145 Are You Hungry or Stressed? (L)

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In a Simple World...

- Hunger
- Energy Expenditure/Nutrient Depletion
- Adequate Nutrient Intake
In the Real World...

Why We Eat

- Emotional Triggers, Including Stress
- Social Environment (Holidays, Office Birthdays, etc)
- Learned Habits (It’s noon – chow time!)
- Neurotransmitters
- Hormones

Why We Eat

education, genetics, availability, psychology, culture, convenience, race, peer influence, eating disorders, family, social circle, friends, life stage, PMs, life transitions, independence, life course, life status, proscriptive behavior on health conditions, religion, personal beliefs, theory of reasoned action, health belief model, social cognitive theory, transtheoretical model, health lifestyle clusters, food choice conceptual model, generations, education, genetics, availability, psychology, society, culture, cost, income, age, sex, geographic location, convenience, race, peer influences, eating disorders, family, social circle, friends, life stage, PMs, life transitions, independence, life course, life status, proscriptive behavior on health conditions, religion, personal beliefs, theory of reasoned action, health belief model, social cognitive theory, transtheoretical model, health lifestyle clusters, food choice conceptual model, generations, education, genetics, availability, psychology, culture, convenience, race, peer influence, eating disorders, family, social circle, friends, life stage, PMs, life transitions, independence, life course, life status, proscriptive behavior on health conditions, religion, personal beliefs, theory of reasoned action, health belief model, social cognitive theory, transtheoretical model, health lifestyle clusters, food choices
After this session, participants will be able to:

- Appreciate the complexity of factors that influence food intake
- Name at least one physiologic factor involved in appetite stimulation
- Describe stress as one factor in food intake behavior
- List at least one healthful strategy for relieving stress
Hypothalamus-Centric & Reward-Center-based

PHYSIOLOGIC HUNGER CUES
Appetite & Weight Regulation

- Basic mechanisms of appetite and body weight regulation
  - The Gut & its peptides
  - Endocrine hormones
  - The Brain & its neurotransmitters
  - The Liver & its metabolic processes
- What’s for dinner? Not so simple…
The Gut & Its Peptides

- **Spoiler Alert!**
  - Think you can trust your stomach to let you know when you’re hungry? Think again.
  - Early theory said that the stomach was the center of feeding control, but no longer considered

- **Several gut peptides, however, help to let you know when to stop**
  - **Cholecystokinin (CCK)**
    - Brain-gut peptide
    - Known to reduce meal size
    - CCK receptor antagonists increase feeding
    - No CCK-a receptors (in rats) they become obese

The Gut and Its Peptides

- **Bombesin**
  - shown to reduce food intake
  - some evidence that it decreases meal size and lengthens intermeal interval -- (Stuckey JA, Gibbs J, Smith GP. Neural disconnection of gut from brain blocks bombesin-induced satiety. Peptides. 1985;6:1249)

- **Glucagon**
  - pancreatic peptide, reduces short-term food intake

- **Ghrelin…**
Ghrelin

Gut secretes peptide hormone called Ghrelin

Given by IV to healthy volunteers during an MRI

Increased brain activity in reward centers of amygdala, orbitofrontal cortex, anterior insula, and striatum

Increased intake

It’s Dinner Time…Feeding Behavior

- Feeding behavior is often separated into homeostatic and hedonic components
  - Hedonic feeding, which can be triggered by visual or olfactory food cues, involves brain regions that play a role in reward and motivation
  - Homeostatic feeding is thought to be under the control of circulating hormones acting primarily on the hypothalamus
- Ghrelin is a peptide hormone secreted by the gut that causes hunger and food consumption
  - Ghrelin administered intravenously to healthy volunteers during functional magnetic resonance imaging increased the neural response to food pictures in regions of the brain implicated in encoding the incentive value of food cues
  - The effects of ghrelin on the amygdala and OFC response were correlated with self-rated hunger ratings
  - This demonstrates that metabolic signals such as ghrelin may favor food consumption by enhancing the hedonic and incentive responses to food-related cues.
Endocrine Hormones

- Insulin in the brain
  - Downregulates Neuropeptide Y (suppressing appetite)
  - Enhances CCK (improving satiety)

- Glucocorticoid hormones
  - Increases feeding
  - Enhances body fat accumulation
The Brain & Its Neurotransmitters

- Early Theory: Dual Center Theory
  - Lateral hypothalamus (LH), or feeding center, receives signals of nutrient depletion, then triggers initiation of eating.
  - Ventromedial hypothalamus (VMH), or satiety center, is stimulated during feeding, and then inhibits eating.
  - VMH is near the brain’s vascular bed and cerebrospinal fluid and can monitor rising nutrient levels.
- Evidence: Destroy VMH = hyperphagia & obesity; destroy LH, hypophagia, weight loss

The Brain & Its Neurotransmitters

- Early Theory: Glucostatic Hypothesis
  - Rate of glucose utilization signals when to start and stop eating
  - Insulin-sensitive glucoreceptors can communicate with VMH, in direct correlation to peripheral metabolic events
  - Accurate feedback control by VMH is therefore possible

Updated Theory

- Multiple, integrated factors stimulate-inhibit appetite
  - Paraventricular Nucleus (PVN)
    - Appetite Stimulants: Norepinephrine, Neuropeptide-Y, and Galanin
  - Lateral-Perifornical Hypothalamus (LH-PFH)
    - Appetite Inhibitors: Norepinephrine, Epinephrine, and Dopamine
    - These are related to our feed-reward system
Neuropeptide Y to the PVN area—stimulates insulin and corticosterone release
  ◦ Strong appetite stimulant
  ◦ Promotes fat synthesis
  ◦ Inhibits fat breakdown
  ◦ Enhances carbohydrate intake

Galanin
  ◦ Appetite stimulant
  ◦ Does not promote fat synthesis
  ◦ Enhances fat intake
The Liver & Its Metabolic Processes

• It’s all about Pyruvate
  ◦ Main product when food is broken down (glucose $\rightarrow$ glycolysis $\rightarrow$ pyruvic acid)
  ◦ **Fed state**: Pyruvate overload leads to satiety
  ◦ **Fasting state**: Pyruvate deficit leads to feeding
    (triggered in order to avoid gluconeogenesis, which is much more work for the body)
The Liver & Its Metabolic Processes

- Fasting
  - Less ATP available
  - Shift from glycolysis and glucose oxidation to fatty acid oxidation
  - Message sent by membrane or intracellular receptors to the brain (via vagus nerve)

Appetite stimulated!
Some people do tend to gain weight when under stress.
When you're stressed out, you may find it more difficult to maintain healthy-eating habits.
Also, many people may eat in an attempt to fulfill emotional needs during a particularly stressful time.
These and other factors can contribute to stress-related weight gain.

Stress and Hunger
Cortisol—the Stress Hormone

- Regulates metabolism and blood pressure
- Known as "the stress hormone” in "fight or flight"
  - Brain perceives a threat, and activates the nervous and endocrine systems to prepare the body to quickly defend or flee
  - Release of cortisol
- During physical and/or psychological stress, cortisol works to break down fatty acids to use for energy
- Once the brain perceives the threat is gone, it sends signals to return the body to a state of calmness
- With ongoing stress, however, the body is in a chronic state of stress, and the adrenal glands are constantly secreting cortisol
- Too much cortisol is harmful
  - For example, excessive cortisol breaks down white blood cells, hindering the immune system
  - A surplus also increases the amount of free fatty acids in the arteries, which, over time, can lead to clogged arteries
  - In addition, the amount of cortisol secreted during stress varies from person to person.
Popular diet books link cortisol and weight gain

Prolonged exposure to very high levels of cortisol, as in Cushing's syndrome, can result in weight gain. Cushing's syndrome is a medical condition in which your adrenal glands make too much cortisol.

Emotional stress in some people may cause mild, temporary increases in cortisol

- Rarely, chronic stress over months or years (not days or weeks) may elevate cortisol levels sufficiently enough and for a long enough period to cause weight gain
- A blood test can check your cortisol level.
Cortisol and Weight Gain

- Whether or not stress causes high levels of cortisol and weight gain is not clear.
- Since the role of cortisol during stress is to provide energy for the body, the result can be an increase in appetite.
- So, stress may lead to cortisol levels that trigger one to eat, which can cause weight gain, difficulty losing weight, or weight gain in certain areas of the body
  - Scientists have learned that elevated cortisol levels tend to cause fat deposition in the abdominal area
- In both children and adults with depression, doctors have found elevated cortisol levels, similar to people who experience chronic stress.
  - It is not completely clear whether high cortisol levels cause depression.
  - Not all people who have high cortisol levels develop depression, and not all people with depression have high cortisol levels.
  - Exercise has been shown to help attenuate
Why Americans Over-Eat

EPIDEMIOLOGICAL EVIDENCE
Factors in Over-Eating and Diet Quality

- Working more hours per week
  - 40 hrs, meals/4hrs: eats 20% more than someone unemployed
  - 40 hrs, meals/8hrs: eats 40% more!

- Hunger & time pressures affect long term health objectives
  - Limit time between meals

ERS-USDA, 2008. Hunger, Stress, and Other Roadblocks to Healthy Eating
Factors in Over-Eating and Diet Quality

• Too long between meals
  ◦ More likely to eat more calories, solid fat, alcohol, and added sugars at each meal
  ◦ 5 vs. 4 hours: 52 more calories
  ◦ 6 vs. 4 hours: 91 more calories

• Eating away from home
  ◦ 107 more calories at restaurant vs. home

• Low education about diet and nutrition
  ◦ 50% score on USDA Diet and Health Knowledge Survey: increases per-meal caloric intake by 28%
  ◦ 100% score on same survey: only 12% more calories

ERS-USDA, 2008. Hunger, Stress, and Other Roadblocks to Healthy Eating
Almost half of Americans (48%) reported overeating or eating unhealthy foods to manage stress (up from 43% last year)

Women were more likely than men to report unhealthy behaviors to manage stress like eating poorly (56% v. 40%)

Overeating ranked low for those who used it to manage stress (16%)

Recent Research & Strategies for Health

STRESS & EATING
Obesity, Binge Eating, and Psychological Distress

- Nocturnal snacking observed in 180 bariatric surgery candidates with Night Eating Syndrome (NES)
  - This study aimed to investigate the clinical significance of NES and nocturnal snacking by exploring the relationship between NES and (1) obesity, (2) binge eating disorder (BED) and (3) psychological distress.

- Results: NES alone was not associated with psychological distress
  - NES was positively associated with BMI, BE and male gender.
  - Elevated psychological distress was only apparent in those who consumed nocturnal snacks.

Stress and Chocolate

• Restrained and emotional eaters overeat in response to stress
• To compare differential effects of cognitive demand and ego-threatening stressors on subsequent chocolate intake
  ◦ 38 females completed three tasks: neutral (control), ego-threatening, and incongruent Stroop color-naming task (cognitive demand) at three separate times
• Result: Emotional eating associated with greater intake only after the ego-threat

Highly palatable food (HPF) was made available to rats with a history of caloric restriction, after stress

Results:
- Post-stress, if only chow was available, no binge eating
- Post-stress, given a taste of HPF, regular chow intake increased to 160% (p<0.001) in rats with a history of restriction only, stress-only, or neither.

Motivated by reward (tasty chow), not need

Sweets to the Stressed

- 68 healthy men and women volunteers grouped into ‘stressed’ or ‘control’ groups
- Provided ad libitum meal of sweet, salty, or bland high- and low-fat foods
- Pre and post measures taken of blood pressure, heart rate, mood and hunger
- Results: Stress increased blood pressure and changes in mood. Overall intake unaffected, however, stressed emotional eaters ate more sweet high-fat foods and a more energy-dense meal.

Women Know Better, But..

- 101 men and women ages 18-35 assessed by State-Trait Anxiety Inventory, the Eating Inventory, the Restraint Scale, the Eating Attitudes Test, the Bing Scale, and Height and Weight.

- Results: Over 80% of females with increased intake had less restraint (uninhibited) during specific and general stress, though cognitively they were not (i.e. they knew better, but over-ate anyway).
  - No associations found in men.

Helping your clients find solutions
Escaping Stress...
Managing Stress

- Manage stress-related eating and weight gain by eliminating or better managing stress

Partnered Activity

- Turn to someone next to you and walk through these stress-management activities together — use a scenario you’ve heard from a client, or draw on personal experience.
Partnered Activity

- **Understand how you experience stress**
  - Everyone experiences stress differently. How do you know when you are stressed?
  - How are your thoughts or behaviors different from times when you do not feel stressed?
Partnered Activity

- **Identify your sources of stress**
  - What events or situations trigger stressful feelings?
  - Are they related to your children, family, health, financial decisions, work, relationships or something else?
Partnered Activity

• Learn your own stress signals
  ◦ People experience stress in different ways. Gauge your stress signals – What are your stress signals?
  ◦ You may have a hard time concentrating or making decisions, feel angry, irritable or out of control, or experience headaches, muscle tension or a lack of energy.
Recognize how you deal with stress

- Identify how you deal with stress.
- Determine if you are using unhealthy behaviors (such as smoking, drinking alcohol and over/under eating) to cope.
- Is this a routine behavior, or is it specific to certain events or situations?
- Do you make unhealthy choices as a result of feeling rushed and overwhelmed?
Partnered Activity

• Find healthy ways to manage stress
  ◦ Pick at least 3 strategies that will work for your situation.
  ◦ Consider healthy, stress-reducing activities such as meditation, exercising or talking things out with friends or family.
  ◦ Keep in mind that unhealthy behaviors develop over time and can be difficult to change. Don't take on too much at once.
  ◦ Focus on changing only one behavior at a time.
Partnered Activity

• **Take care of yourself**

  ◦ Pick at least 3 strategies that will work for your situation.

  ◦ Eat right, get enough sleep, drink plenty of water and engage in regular physical activity.

  ◦ Ensure you have a healthy mind and body through activities like yoga, taking a short walk, going to the gym or playing sports that will enhance both your physical and mental health.

  ◦ Take regular vacations or other breaks from work. No matter how hectic life gets, make time for yourself — even if it's just simple things like reading a good book or listening to your favorite music.
Partnered Activity

• **Reach out for support**

  ◦ Accepting help from supportive friends and family can improve your ability to manage stress.

  ◦ Identify who this might be in your life

Managing Food & Mood

- Tips from the American Dietetic Association

  - Stress often leads to a craving for carbohydrates, because they boost serotonin, which has a calming effect.

  - Choose complex carbohydrates, such as whole-grain products, beans and vegetables, to help increase the nutritional content of meals and snacks.

  - “Afternoon lows” are often a result of poor meal timing or food choices. Space meals three to four hours apart and choose low-fat protein and complex carbohydrates for your meals.
Managing Emotional Eating

- **Tips from the American Dietetic Association**
  - Try keeping a food record of what you eat, when you eat and why you eat.
  - Recognize what triggers your eating to help make it easier to make changes.
  - Take your mind off things – take a walk, bike ride, play with a pet, meet up with friends.
  - Find a balance between eating and your emotions and still enjoy your comfort foods.
Resources

- American Dietetic Association
  - EatRight.org

- American Psychological Association
  - APA.org

- Obesity Society
  - Obesity.org
THANK YOU!

www.twitter.com/JBthedietitian

ENERGY to BURN
THE ULTIMATE FOOD AND NUTRITION GUIDE TO FUEL YOUR ACTIVE LIFE

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