Motivation II

Hunger and Satiety

Control of Nutrient Levels

• The body requires food to supply nutrients, vitamins, and minerals needed for energy, growth, and repair.
• Consequently there are control systems to maintain appropriate levels of these necessities.
• Ultimately, these systems produce motivations to eat or to abstain from eating, respectively called hunger and satiety.

Early Research on Hunger and Satiety

• Walter Cannon
  • Concluded that hunger pangs originate in stomach contractions
• Work with dogs indicated that satiety depends on:
  • Stretching of stomach as it fills
  • Chewing and swallowing
  • Nutrients entering bloodstream
Strategies for Studying the Brain

- Lesioning
  - Destroy a portion of the brain.
  - Determine what functions are lost as a result.
- Stimulation
  - Artificially stimulate a portion of the brain via an electrode.
  - Determine what behaviors ensue.
- Ideally, the conclusions drawn from these two sources should be complimentary.

The Lateral Hypothalamus (LH)

- Lesioning
  - Rat will not voluntarily eat, must be force-fed.
- Stimulation
  - A rat that is not hungry picks up food and resumes eating for a short time after stimulation
  - Conclusion: The LH functions as a hunger center.

The Ventro-medial Hypothalamus (VMH)

- Lesioning
  - Rat overeats (hyperphagia), gains weight until it weighs 2-3 times normal (1000-1500 grams).
- Stimulation
  - Hungry rat stops eating for a short while after stimulation.
  - Conclusion: The VMH functions as a satiety center.
The Dual-Center Hypothesis

- Hunger signals enter the lateral hypothalamus; it becomes active, generating feelings of hunger and motivating a search for and consumption of food. Inhibitory signals from the LH tend to suppress activity in the VMH.
- As food is consumed, hunger signals diminish and satiety signals grow. The ventro-medial hypothalamus switches on, generating feelings of satiety. Inhibitory signals from the VMH suppress activity in the LH.

Illustration of the Dual-Center Hypothesis

Evidence Against the Dual-Center Hypothesis

- Lateral Hypothalamus
  - Lesioned rats eventually recover eating if kept alive long enough.
  - Stimulation effect turns out to promote any available activity, not just eating.
- Ventro-medial Hypothalamus
  - VMH rats still regulate their body weights. Lesions only appear to increase the set-point.
The Set-Point Theory

- Nutritional intake and body weight are regulated around a set-point.
- The organism will actively defend against disturbances to these variables.

Evaluating Set-Point Theory

- Data show that metabolic rate will decrease or increase, respectively, if body weight is forced more than 10% above or below normal values. Thus body weight is defended.
- However, there may be stronger controls against being underweight than against being overweight, because in our evolutionary history, being overweight can have survival value where famines are common.

Nature Versus Nurture

- Adoptive studies show that the body weights of adoptive children correlate strongly with those of their biological parents. Heredity may contribute strongly to set point.
- However, lifestyle can have an influence, too.
Anorexia Nervosa

- Eating disorder in which the person eats very little, becomes extremely thin. More common in young women than in men.
- Not due to malfunctioning regulatory system. The person must exert strong will-power to keep from eating, and may induce vomiting after giving in.
- My opinion: a form of psychosis triggered by hormonal changes in puberty. Similar to obsessive-compulsive disorder.