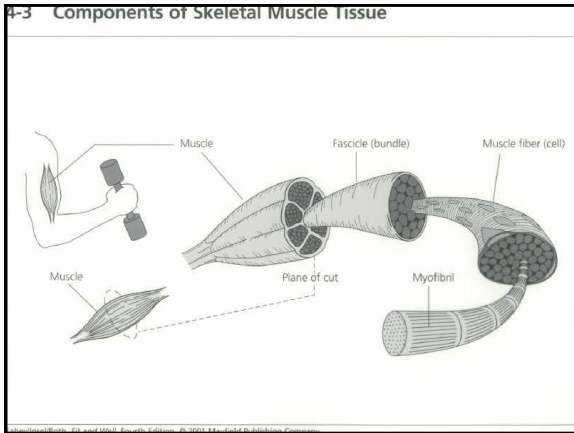
**Hypertrophy**-increased muscle fiber size- occurs when wt. training causes the number of myofibrils to increase

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)

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## 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

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## Types of Weight Training Exercises

**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)

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## Types of Weight Training Exercises

- 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)

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## Types of Weight Training Exercises

- 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

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## 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.

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## 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

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## 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

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## 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

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## Weight Training Safety

- Adjust machines as needed
- Be sure machines are clean and in good condition
- Be aware of your surroundings & others lifting
- Be alert for injuries

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## 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

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## 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

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## 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

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## Supplements and Drugs

- 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

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## Supplements and Drugs

- 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

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## Supplements and Drugs

- **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

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## Supplements and Drugs

- 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

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## Ch 8

### Muscular Flexibility

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## Muscular Flexibility

Complete Lab 8A in your text.

Instruments for the assessments  
are only available on campus.

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## Flexibility – Definitions & Types

**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.

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## Flexibility – Definitions & Types

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

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## Major Benefits of Flexibility

- Promotes good joint health
  - Slows 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

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## Other Benefits of Flexibility

- ❖ Reduces 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

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## What Determines Flexibility?

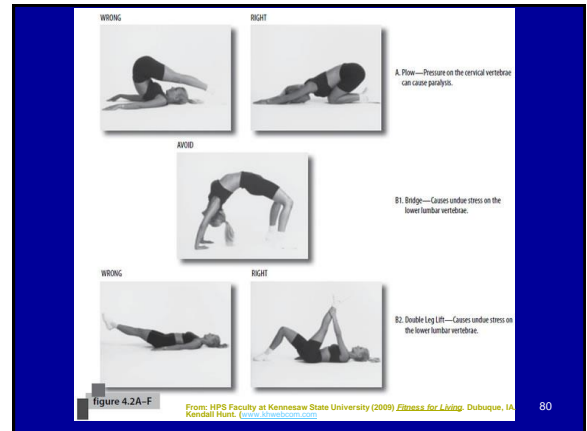
- Joint structure - Different for joint types (hinge – finger & knee; ball & socket - shoulder & hip)
  - ❖ primary determinant - can be limited by heredity
- Muscle tissue's elasticity and length can be lengthened if stretched regularly
- Important for connective tissue to stretch
- Nervous system activity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

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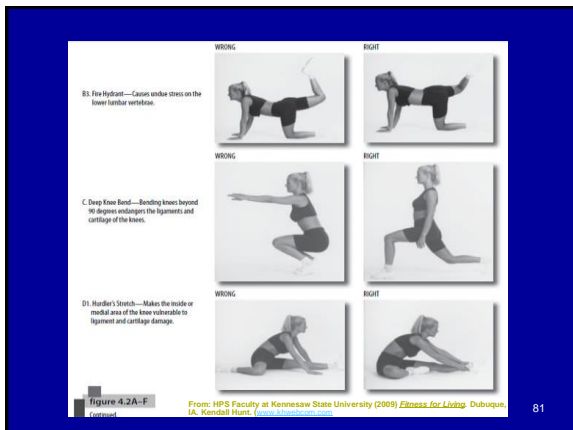
## Contraindicated Exercises

- 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)

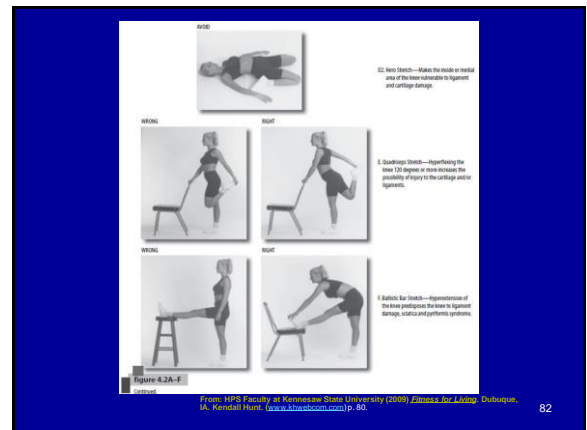
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## Muscle Tissue and Flexibility

- ❖ 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

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## 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

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## 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

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## Stretching Techniques

- **Static stretching** (slow, sustained)
  - should "warm-up" before stretching
  - each muscle is gradually stretched and held for 15-30 seconds; repeated 2-4 times; at least 3 times/week
  - Should experience a sensation of "tightness" - but not pain
  - Can be active (done by one's self) or passive (with a partner)
- **Ballistic stretching**
  - sudden stretching in a bouncing movement
  - sometimes used in sport specific training, but can/will cause problems (e.g. muscle damage & delayed muscle soreness)
  - Could increase risk of partial or full joint dislocation due to loosening of the ligaments
  - **NOT** recommended for improving overall range of motion (ROM)

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## Stretching Techniques

- **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

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Figure 16.3 Passive prestretch of hamstrings during hold-relax PNF hamstring stretch.



Figure 16.4 Isometric action during hold-relax PNF hamstring stretch.



Figure 16.5 Increased ROM during passive stretch of hold-relax PNF hamstring stretch.

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## Alternative Methods of Stretching

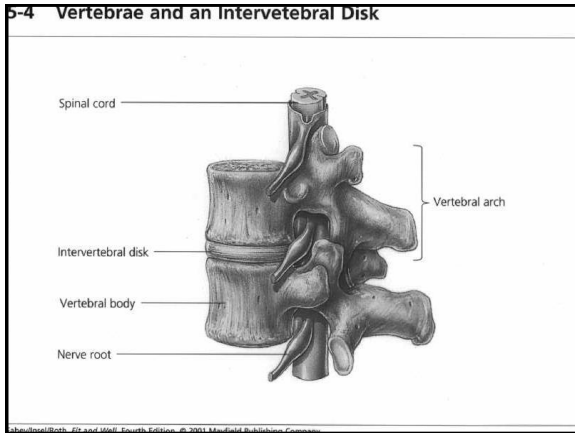
- **Pilates:** incorporated yoga, martial arts, and calisthenics into light resistance exercises using machines with springs or elastic cables to work the entire body.
- **Yoga:** Stimulates the mind/body relationship to enhance one's well-being. Incorporates breathing techniques and body alignment movements 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

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## 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 bio-mechanics
- "Slipped" disk – a damaged intervertebral disk – may bulge out between vertebrae against a nerve causing pain, numbness, loss of muscle function, muscle spasms

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## 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

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## 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

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## Modified Sit and Reach Test



Measures hip and trunk flexibility. Modified protocol accounts for arm/leg length discrepancies.

Starting position for the modified sit-and-reach test

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## Modified Sit and Reach Test



Hold the final reach for two seconds

Modified Sit-and-Rreach Test

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## Total Body Rotation Test



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

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## Shoulder Rotation Test

- Measures shoulder flexibility



Measuring  
biacromial width



Starting position  
for the shoulder  
rotation test



Shoulder rotation test