Chapter 11

Sensory Systems
Addictive Behavior
Drugs
Sensory Systems

- Eyes
- Ears
- Nose
- Taste buds
- Sensory receptors in the skin, joints, muscles
The Eye (11.1 about p. 224)

- Spherical organ

- Sclera – Tough, protective outer covering (white of the eye)
  - Cornea – sits in front of optical lens and allows light to pass through

- Optical Lens
  - Held up by ligaments
  - Between 2 fluid-filled chambers
  - Anterior chamber has fluid that nourishes the lens and the cornea
  - Posterior chamber has fluid to refract light as it enters the eye
The Eye

- Iris – colored contractile membrane. Contracts based on amount of light present

- Retina – transmits light impulses to the brain via optic nerve
  - Photoreceptors
    - Rods (non-color, low acuity)
    - Cones (color, high acuity)
The Ear (11.2 about p. 224)

- **Outer** – auricle and ear canal

- **Middle** – Eardrum and ossicles (bones)
  - Eardrum responds to vibrations, transmits these signals to the 3 bones (malleus, incus, stapes)
  - Ossicles receive vibrations and transmit them to the cochlea of the inner ear...

- **Inner** –
  - Cochlea – fluid-filled, tiny sensory endings, or “hairs”
  - Sound vibrations stimulate these hairs to transmit impulses to the brain via auditory nerve
  - Semi-circular canals (in all 3 planes) – maintain balance during movement
What is a Drug?

Drug: Substance other than food that affects the structure or function of the body through its chemical action

- Psychoactive drugs – cause changes in brain chemistry and alter consciousness, perception, mood, and thought (make one “intoxicated”)

All drugs have the potential to be toxic, poisonous, dangerous, or deadly
Types of Drugs

- **Legal**
  - Prescription medication (Rx)
  - Over-the-counter (OTC) medications
  - Herbal remedies
  - Pharmaceutical – developed for medical purposes (OTC or Rx)

- **Illicit**
  - Unlawful to possess, manufacture, sell, or use
Drug Misuse and Abuse

- Drug misuse: Use of prescription drugs for purposes other than those for which they were prescribed or in greater amounts than prescribed.

- Drug abuse: Use of a substance in amounts, situations, or a manner such that it causes problems, or greatly increases the risk of problems, for the user or for others.
Factors Influencing the Effects of the Drug

- Characteristics of the drug
  - Chemical properties of the drug and its actions

- Characteristics of the person
  - Age
  - Gender
  - Body weight and mass
  - Physical condition
  - Mood
  - Experience with the drug
  - Expectations

- Characteristics of the situation
  - Environment, setting
Drug Dependence

- Dependence ("addiction")
  - Strong craving for a drug
  - Compulsive use despite serious negative consequences

- Physical changes in brain and body chemistry

- Physiological dependence:
  - Tolerance – reduced sensitivity to the effects of the drug
    - Withdrawal – symptoms are different for different drugs and lead to unpleasant feelings
Drugs act on neurons in three brain structures *(Pleasure and Reward Circuit)*
- The ventral tegmental area (VTA) in the midbrain
- Nucleus accumbens
- Prefrontal cortex

“Pleasure and Reward Circuit”
- Responsible for feelings of pleasure and satisfaction when a need is met (hunger, thirst, bonding, sexual desire)
- Powerful reinforcement of the behavior that satisfied that need

VTA releases *dopamine*…
- Intense pleasure (in the NA)
- Affects thinking, motivation, behavior (in the prefrontal cortex)

Addictive psychoactive drugs activate this same pathway… Surge of dopamine and associated feelings of pleasure (artificial)
- Reduces body’s own production of dopamine (natural)

All, or nearly all, addictive drugs operate via the Pleasure and Reward Circuit
Pleasure and Reward Circuit in the Brain
Drugs of Abuse

- Stimulants
- Depressants
- Opioids
- Hallucinogens
- Inhalants
- Cannabinoids
CNS Stimulants

- Speed up activity in the brain and sympathetic NS
- Effects similar to ‘fight or flight’ reaction
- Fidgeting, excessive talking, produce intense feelings of euphoria, create a sense of well-being

Examples:
- Cocaine
- Amphetamines
- Meth
- MDMA (ecstasy)
- Caffeine
CNS Depressants

- Slows down activity in the brain and sympathetic NS
- Can be deadly if misused, especially when mixed with alcohol
- CNS depressants carry a high risk of dependence

Examples:
- Barbiturates and hypnotics
- Anti-anxiety drugs (Valium, Xanax)
- Rohypnol
- GHB (Gamma hydroxybutyrate)
- “Club Drugs”...
Opioids

- Natural (seed of opium poppy) and synthetic
- Historically: pain relief, treat diarrhea and dehydration
- Currently: pain relief, anesthetics, antidiarrheal agents, and cough suppressants
- Examples:
  - Morphine
  - Heroin
  - Synthetic opioids
    - OxyContin, Vicodin, Demerol, Percocet, and Percodan
- Produce feelings of pleasure and block sensation of pain
Hallucinogens (aka, Psychedelics)

- Alter perceptions and thinking
- Intensify and distort visual and auditory perceptions, produce hallucinations

Examples:
- LSD (synthetic)
- Mescaline, psilocybin (plant-derived)
- PCP (“angel dust”, first used as anesthetic)
Inhalants

- Alter consciousness, producing a drunken-like state
- Paint thinner, gasoline, glue, and spray can propellant
- Active ingredients are all powerful toxins and carcinogens
- Widespread and long-lasting brain damage
Marijuana is the most widely used “illicit” drug in the United States.

Marijuana is derived from the hemp plant, Cannabis sativa.

The active ingredient is THC.

Mild euphoria, sedation, lethargy, short-term memory impairment, distorted sensory perceptions, distorted sense of time, impaired coordination, increased heart rate.

THC has a variety of effects on the brain, impairments in problem solving and decision making.