

Unit 1: Healthy Behaviors

~PHYSIOLOGY~

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❖ Health

The Heath Triangle	
Type	Examples
Physical	exercise, sleep, diet, fitness, hygiene, hydration
Mental	letting out emotions in a positive manner, relaxation, low stress, challenges, positive attitude, confidence
Social	friends, family, activities, having an open mind, community



❖ Nutrition

- Carbohydrates
 - Body's first choice of energy (4 kcal/g)
 - Can be:
 - Oxidized immediately for energy (cellular respiration)
 - Stored as glycogen in the liver or muscles
 - Transformed for storage as fat.
 - Found in breads, pastas, candies, fruits, etc.

- **Glycemic Index:** a measure of how quickly a food raises blood sugar.

Kinds of Food	GI Levels	Functions
High GI Food	GI Value > 70	<ul style="list-style-type: none"> ▪ Increase blood sugar levels rapidly ▪ Pancreas must produce a large amount of insulin to lower the blood sugar level ▪ Wear and tear on pancreas ▪ Linked to insulin resistance <ul style="list-style-type: none"> ○ Type II Diabetes ○ Cardiovascular disease (damages arteries and vessels)
Low GI Food	GI Value < 55	<ul style="list-style-type: none"> ▪ Increase blood sugar level slower ▪ Pancreas does not have to work as hard

- **Lipids**
 - Body's second choice for energy (9 kcal/g)
 - Important in:
 - Structure of the plasma membrane and myelin sheath
 - Creating steroids and hormones (especially sex and adrenal hormones)
 - Manufacture of bile and Vitamin D
 - Types of cholesterol
 - LDL (low-density lipoprotein)- "bad" cholesterol
 - HDL (high-density lipoprotein)- "good" cholesterol

Type of Fat	Effect on Body	Found In
Monounsaturated Fats	<ul style="list-style-type: none"> ▪ Decrease LDL (good for cardiovascular system) ▪ Resist oxidation 	Avocado oil, canola oil, olive oil, peanut oil, nuts (cashews, pistachios, walnuts)
Saturated Fats	<ul style="list-style-type: none"> ▪ Increase "bad" cholesterol (LDL) ▪ May lead to cardiovascular disease 	Animal fat (butter), coconut oil, palm oil
Polyunsaturated Fats	<ul style="list-style-type: none"> ▪ Oxidize quickly into toxic compounds that damage the cardiovascular system ▪ Contain increased amounts of trans-fatty acids (TFA's) 	Corn oil, Safflower oil, Sunflower oil, margarine (Crisco), soybean oil

Healthiest

 Monounsaturated > Saturated > Polyunsaturated

 Unhealthiest

- **Trans Fatty Acids (TFA's)–“Funny Fats”**
 - Found in polyunsaturated oils (especially hydrogenated oils)
 - *Hydrogenation:* Heating an oil so that the heat forces an extra Hydrogen molecule into the fatty acid chain of carbohydrates
 - Damages cardiovascular system
 - Promote cancer
 - Used by body as a building block in place of the *cis-* form
 - May form defective enzymes and cell membranes
- **Omega 3 Fatty Acids**
 - Many Americans are deficient in omega 3 fatty acids
 - Important in building prostaglandin (hormones that govern cell growth and differentiation, blood clotting, immune function, and inflammation)
 - Found in: salmon, herring, sardines, soybeans, walnuts, pumpkin seeds, canola oil, algae, wild grasses, flaxseed

- **Proteins**
 - Body's last choice for energy (4 kcal/g)
 - Used to:
 - Create enzymes
 - Build strong muscles and skin
 - Fight disease (immunity)
 - Manufacture cell receptors
 - Problem with burning proteins for energy:
 - Not a clean fuel
 - Creates NH₃ (ammonia), which is toxic
 - Strain on liver and kidneys
 - Diuresis (facilitated urine production) causes loss of minerals (calcium)
 - Proteins are essential building blocks, but not a good energy source! (hardest to access because they are in muscles and tissue)

- **Water**
 - Makes up 2/3 of body weight
 - All cell and organ functions depend on water
 - Regulates body temp
 - Serves as a lubricant (main component of saliva)
 - Need 6-8 glasses of water a day (½ a person's body weight in oz.)
 - Ex. 140 lb. person should drink 70 oz. of water per day
 - Should avoid caffeine and alcohol which cause dehydration

- **Minerals**
 - Inorganic elements that often:
 - Regulate enzymatic reactions
 - Act as catalysts
 - Examples of Mineral Function

Type of Mineral	Function
Calcium and Phosphorous	Bones, teeth, blood clotting, muscle contraction, nerve activity, energy storage
Sodium and Potassium	Nerve impulse conduction, muscle contraction
Chlorine	pH balance of blood, water balance, formation of stomach acid
Iron	ETA (electron transport chain), hemoglobin
Iodine	Thyroid hormone

- **Vitamins**
 - Organic nutrients required in small amounts that:
 - Maintain growth and normal metabolism
 - Act as co-enzyme
 - Do NOT provide energy or serve as building materials

Type of Vitamins	
Types	Descriptions
Fat-soluble Vitamins	<ul style="list-style-type: none"> ▪ Vitamins A,D,E, and K ▪ Only absorbed when ingested with lipids ▪ May be stored in cells (liver cells especially)
Water-soluble Vitamins	<ul style="list-style-type: none"> ▪ Vitamins C and B ▪ Dissolved in body fluids ▪ Excess vitamins excreted in urine
Anti-Oxidant Vitamins	<ul style="list-style-type: none"> ▪ Vitamins C, E, and beta carotene ▪ Inactivate oxygen free radicals (highly reactive molecules that damage cell membranes, DNA, and other cell structures) ▪ Protect against cancer, atherosclerosis, aging, and cataracts

Vitamin	Function
Vitamin D	Absorption of calcium and phosphorous
Vitamin E	Wound healing, formation of DNA, RNA, and red blood cells
Vitamin K	Blood clotting
Vitamin A	Regulates osteoblasts and osteoclasts (bone cells)
Folic Acid	Production of red blood cells and white blood cells
Vitamin C	Formation of collagen and connective tissue, co-enzymes, and antioxidants

- **Fiber**
 - “Resistant” carbohydrates
 - Protect health of intestinal tract
 - Lower cholesterol level
 - Examples: fruits (raspberries), vegetables, beans, whole grains

- **Phytochemicals**
 - Substances in plants that give them color, flavor, and natural disease resistance
 - For us:
 - Help fight disease
 - Reduce risk of cancer
 - Work as powerful antioxidants
 - Protect against environmental toxins

Types of Phytochemicals	
Types	Examples
Polyphenols	Olive oil, green tea, red grapes, cherries
Carotenoids	Carrots, pumpkins, sweet potatoes, tomatoes
Phytoestrogens	Soybean, flxseed

- **Mediterranean Diet**
 - 50-60% of calories from carbohydrates
 - 30% calories from fat
 - 10-20% calories from proteins

➤ **Eating Disorders**

Eating Disorder	Characterized By	Warning Signs	Medical Consequences	Additional Info
Anorexia Nervosa	Excessive weight loss and self-starvation	<ul style="list-style-type: none"> ▪ Extreme weight loss ▪ Complaining of being fat ▪ Excessive exercise ▪ Denial of hunger ▪ Reduction of food intake ▪ Eating foods that are no/low calorie or fat content 	<ul style="list-style-type: none"> ▪ Heart changes/failure ▪ Kidney failure ▪ Osteoporosis ▪ Lanugo (growth of a thin layer of hair) ▪ Loss of menstrual period ▪ Lowered testosterone levels 	<ul style="list-style-type: none"> ▪ One of most commonly diagnosed psychiatric disorders in young women ▪ Highest DEATH rate of any mental disorder
Bulimia Nervosa	Binge eating followed by purging	<ul style="list-style-type: none"> ▪ Large amounts of food disappear suddenly ▪ Frequent excuses to go to the bathroom after a meal ▪ Mood swings 	<ul style="list-style-type: none"> ▪ Electrolyte imbalance (results in heart failure, arrythmia, death) ▪ Teeth discoloration ▪ Irritation to digestive 	<ul style="list-style-type: none"> ▪ Many bulimics are within the normal weight range ▪ Binging- rapid consumption of

		<ul style="list-style-type: none"> ▪ Unusual swelling around the jaw 	<ul style="list-style-type: none"> tract lining (throat, esophagus, stomach) ▪ Irregular bowel movement 	<ul style="list-style-type: none"> food ▪ Purging- self-induced vomiting, excessive exercise, diuretics
Binge Eating	Uncontrolled eating	<ul style="list-style-type: none"> ▪ Rapid eating ▪ Secretive eating patterns ▪ Irritated and disgusted with self after overeating ▪ No purging ▪ Eats to the point of being uncontrollably full 	<ul style="list-style-type: none"> ▪ High Blood Pressure ▪ High cholesterol ▪ Heart/vascular disease ▪ Leg and joint pain ▪ Pancreatic Stress ▪ Type II diabetes 	<ul style="list-style-type: none"> ▪ Commonly occurs with depression or other psychiatric illness ▪ Most afflicted individuals are obese

- **Psychological Aspects of Anorexia**
 - Anorexics gain sense of control by denying selves food
 - Likely psychological characteristics include:
 - Low self-esteem
 - Perfectionism
 - Depression
- **Treatment**
 - Psychological counseling
 - Nutritional counseling
 - Group or individual therapy
 - Inpatient care (if life-threatening problems develop)
- **Causes**
 - Genetic
 - Social
 - Psychological
- **Altered Chemical Messengers**
 - Altered levels of serotonin (chemical associated with obsessive behavior and mood)
 - Norepinephrine levels reduced
 - Cortisol levels elevated
 - Vasopressin (associated with Obsessive/ Compulsive Disorder)

❖ **Sleep**

- **Essential for**
 - Physical and emotional well-being
 - Rest body and restore brain
 - Organize long-term memory
 - Integrate new info
 - Repair and renew tissue, nerve cells, and other biochemicals
 - Sort out past, present, and future activities and feelings

REM vs. Non-REM Sleep

REM sleep	Non-REM sleep
Rapid eye movement	Slow, rolling eye movements
Eyes move together	Eyes move independently
Brain is very active	Brain is less active than REM (at least as active as when awake)
Most of body is paralyzed	Body is not paralyzed
Vivid dreams	

Biological Clock & Circadian Rhythms

- Controlled by the **suprachiasmatic nucleus (SCN)** located in the hypothalamus
- Hardwired to the optic nerve
- If you suffer from jet lag, get out into the light to reset your body's internal clock.
- Makes sure certain things happen at the same time every day
- Reason it is difficult to stay up all night
- Reason for sleepiness at 2-3 pm
- CR → Clock dependent alerting = "forbidden zone" for sleep
- Wake up signals sent by brain
- Increases level of awareness
- Reason why you wake up in the morning even w/o enough sleep

Cortisol = wake up!	Melatonin (<i>Dracula hormone</i>) = sleep!
Secreted by adrenal glands (kidney)	Secreted by pineal gland (SCN activated)
Peaks as sun rises; tapers as sun sets	Causes sleepiness
Gives energy to begin the day	Secreted @ different times for different age groups (teens @ 12-1am; parents @ 9 pm)

Issues with Sleep Deprivation

Sleep Need:	the amount of sleep necessary to function properly and maintain health
Sleep Debt	When sleep need is not met, it MUST BE PAID BACK . Napping is an effective coping tool to reduce sleep need.

Effects of sleep debt

Day time drowsiness	Large sleep debt Last step before falling asleep → car accidents Comparable to drinking alcohol 18 hrs sustained wakefulness = 0.05 BAC 24 hrs sustained wakefulness = 0.10 BAC 4 hrs / 6 nights = more impaired than a drunk driver
Impaired performance	Lack of concentration and alertness
Impaired mood	Irritable
Impaired immunity	Susceptible to sickness
Lots of money!!	Billions in health care/yr (Accidents) 100,000 crashes/yr 71,000 injuries/yr >50,000 fatalities/year \$70 billion in lost productivity (don't work well when sleepy)

Data during sleep

Electroencephalography (EEG)	Measures electrical changes in the brain, otherwise known as brain waves . Electrodes are placed on scalp and measure small voltages caused by synapses (nerve connections).
Electromyography (EMG)	Measures electrical activity due to active muscles . Electrodes are placed on the skin overlying a muscle, under the chin (undergoes very dramatic changes during diff stages of sleep), or on the lower leg.
Electrooculography (EOG)	Measures eye movement . Electrode is placed on skin near eye, and measures voltage as eye rotates.

Hypnograms: Summarize EEG, EMG, EOG, and shows how sleep is organized into stages. Sleep follows a regular cycle each night and goes through 3 - 6 repeated cycles of NREM and REM sleep.

	Wakefulness	NREM	REM
EEG	Low amp, random, fast wave patterns	High amp, slow waves	Low amp, random, fast wave patterns
EMG	Moderate to high depending on activities	Moderate to low	Virtually absent b/c voluntary muscle activity is inhibited
EOG	Rapid eye moves may be frequent/scarce depending	Absent. Brain activity may be picked up though	Bursts of rapid eye movement, and then no eye movement
Heart rate	Varies depending on activity	Slightly lower than resting HR	Large changes and may rise to HR levels of med - high exercise levels
Blood pressure	Varies with activity and stress	Decreases slightly, less variation	Highly variable and may increase up to 30% over resting, may be due to the diameter of blood vessels decreasing.
Body temperature	Relatively constant	Maintained at a lower temperature	Not regulated, so it will drift toward environmental temp
Respiration	Vary with activity, stress, emotions	Breathing slows; inhalation and exhalation of air decrease in magnitude. Generally regular.	Can be very irregular.

Sleep Disorders

Disorder	Description	Treatment
Insomnia	Perception of inadequate sleep due to difficulty falling asleep, frequently waking up during the night, waking up too early, and feeling unrefreshed. Short term may be caused by emotional / physical discomfort, stress, environment, temperature, jet lag, or medication. Long term may be caused by physical / mental disorders, other sleep disorders.	Behavioral modification (relaxing before sleep), reducing caffeine and alcohol intake, reduce afternoon naps, light therapy.
Narcolepsy	Excessive and overwhelming daytime sleepiness, even after adequate night sleep. Is likely to suddenly become drowsy or fall asleep without warning at inappropriate times and places.	No cure available yet, but medication is available to help reduce some symptoms. Other ways are to take frequent naps and change their lifestyle.
Obstructive Sleep Apnea	Breathing disorder that is potentially life threatening. Characterized by a repeated collapse of the upper airway, so their breathing is cut off, decreasing the amount of available oxygen. May snore loudly, and have gasping, choking or no-breathing episodes during sleep.	Continuous positive airway pressure - wear a medical mask attached to a hose that produces a constant push of air so passages do not collapse
Parasomnias - sleepwalking	Walking or moving about during sleep. Objects may be carried from one place to another without reason. Usually have no memory of the event.	Get enough rest, unwind before bed, maximize safety of sleeping environment
Parasomnias -REM motor behavior disorder	Occurs during REM sleep, and acts out some or all of their dreams. Dreams may be vivid, intense, action packed, and violent.	Medication and a safe sleeping environment
Restless Legs Syndrome	Irresistible urge to move their legs. Experiences creeping, crawling, pulling, or tingling sensations during inactivity or sleeping.	Light cases - exercise, leg massages, no alcohol / caffeine Others- medication

❖ Exercise

Exercise Improves

Cardio respiratory endurance	Ability to deliver oxygen & nutrients & remove wastes
Muscular strength	Ability of muscle to exert force for a period of time
Muscular endurance	Ability of muscle/group of muscles to sustain repeated contractions
Flexibility	Ability to move joints and use muscles through full range of motion

Exercise Benefits

Reduces risks of:	Helps to:
dying prematurely	-control weight
developing diabetes	build and maintain healthy bones, muscles, and joints
developing high blood pressure	promote physiological well-being
reduces feelings of depression and anxiety	improve self image, quality of sleep, ability to cope with stress, and appearance; increase mental acuity & productivity

Exercise causes the release of **endorphins**, which make you feel good. 😊

- Type of neuropeptide
- Natural pain killers released by pituitary gland
- Linked to improve memory/learning
- Brings feelings of pleasure
- Shuts off frontal lobe (inhibits pain)
- Decreases blood pressure, less appetite
- 45 min of exercise, 3x a week is effective as Zoloft

Levels of Activity Intensity

Light (60 mins)	Walking slowly Golf w/ cart Slow swimming
Moderate (30-60 mins)	Walking briskly Doubles tennis Scrubbing floors
Vigorous (20-30 mins)	Bicycling > 10mph Running Swimming laps

Ways to measure activity level

Talk test	If you can sing - light intensity If you can talk - moderate activity If you can't - vigorous activity
Target heart rate (220 - age) * 70%	Pulse Heart rate monitor
Borg rating	Perceived exertion
Metabolic Equivalent Level (MET)	Device on bike / workout equipment