



NTR 306: Fundamentals of Nutrition

Chapters 8+9:
Energy Balance &
Healthy Weight





Defined

- Energy Balance:

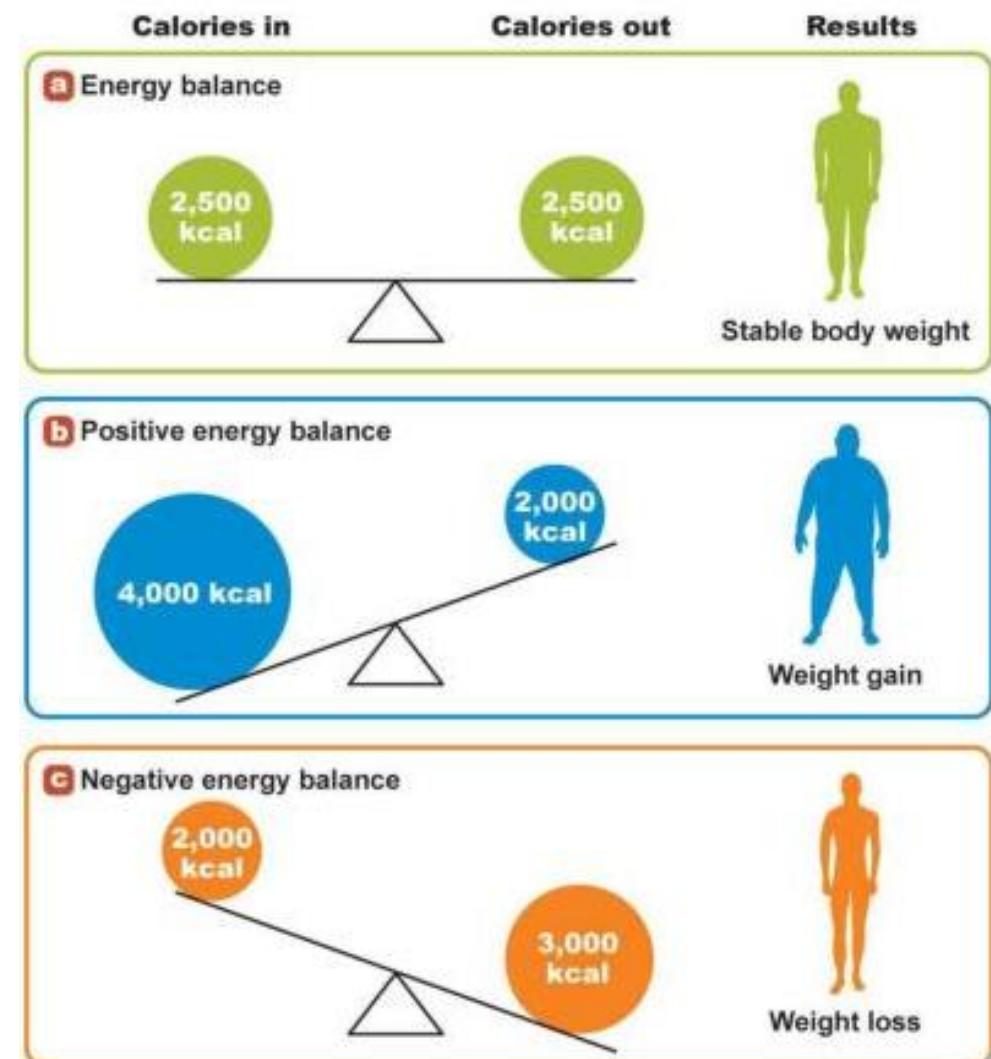
- Energy consumed = energy expended

- Weight Management:

- Result of energy balance
- Behaviors that maintain a healthy body weight

- Over time, energy balance disruption → weight management disruption

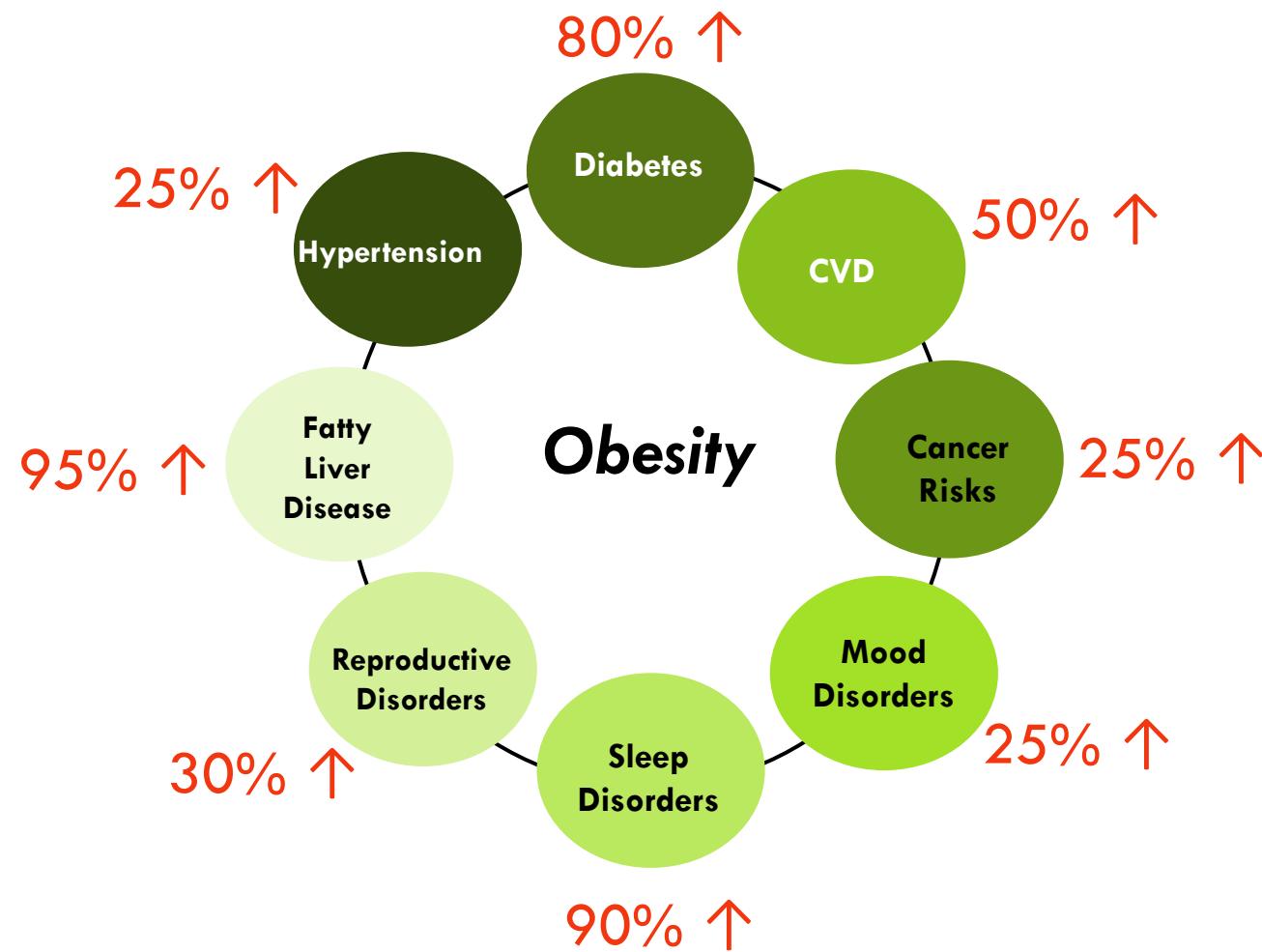
- Weight gain
- Weight loss



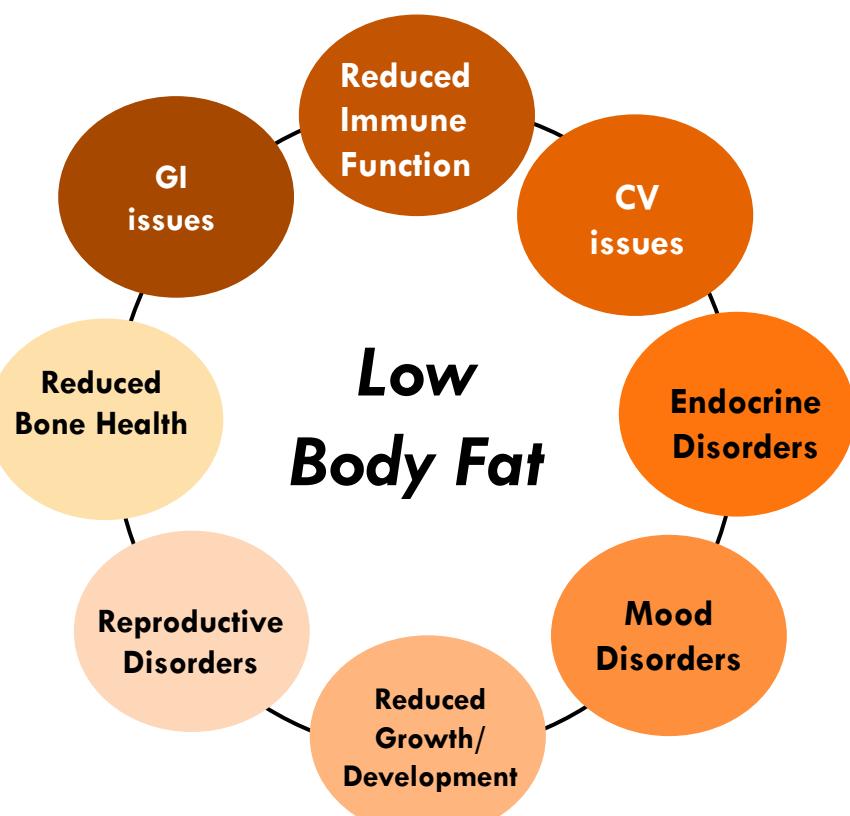


Health Risks Associated with Energy Imbalance

Positive (+) Energy Balance



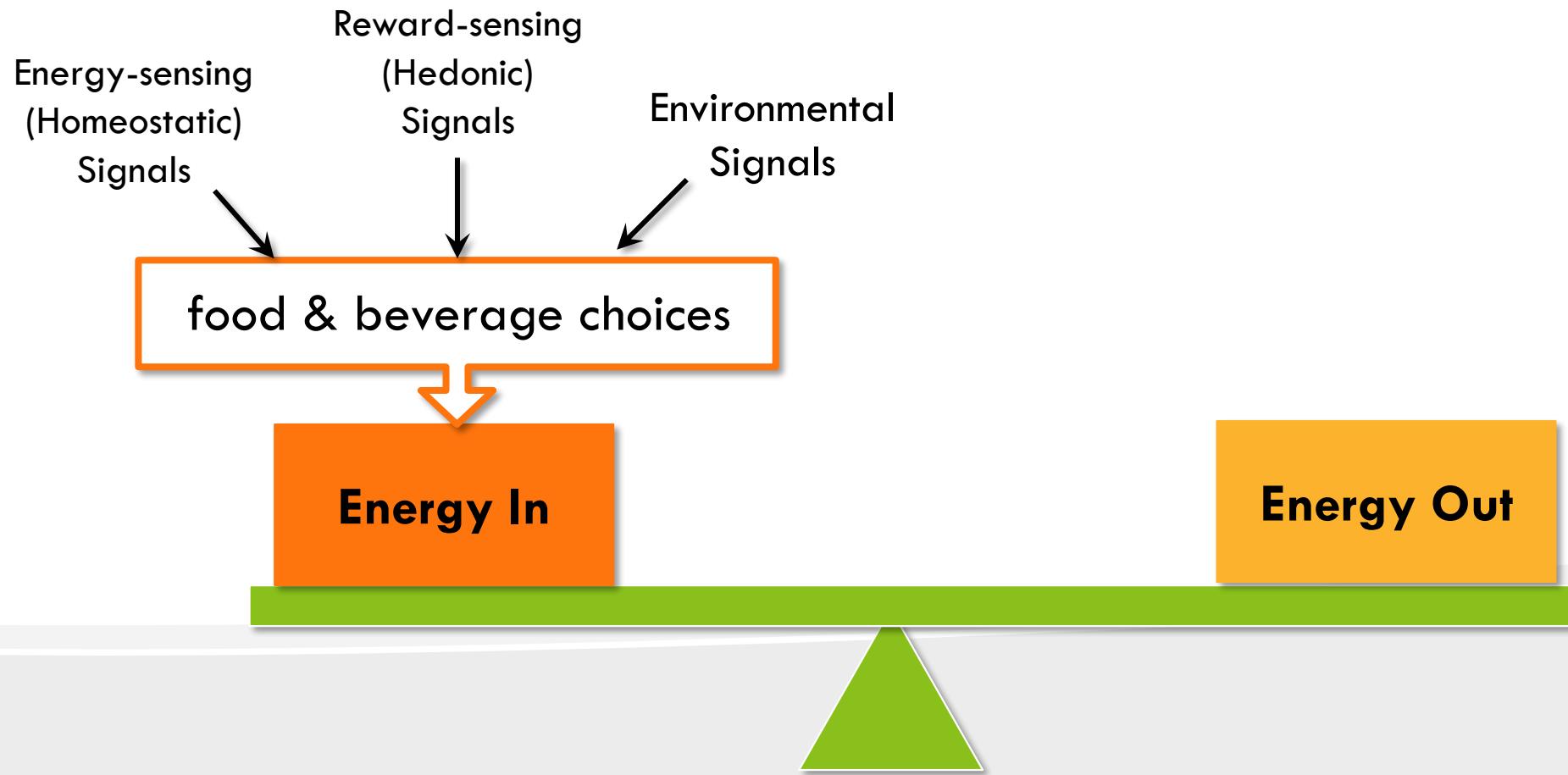
Negative (-) Energy Balance





Components of Energy Balance

- Energy balance: energy in = energy out





Energy In: Food Composition Factors

- Energy density of foods
 - High fat/high sugar foods = higher calories
- Nutrient density of foods
 - Healthy food group categories = lower energy density
- Portion size
 - Larger meals = higher calories
- Food form
 - Beverages = added sugar, less satiety than solid foods



InstaPoll

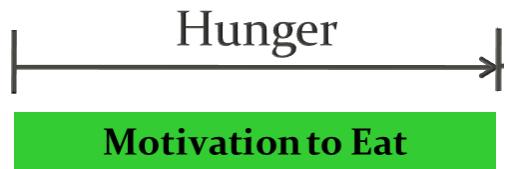
What is the main reason why adhering to a 'diet' is so difficult?

- 1.) Feel hungry all the time
- 2.) Never full/satisfied
- 3.) Crave all the foods you can't have
- 4.) No energy/feel tired all the time
- 5.) Can't concentrate





Energy In: Homeostatic Signals



Homeostatic Hunger (energy-sensing)



- Physical sensations reflecting the urge to eat
- Characteristics: light-headedness, weakness, jittery, stomach emptiness/growling, agitation
- Determines when to eat, impacts how much to eat



Energy In: Homeostatic Signals



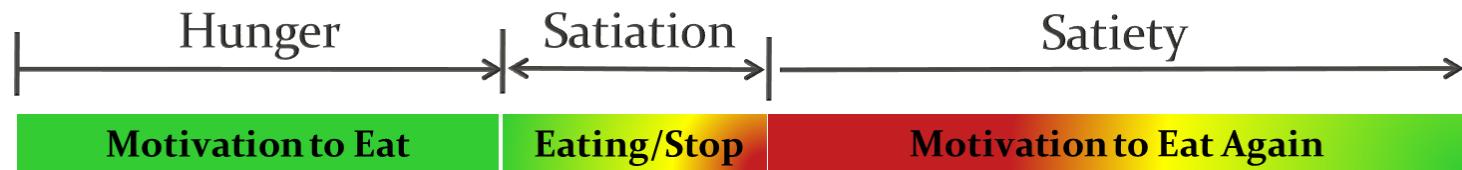
Homeostatic Satiation (energy sensing)



- Physical sensations reflecting the urge to stop eating
- Characteristics: stomach expansion/fullness
- Reduced hunger and increased fullness as a result of eating/drinking (positive energy balance)



Energy In: Homeostatic Signals

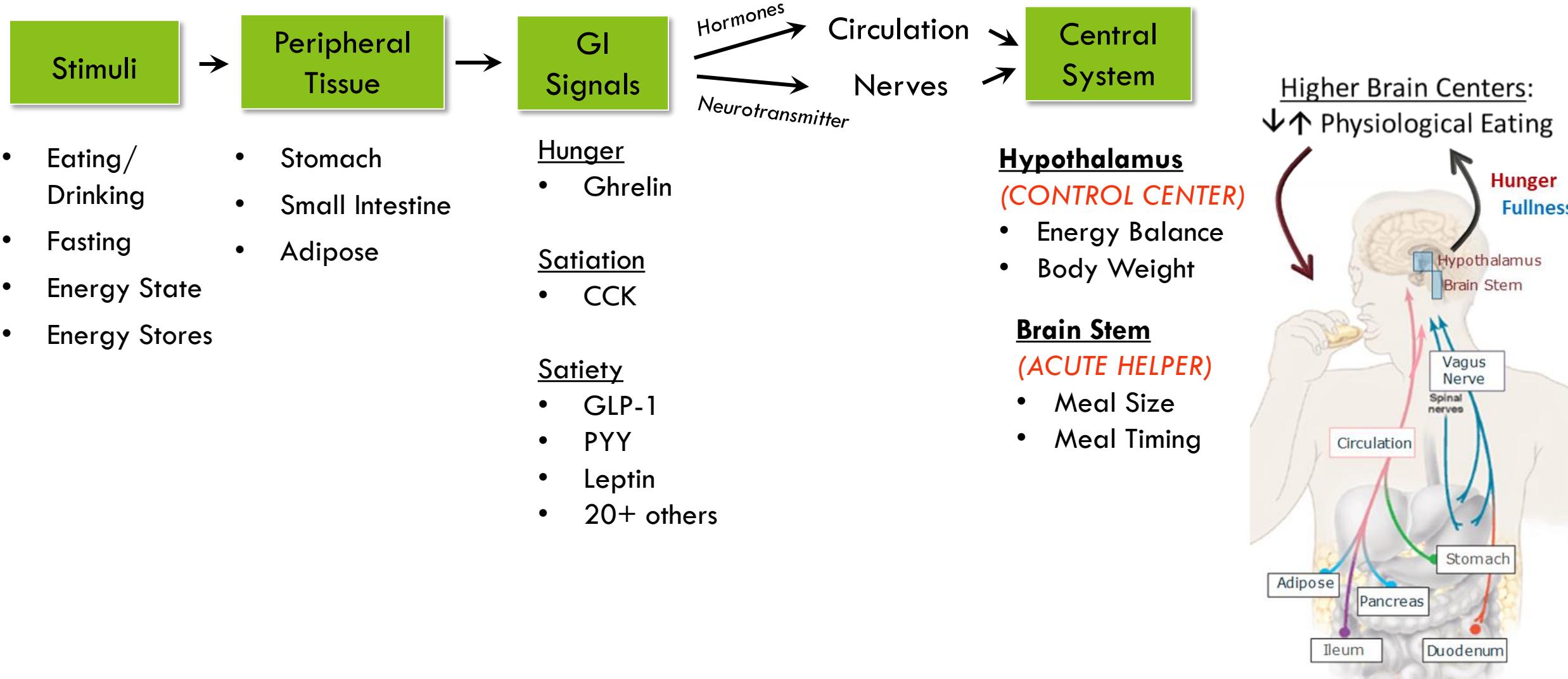


Homeostatic Satiety (energy-sensing)



- Physical sensations reflecting the urge to not eat (again)
- Characteristics: stomach expansion/fullness
- Reduced hunger and increased fullness as a result of previously eating/drinking (i.e., positive energy balance)

Energy In: Homeostatic Signals





Energy In: Hedonic Signals



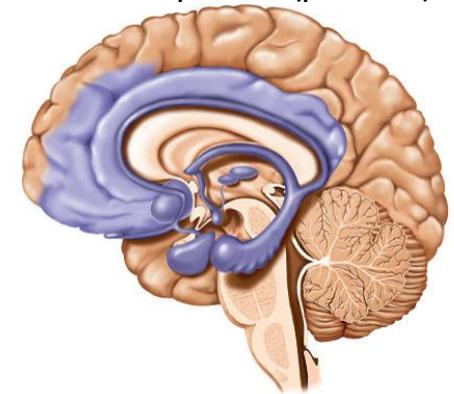
Hedonic Cravings
(reward-sensing)



- Physical sensations reflecting the urge to eat
- Characteristics: thinking about/craving specific foods
- Cravings originate in the cortico-limbic brain regions associated with reward

Cortico-limbic Regions:

Reward areas (purple)
Release dopamine (pleasure)





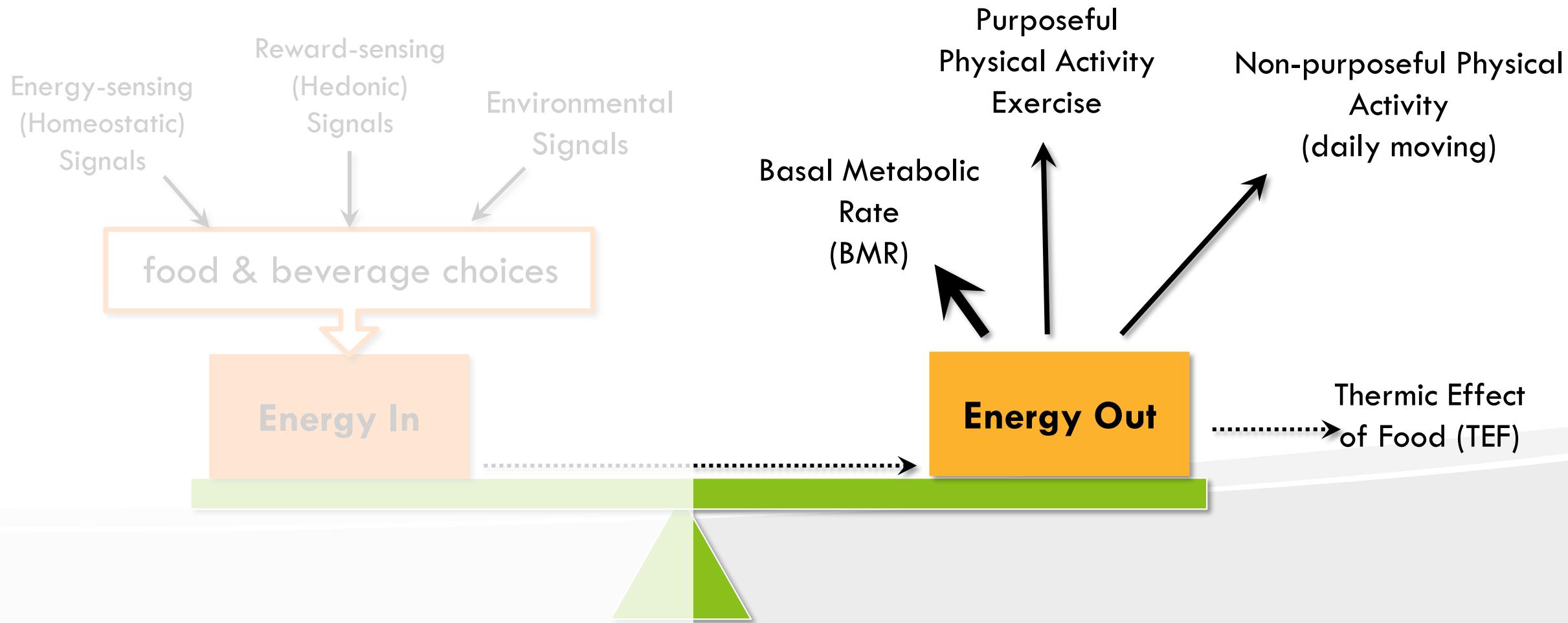
Energy In: Environmental Factors

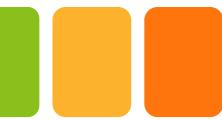
- External cues override our homeostatic satiety signals → stimulate hedonic eating



Energy Out (Energy Expenditure)

- Energy balance: energy in = energy out





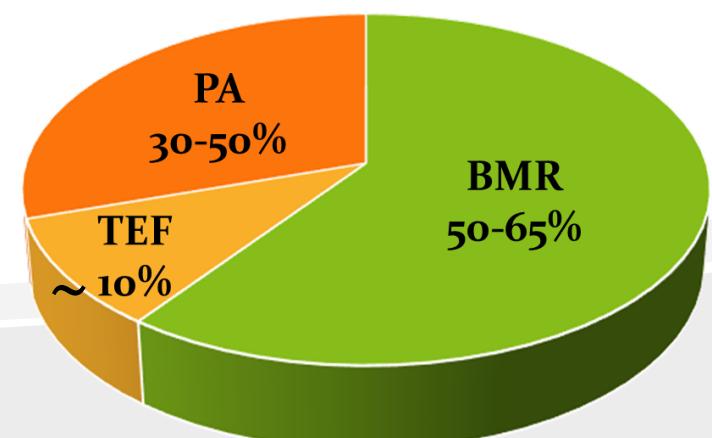
Energy Out: Thermogenesis

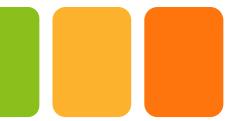
- Heat released:

- When body breaks down energy nutrients
- When energy is used to fuel body's work

- Types of energy expended:

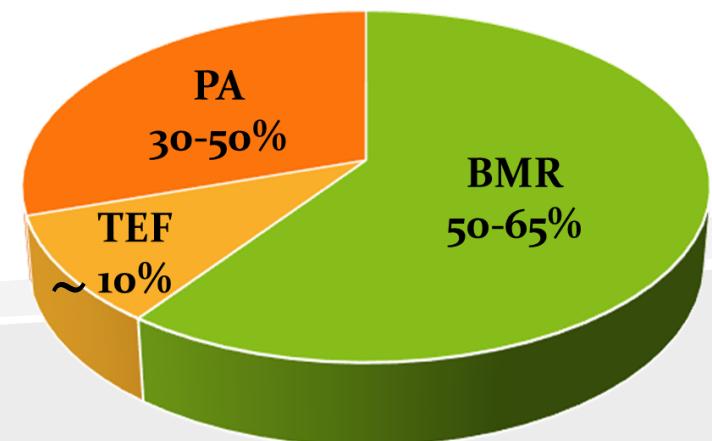
- Basal metabolic Rate (BMR)
- Purposeful & Non-purposeful Physical activity (PA)
- Thermic Effect of Feeding (TEF)

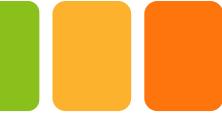




Energy Out: Basal Metabolic Rate (BMR)

- BMR: Minimum energy required to fuel basic life processes like:
 - Breathing, making red blood cells, heart beating, etc.
- BMR Ranges: Men: 1400-2230 kcals/day ; Women: 1240 – 1570 kcals/day
- Factors that Influence BMR:
 - ↓ with aging
 - ↑ growth (in children, adolescents, pregnant women)
 - ↑ lean mass (muscle)
 - ↑ fevers (infections) & stress
 - ↓ with malnutrition (insufficient intake or body fat)
 - ↑ chemicals (nicotine & caffeine)





Energy Out: BMR

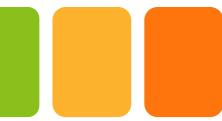
○ Estimating your BMR:

- Weight in kilograms (kg) = Weight in pounds / 2.2
- Height in centimeters (cm) = Height in inches x 2.54



Men: $(10 \times \text{weight in kg}) + (6.25 \times \text{height in cm}) - (5 \times \text{age}) + 5 = \text{BMR (kcal/d)}$

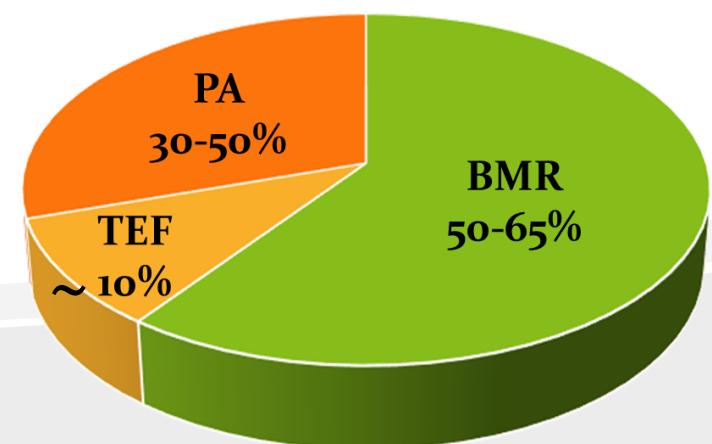
Women: $(10 \times \text{weight in kg}) + (6.25 \times \text{height in cm}) - (5 \times \text{age}) - 161 = \text{BMR (kcal/d)}$

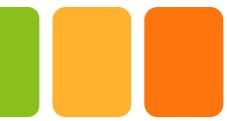


Energy Out: Physical Activity (PA)

- PA: Voluntary movement of skeletal muscles

- Most variable component of energy expenditure
 - ✓ Purposeful PA = exercise (e.g. running, basketball, walking, etc.)
 - ✓ Non-purposeful PA = moving (e.g. fidgeting, general movement)
- Amount of energy needed for PA depends on:
 - ✓ Muscle mass and total body weight: larger, more muscle requires more energy
 - ✓ Activity: duration, frequency and intensity

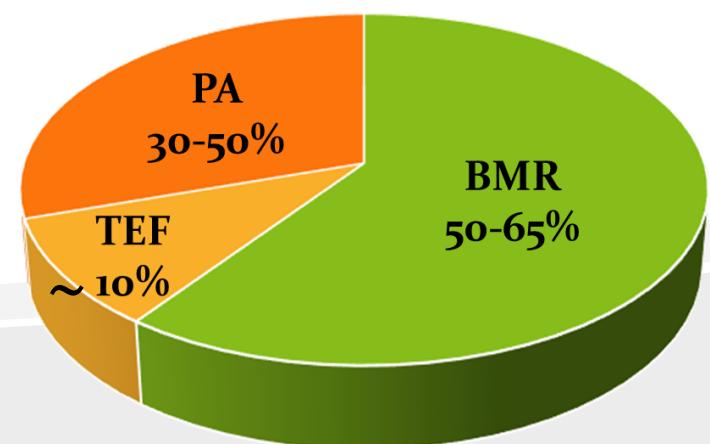




Energy Out: Thermic Effect of Food (TEF)

- TEF: Energy used in digestion and absorption

- GI tract functioning accelerates in response to eating
- Varies by macronutrient, meal size & meal frequency
 - ✓ Greater for high-protein foods than for high-fat or high-carbohydrate foods
 - ✓ Greater for meals eaten quickly than over a few hours
- Not very reliable (difficult to accurately measure)





Estimated Energy Requirements (EER)

- BMR + TEF + PA = EER = energy required for weight stability = energy intake
 - Use formulas below or this calculator: <https://goodcalculators.com/estimated-energy-requirement-eer-calculator/>
 - PA needs estimated from PA Factor (in table below):

PA Factors	Men	Women	Physical Activity
Sedentary	1.0	1.0	Typical daily living activities
Low Active	1.11	1.12	+ 30-60 min moderate activity
Active	1.25	1.27	+ ≥ 60 min moderate activity
Very Active	1.48	1.45	+ ≥ 60 min moderate activity + 60 min vigorous or + 120 min moderate activity

Men: $[662 - (9.53 \times \text{age})] + \text{PA} \times [(15.91 \times \text{weight in kg}) + (539.6 \times \text{height in m})]$ = kcal/d

Women: $[354 - (6.91 \times \text{age})] + \text{PA} \times [(9.36 \times \text{weight in kg}) + (726 \times \text{height in m})]$ = kcal/d



Weight Management: Defining a Healthy Weight

- Healthy weight is **NOT:**

- Appearance based
 - ✓ Perceived body image ≠ actual body size OR actual body health
 - ✓ Societal pressure → dissatisfaction with body image → damaging behaviors
- Based on a societal numbers (weight, clothing size, bicep measure, etc.)





Weight Management: Defining a Healthy Weight

- Healthy weight **IS:**

- Body size that increases health, wellness, and longevity
- Based on measures that predict health/chronic diseases:
 - ✓ Body Mass Index (BMI)
 - ✓ Waist Circumference (abdominal obesity)
 - ✓ % Body Fat (visceral fat)
- Healthy rate of weight loss: 1 – 1 ½ lbs/week
 - ✓ -500 – -750 kcals/day (lower than EER)





Clinical Markers: BMI

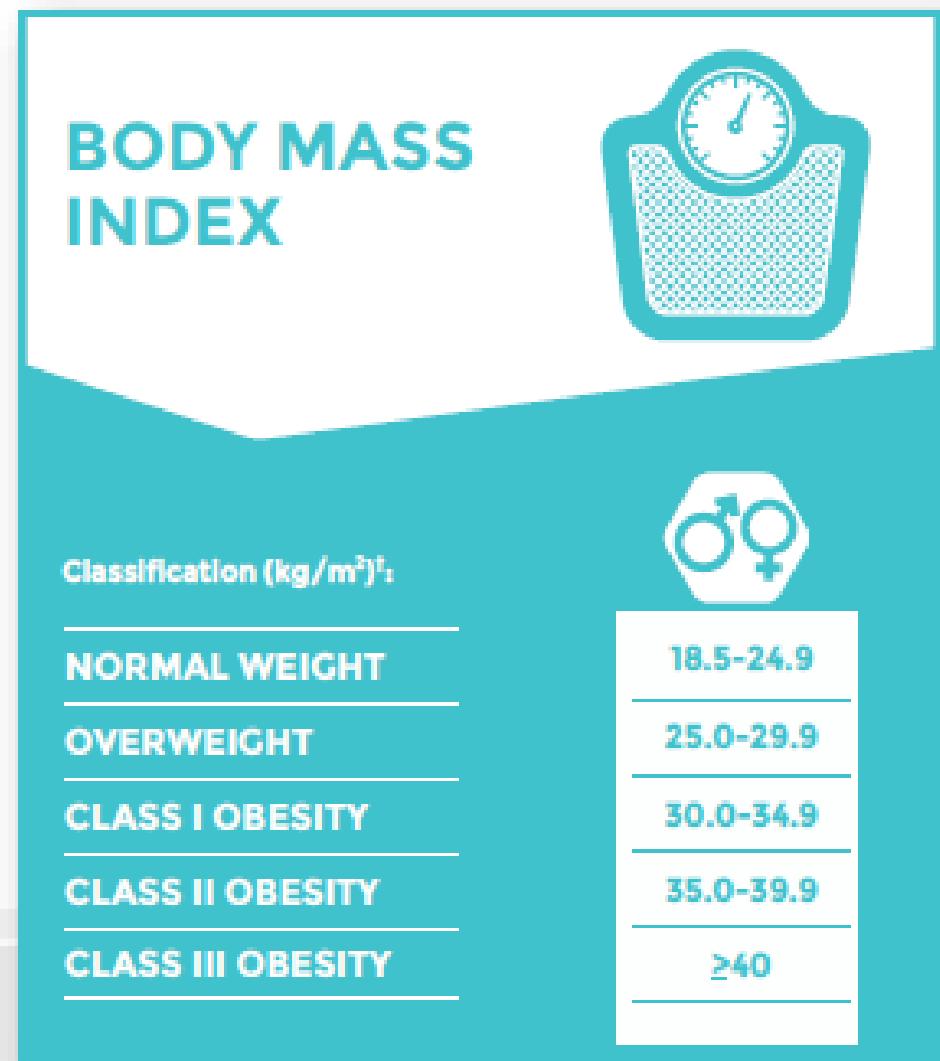
○ Body Mass Index (BMI)

- Relative weight for height

✓
$$\text{BMI} = \frac{\text{weight (kg)}}{\text{height (m)}^2}$$

✓
$$\text{BMI} = \frac{\text{weight (lb)}}{\text{height (in)}^2} \times 703$$

- Good screening tool for disease risk
- Not a measure of body composition
- Problematic for muscular bodies





Clinical Markers: BMI

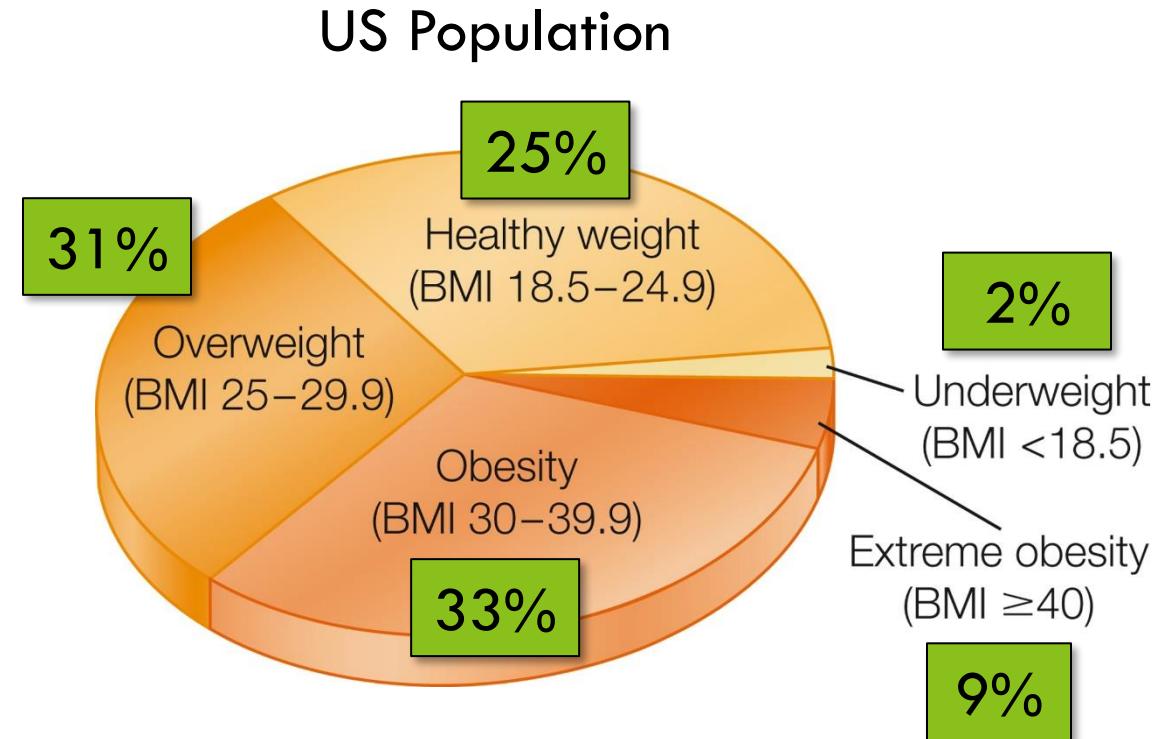
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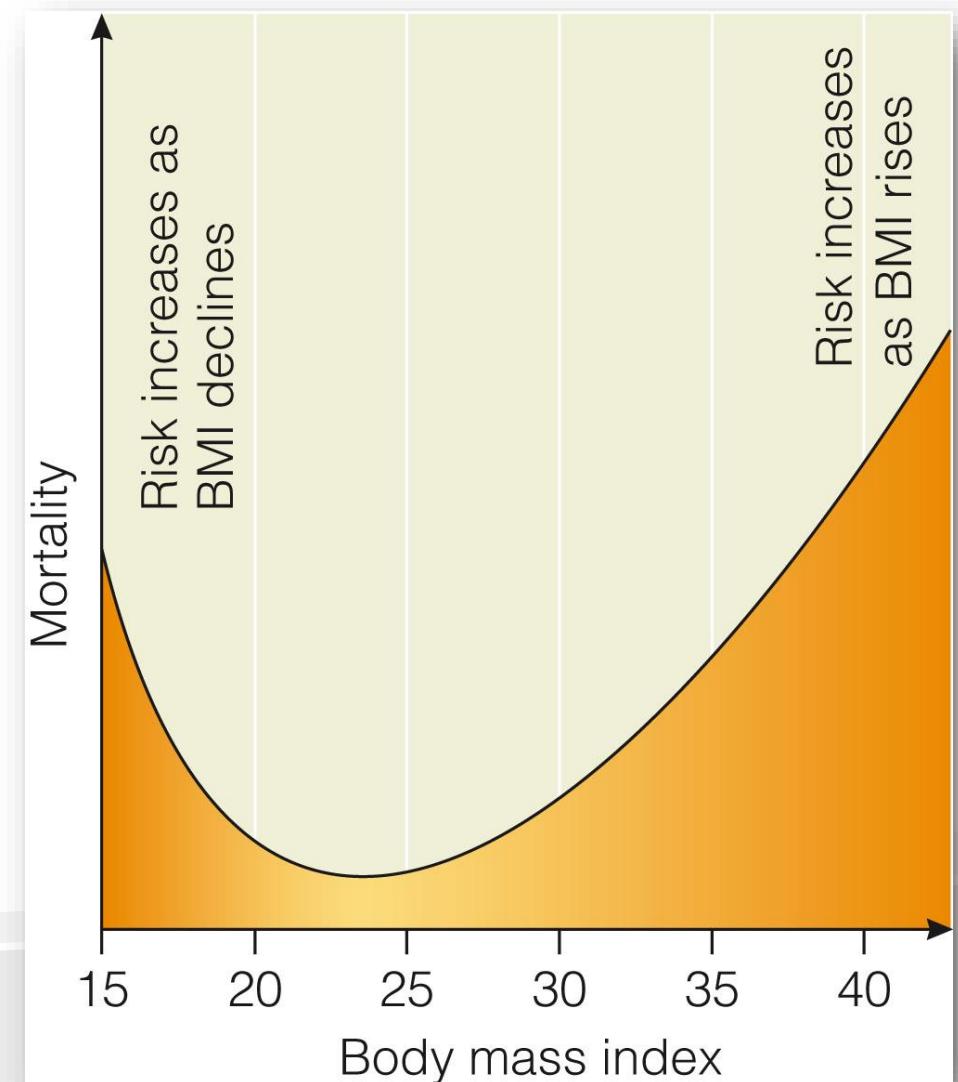
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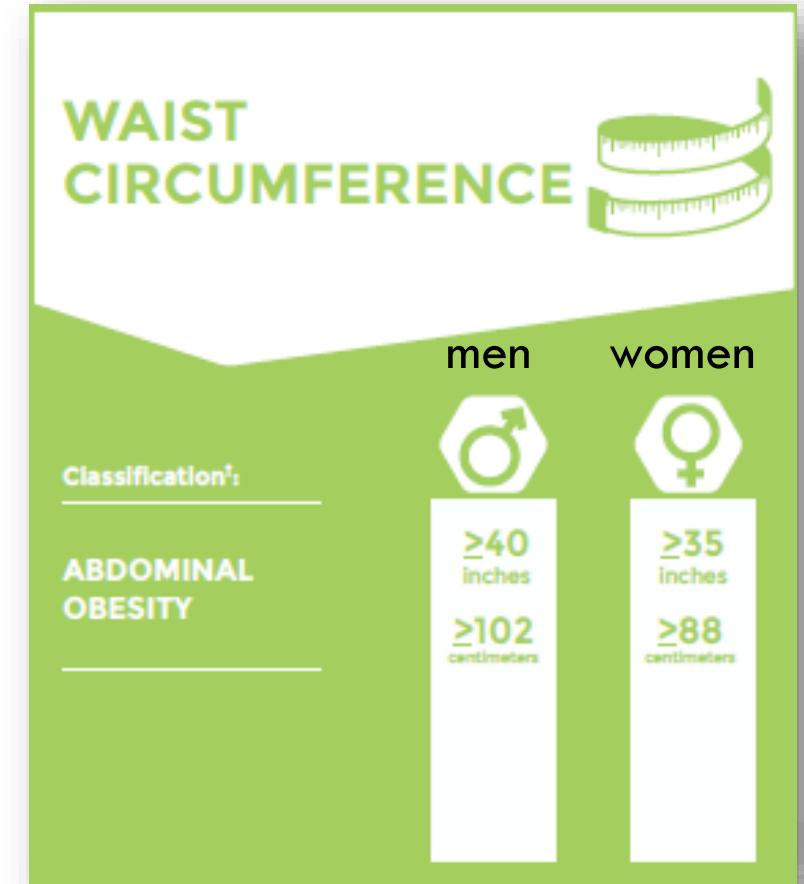
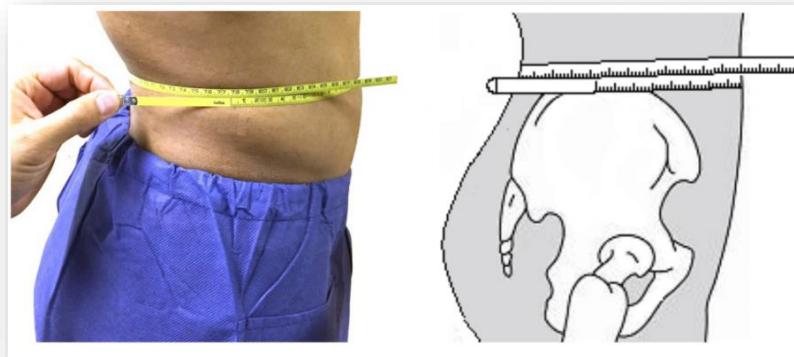




Clinical Markers: Waist Circumference

- **Waist Circumference (WC)**

- Strong predictor of disease risk
- Based on fat in abdominal area
- *Doesn't differentiate fat type or specific location*



Most Accurate Measure: Visceral Fat

○ 2 Main Types of Fat

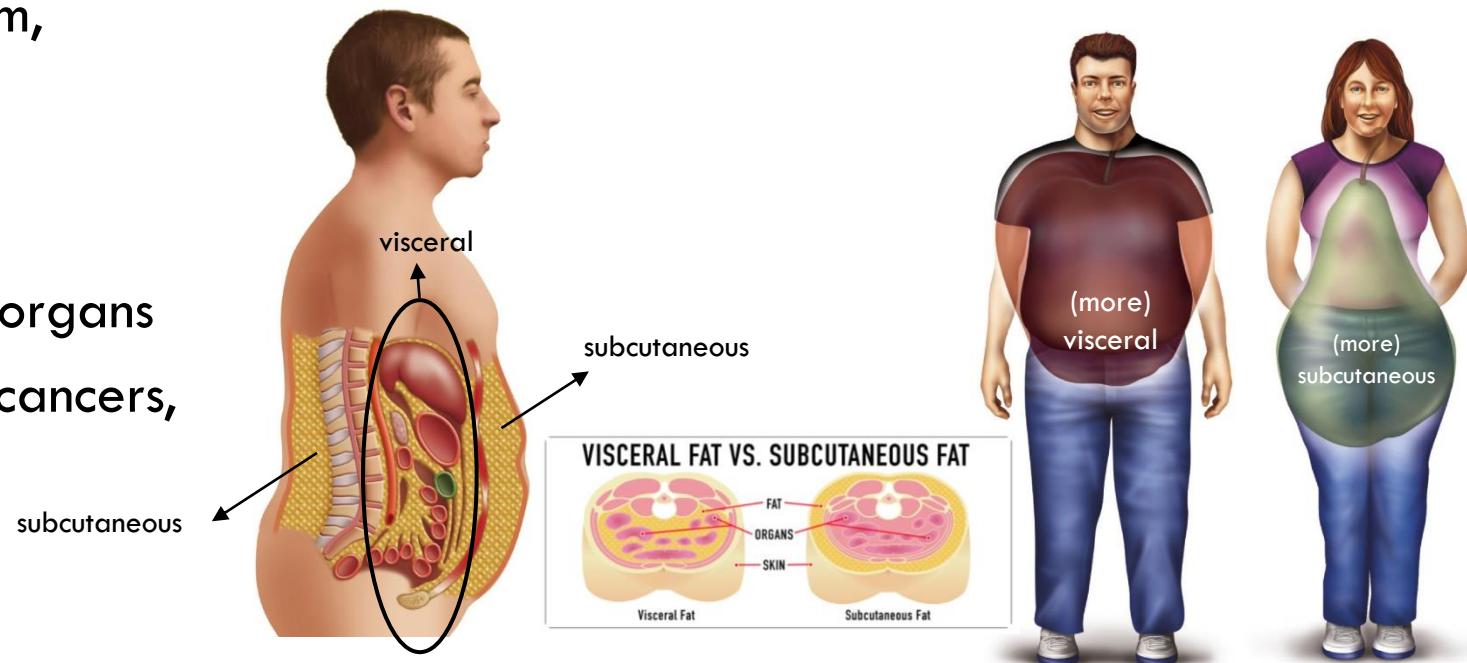
- Subcutaneous fat

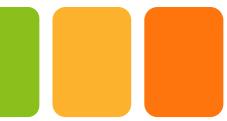
- ✓ Stored under skin
- ✓ No disease associations
- ✓ Contributes to fuel/metabolism, protection, insulation

- Visceral fat

- ✓ Stored in/around abdominal organs
- ✓ Contributes to heart disease, cancers, diabetes, and related deaths

Fat Storage Location	Small Quantities	Large Quantities
Subcutaneous Fat <i>(just under-skin)</i>	PROTECTIVE	NO RISKS
Visceral Fat <i>(internal abdominal organs)</i>	SOME RISK	HIGH RISK



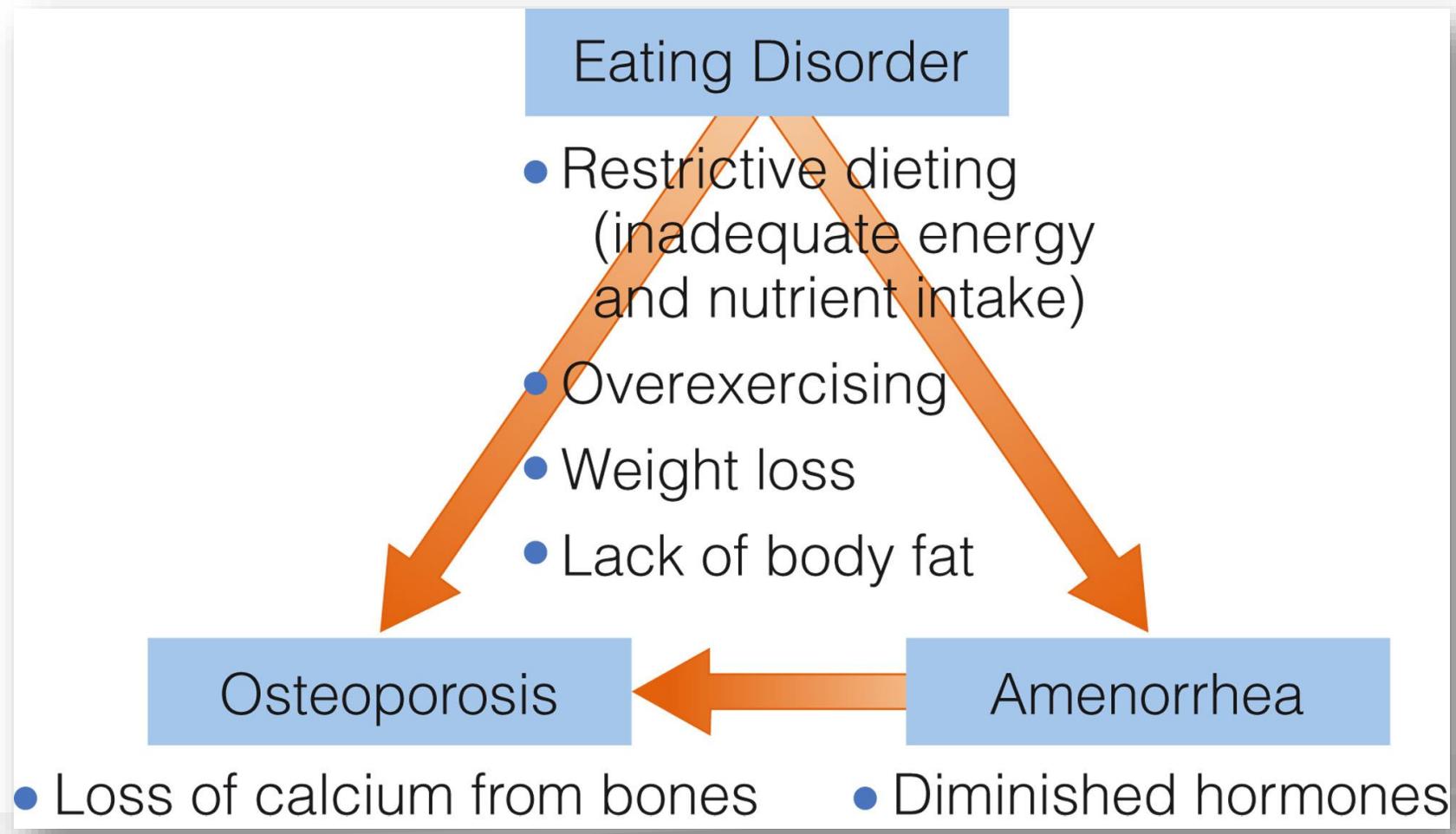


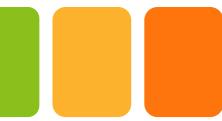
Eating Disorders

- Three disorders:
 - Anorexia nervosa
 - 0.9% women; 0.3% men
 - Bulimia nervosa
 - 0.5% women; 0.1% men
 - Binge eating disorder
 - 3.5% women; 2% men
- Causes
 - Sociocultural, psychological, neurochemical
- Athletes and dancers especially



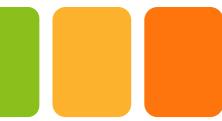
Female Athlete Triad





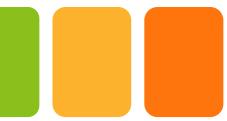
Other Dangerous Practices of Athletes

- Muscle dysmorphia
 - Behaviors: excessively high-protein diets; overuse of dietary supplements; prolonged weight training; steroid abuse
 - Distorted body image and weight obsession
- Orthorexia nervosa
 - Extreme efforts to improve health
 - Behaviors: restrictive diets; ritualized eating patterns; rigid food avoidance; obsessive exercise
- Food deprivation and dehydration practices
 - Impair physical performance
 - Reduce muscle strength
 - Decrease anaerobic power
 - Reduce endurance capacity



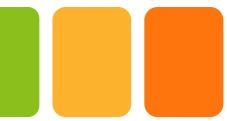
Anorexia Nervosa

- Distorted body image: overestimates personal fatness
 - Central to diagnosis (cannot be self-diagnosed)
 - Denial = high
 - Need for self-control
- Malnutrition
 - Body depleted of fat and lean protein
 - Impacts brain function and judgment
 - Lethargy, confusion, delirium, insomnia
 - BMR slows, organs can fail (heart = weak and thin)
 - Growth ceases, normal development falters
 - Amenorrhea, infertility, low-birthweight babies



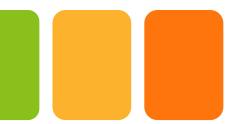
Anorexia Nervosa

- Treatment: multidisciplinary approach
 - Food and body weight issues
 - Relationship issues (with self and others)
- After treatment
 - Energy intakes and eating behaviors may not return to normal
 - ~Half of women can maintain 85% or more of healthy body weight
 - Other half have poor or fair outcomes, relapse, fatality
- Highest premature mortality rate among psychiatric disorders
 - Cardiac complications, suicide



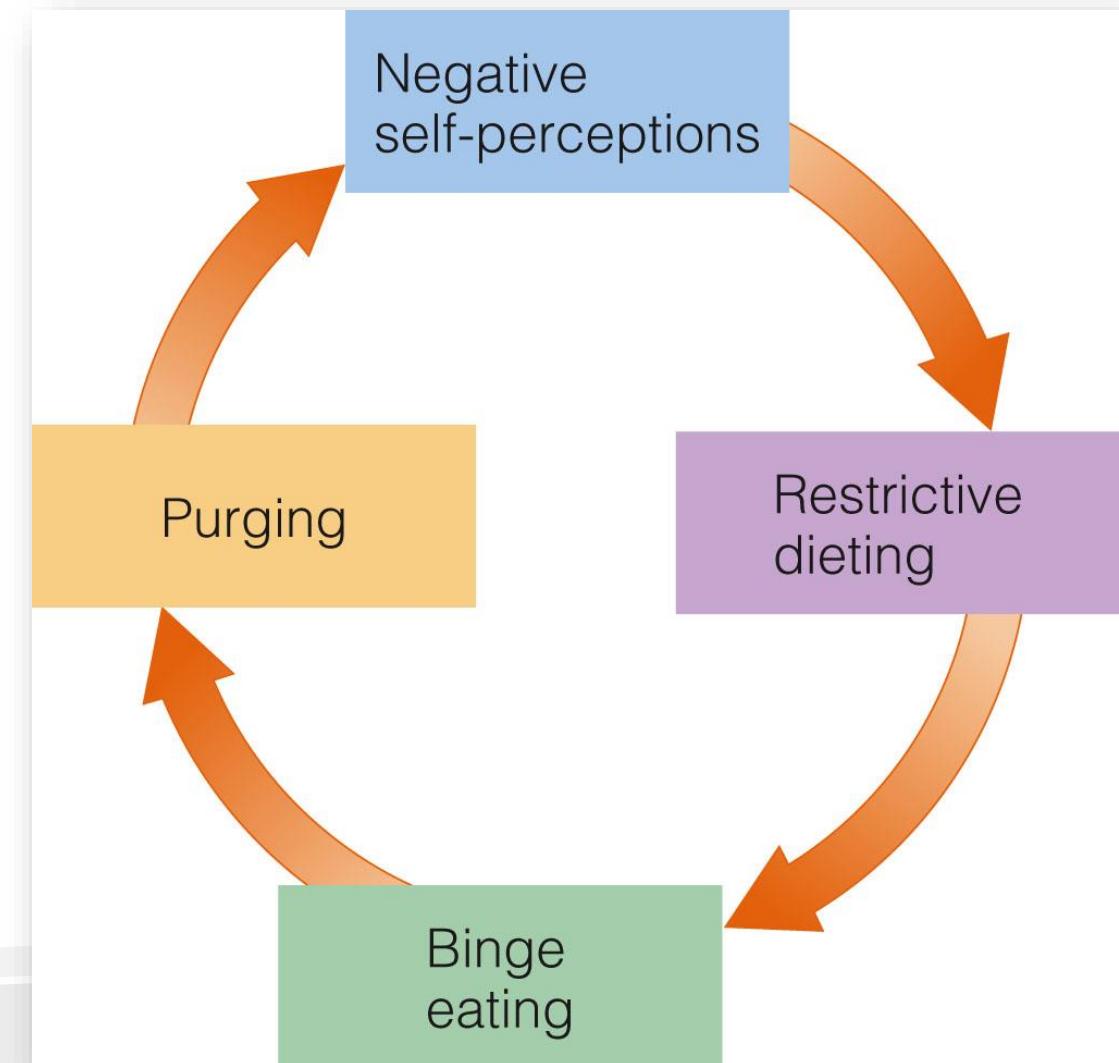
Bulimia Nervosa

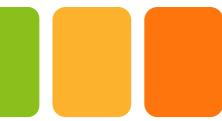
- True incidence is difficult to establish
 - Secretive nature
 - Not as physically apparent
- Common background characteristics:
 - Single, female, white, preference to weigh less than naturally maintained body weight
 - Depression, impulsive tendencies, low self-esteem



Bulimia Nervosa

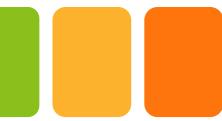
- Binge-purge cycle
 - Lack of control
 - Binge
 - Consume food for emotional comfort
 - Cannot stop: lasts for an hour or more
 - Done in secret: typically at night
 - Purge
 - Feelings of shame and guilt
 - Cathartic: strong laxative
 - Emetic: induces vomiting





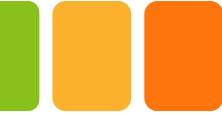
Bulimia Nervosa

- Physical consequences of binge-purge cycle
 - Subclinical malnutrition
 - Compromised immune system; fluid/mineral imbalances can cause abnormal heart rhythms and kidney damage; urinary tract infections
 - Physical effects
 - Irritation/infection of pharynx, esophagus, salivary glands; tooth erosion; red eyes; calloused hands
- Feelings of shame and low self-worth
 - Clinical depression and substance abuse are common



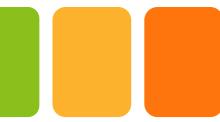
Bulimia Nervosa

- Treatment
 - Discontinuing purging and restrictive diet habits
 - Learn to eat three meals a day, plus snacks
 - Treatment team including mental health professional
- Overlap between anorexia nervosa and bulimia nervosa
 - Overly concerned with body image
 - Tendency to drastically under-eat
 - Perceive food as “forbidden” and “give in” to an eating binge
 - Treatment is challenging and relapses are common
 - One person may have both conditions



Binge-Eating Disorder

- Periodic binging without purging
- Contrast with bulimia nervosa
 - Consume less during binge; rarely purge; less restraint when dieting
- Compare with bulimia nervosa
 - Feeling out of control; disgusted, depressed, embarrassed, guilty, or distressed because of self-perceived gluttony
- Similar characteristics to substance-abuse disorders:
 - strong cravings; poor self-control; diminished sensitivity to pleasure; compulsive behaviors
- Behavioral disorder responsive to treatment



Eating Disorders in Society

- Society plays central role in eating disorders
 - Primarily in developed nations
 - More prevalent as wealth increases in developing nations
 - Food is plentiful
 - Globalization spreads fashion and beauty ideals
- Body dissatisfaction due to social pressures
- Characteristics of disordered eating
 - Restrained eating, fasting, binge eating, purging, fear of fatness, distortion of body image: common among children and adolescents





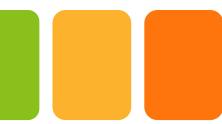
How to Get Help

- UT Nutrition Services (University Health Services):

<https://www.healthyhorns.utexas.edu/dietitian.html>

- Student Emergency Services:

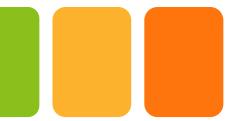
<https://deanofstudents.utexas.edu/emergency/>



Fad Diets

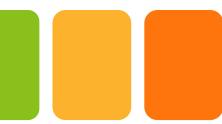
- Outrageous claims
 - Not safe or effective long-term
 - Unsubstantiated: no requirements to prove the claims
 - Do not have to support with credible research
 - Distorted tidbits of research

Keto South Beach
Atkins
Paleo Whole 30
Intermittent Fasting
Raw Food Zone
Master Cleanse



Fad Diet Appeal

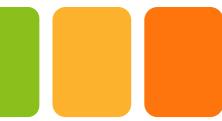
- Large market for weight-loss products
 - \$60 billion/year spent by Americans
- Greatest appeal: tend to ignore dietary recommendations
- Sophisticated and erroneous explanations of metabolic consequences of eating certain foods
- Tend to work for short time
 - Fail to produce long-lasting results



Don't Count Calories

- Claim to disregard kcalories
 - Designed to have low energy intake
 - Tend to lack variety: inadequate nutrient intakes
 - Often recommend dietary supplement
- Follow a plan (no thinking required)
- Most fad diets cannot support optimal health over long-term





The Real Deal

- Fad diet “magic” is simple! Energy out > energy in
- Healthy, sustainable weight loss:
 - Long-term lifestyle changes in eating and activity patterns
 - Healthy dietary pattern with flexibility and variety