PSYCH 1000

Winter 2012

STUDY GUIDE

WUCK EXAMS

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SENSATION & PERCEPTION CHAPTER 5

THE BASICS

Sensation - stimulus detection
- Our sense organs translate environmental stimuli into nerve impulses
- Those impulses are then sent to the brain

Perception - Making "sense" of what our senses tell us
- Organizing the stimulus input and giving it meaning
- Perception is heavily influenced by context

Transduction - Characteristics of the stimulus are converted into nerve impulses
- There are more than just 5 senses: balance, temp/pain/pressure & immune system are all sensory systems
- Sensory systems extract info that we need to survive from the environment

Synesthesia - condition in which the brain mixes up senses (ex. Sounds have colors)
- **Theory 1:** The pruning of neural connections that occurs in infancy hasn't happened
- **Theory 2:** Insufficient neural inhibition in the brain so input overflows to other areas

PSYCHOPHYSICS


Fechner

Psychophysics
- The study of the relation between physical stimulus and physiological response
- **Fechner:** "The father of psychophysics"

Absolute threshold
- Lowest intensity at which a stimulus can be detected 50% of the time.
- Varies depending on fatigue, expectations, etc.

Lower threshold means better sense!

Signal detection theory
- Situational factors can influence sensory judgements
- When the perception is more important, people have lower absolute thresholds
- Perception is essentially a decision

Vision is the most sensitive sense, hearing is second. The rest aren't very good at all.

Difference threshold

- Smallest difference between two stimuli than can be detected 50% of the time
- The difference threshold is amount of chance necessary for a **Just Noticeable Difference (JND)**

Example: If your hand was on a stove and someone was gradually raising the heat, you would probably not notice the difference between 50° and 50.1°. But you would most likely feel the difference between 50° and 60°.

- Whatever the minimum change in temperature you need to feel a change is the **JND**.

Note: *JND's apply to any kind of sensation, not just temperature.*

Weber's law

- States that the difference threshold is proportional to magnitude of stimulus.
- Varies for every stimulus
- Breaks down at extremely high and low intensities
- *Most sensitive* - pitch, brightness
- *Least sensitive* - smell, taste.

ΔI ÷ I = c

I is the original stimulus intensity
ΔI is the change in stimulus intensity
c is the stimulus constant for *this* stimulus

The smaller it is, the better the sensory system)

Weber's Law Example: A sound was playing at 50db. The JND happened at 55db. When will the JND occur if the sound was playing at 100db?

I = 50db
ΔI = 55 - 50 = 5db
c = 5 ÷ 50 = 0.1

c is constant for this stimulus. So even if we raise **I**, **ΔI** will always be **c** × **I**.

New I = 100db.
New ΔI = **c** × **I** = 0.1 * 100 = 10

Important: Don't forget that the change (ΔI) can happen *in either direction*. That means, if the stimulus started at 100db, a JND would happen at **90 OR 110.**

Lets say that you can barely distinguish 100 grams from 105 grams of cheese. Where would the JND happen for 300 grams? 315 OR 285. (←Tilt screen to see answer)

Fechner's Law: $S = k\ log(I)$

- Sensation increases with the logarithm of intensity
- Unlike Weber's law, this says that there is **not** a 1:1 relationship between physical intensity and psychological intensity
- Generalizes better than Weber's law

Steven's Power Law: $S = k\ log(I)^n$

- More predictive across a variety of sensations

Sensory adaptation

- Reducing sensitivity to a constant stimulus
- This is the reason a concert seems painfully loud when you walk in but seems normal volume by the end of it
- Because of this, your eyes are constantly moving; otherwise images slowly disappear

Subliminal Perception

- This is perception below the absolute threshold
- Can we perceive subliminal stimuli? Is our behavior affected by subliminal stimuli?

James Vicary: claimed 50% increase in popcorn sales due to subliminal "cuts" in a movie. This isn't true. He made it up.

- No evidence whatsoever what subliminal cuts influence consumer behavior

But, consider **Bruce & Valentine** (1986); ***priming***

- If you are subliminally shown a relevant image, you are 100 milliseconds faster at identifying someone as famous

Fitzsimons (2008); 30 millisecond flash of an Apple or IBM logo before simple identifying task

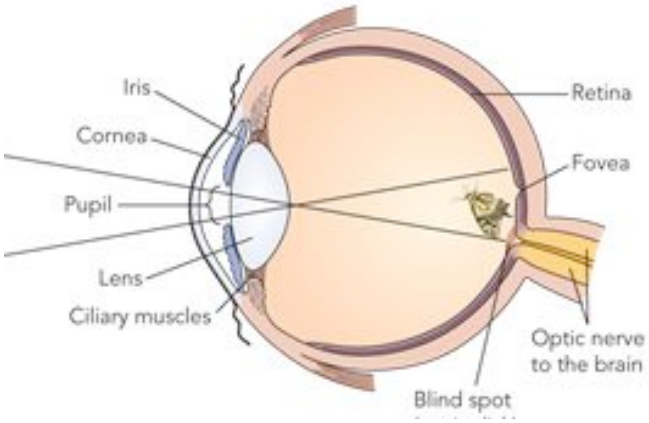
- Afterwards you are more creative

VISUAL SYSTEM

Cornea - outer layer that focuses the light
Pupil - contracted by the **Iris**
Lens - fine tuning

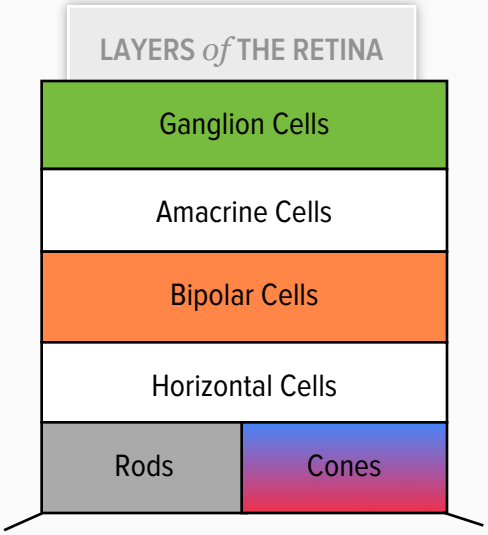
- Lens too long = **Myopia** (nearsightedness)
- Lens too short = **Hyperopia** (farsightedness)

Vitreous humor - keeps the shape of the eye



Retina - Lines the back of the eye. Many layers.

Fovea - small area in the back center of your eye with no rods
- It is the most sensitive part
- **Visual acuity (clearness)** is best on the fovea because each cone has its own bipolar cell
- You can't look directly at stars at night cause theres no rods in the fovea (and you need rods to see in the dark)



- Best in the **dark**.
- Most common in **peripherals**
- Sensitive to blue ↑
- Can't see red ↓

- Best in the **light**.
- Color receptors
- Sensitive to **greenish-yellow**

How do rods and cones work?

- Turn light into action potentials though the breakdown of **photopigments** (chemicals)
- ***Rods***: Rhodopsin. If you extract Rhodopsin and expose it to light, it gets "bleached". When you see a flash of light your retina is bleached.
- ***Cones***: Erythrolabe **(R)**, Chlorolabe **(G)**, Cyanolabe **(B)**.

Optic nerve - bunch of axons of ganglion cells that take info from retina to the brain

Blind spot - portion of eye with no photoreceptors

Dark adaptation - progressive improvement to light sensitivity under low illumination
- Photopigments are depleted by light and it takes time from them to regenerate
- Cones reach max adaptation in **10 mins**
- Rods regenerate **slower** but get much **more sensitive**
- Pilots sit in red light because rods are not stimulated by red so dark vision is ready for use when the pilots need

Rods and Red

When pilots are waiting to fly at night, they sit in a room with red light. This is because rods, which are needed to see in the dark, are insensitive to red. As a result, unlike other colors, red light won't bleach their rods, and they'll be ready to see in the dark when they need to fly.

Color-deficient Vision

- **Dichromat** - color blind to one of **RG** or **BY**
- **Monochromat** - sensitive only to **BW**

Trichromatic theory

- Every color can be made of Red, Green and Blue (RGB), so there are three color receptors in the retina
  - **Problems with theory:** why can red-green colorblind people can still see yellow?
  - Also, why is the *afterimage* a different colour

What's an afterimage?

Look at **this image** for 20 seconds without blinking and then look away

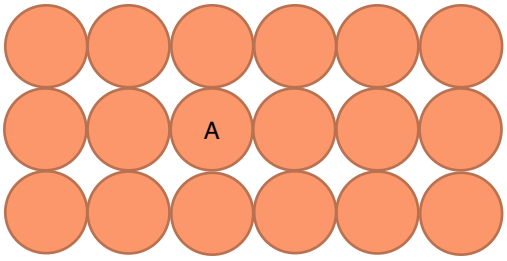
Opponent-process theory

- There are three different cones and each one has two colors (**R**-**G**, **B**-**Y**, **B**-**W**)
- So there would be one chemical for green, and an "opponent process" for red
- This explains the *afterimage* as the opponent process rebounding

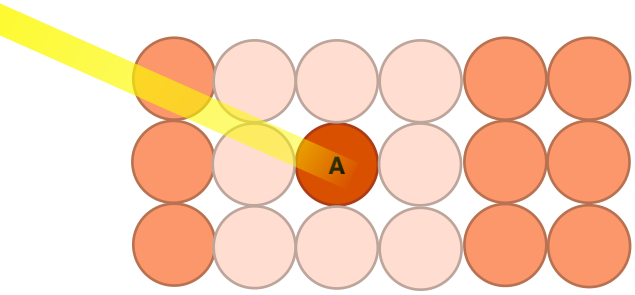
Dual process theory

- Says that both trichromatic and opponent-process theories were right
- Trichromatic was right about the **cones**
- Opponent process was right about the **ganglion cells**

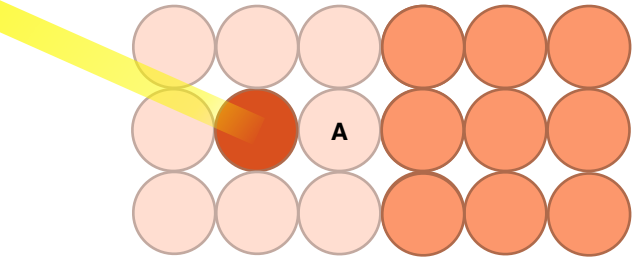
Lateral Inhibition



These circles are retinal ganglion cells. In this scenario, there is ambient light shining on all the cells, so they are equally stimulated. They are all firing at the same rate.

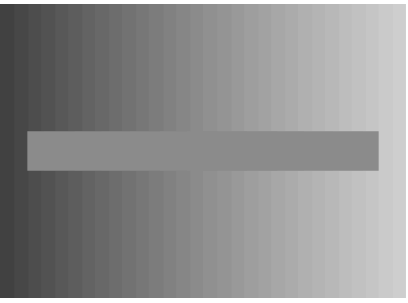


Now, we focus a beam of light right on Cell A. Cell A is firing at a very fast rate, and the cells around it are firing at a lower rate.



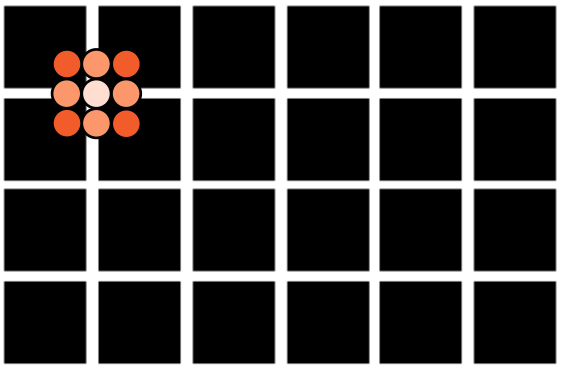
If we move the beam to a cell next to Cell A's **receptive field**. Cell A is now firing at an even lower rate than it does under ambient light.

This is called **lateral inhibition.** It is caused by **horizontal cells.**



The cell above has an **on-centre** and an **off-surround**. Some cells are the opposite. Other cells have different shaped receptive fields.

This explains contrast effects & optical illusions like this one. That strip in the middle is not a gradient. Lateral inhibition increases the perceived contrast and makes it look like there is a gradient.



Phantom Spots

In the middle of the crosshairs, there is more intensity in the off surround than the on centre. As a result, the cell in the middle shuts down and you see a black smudge.

Single Cell Recordings

Retinal ganglion cells - respond to spots
Cortex cells - respond to slits/bars of light, not spots
Simple cell - respond to a slit at a particular orientation on a specific retinal location
Complex cell - responds to moving slits/bars of light
Hypercomplex cell - respond to combination of stimulus features (objects, angles)

A cell shows maximum firing to a **spot** of light at particular area on the screen. A slit of light decreases the firing rate. Where is the researcher recording from?
Retinal ganglion cell. **(←Tilt screen to see answer)**

HEARING

Frequency - number of sound waves per second (Hz)
• Frequency determines pitch. 20 - 20,000Hz is hearable.
Amplitude - vertical size of the waves (db)
• Amplitude determines loudness.

Parts of the ear

There are 3 major sections.

Eardrum moveable membrane that vibrates in response to sound waves

Middle ear three tiny bones (the smallest in the body) that amplify sound 30×

Hammer | **Anvil** | **Stirrup**

Inner Ear

Cochlea - snail-shaped tube filled with fluid

Basilar membrane - sheet of tissue

Organ of Corti - 16000 tiny hair cells; they are the sound receptors of the ear.

Coding for Pitch and Loudness

Loudness

- Rate of firing of hair cells
- Specific hairs have higher threshold so they only fire with louder sounds

Pitch

- **Frequency theory** - nerve pluses match the frequency of the sound
  Problem: neurons can't fire fast enough to produce sounds over 1000Hz
- **Place theory** - the specific point in the cochlea where the fluid wave peaks indicates the frequency *(discovered by von Bekesy)*
  - The cochlea is essentially "mapped" to the auditory cortex, just like the retina is mapped to the visual cortex

Both are true. For low sounds, frequency theory holds true. For high sounds, place theory does.

Sound localization - ears are on either side of head so we can tell where a sound is coming from depending on which ear hears it first

Hearing Loss

Conductive deafness - problems with the mechanical system that transmits waves to the cochlea (hearing aid can help)
Nerve deafness - damaged hair cell receptors within the inner ear (hearing aid can't)

TASTE AND SMELL

These are chemical senses, instead of energy senses like sound and sight.

Taste buds - chemical receptors concentrated along the edges and back of the tongue

- Each is more responsive to one or two basic taste qualities, weakly to others
- Umami increases the sensitivity to other taste qualities
- Poisons are bitter; hard-wired into us

Olfactory bulb - forebrain structure above the nasal cavity, specific odors excite specific portions of it

Pheromones - chemical signals in natural body scent, no evidence to support they effect behavior

Menstrual synchrony - The effect can be caused when a woman smells another woman's sweat - their menstrual cycles will sync up. Doesn't happen with prolonged exposure though.

SKIN AND BODY

Tactile senses - pressure, pain, warmth cold

Gate control theory - pain results from the opening and closing of gating mechanisms in the nervous system. These gates can be closed by physical or brain activity.

Glial cells are responsible for the ache all over feeling when you're sick.

Endorphins - natural painkillers, inhibit pain neurotransmitters

Kinesthesis - info about position of muscles, joints and movements

Vestibular sense - body orientation or equilibrium (inner ear fluid)

PERCEPTION

bottom-up processing - individual elements of the stimulus are then combined into unified perception
top-down processing - sensory info is interpreted in the light of existing knowledge, concepts, ideas (pioneered by Gestalt)

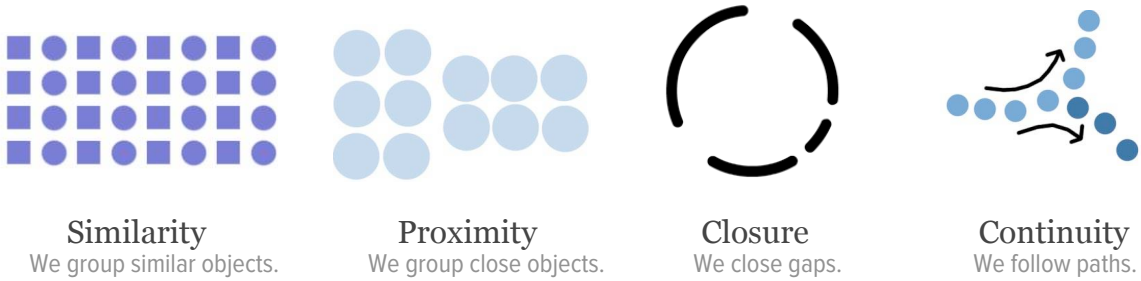
Processing depends on attention

- Attention involves 1) focusing on a certain stimuli and 2) filtering out other incoming info
- **Shadowing** - playing a different message in either ear. It's easy to repeat the words of one (shadow them), but only at the expense of paying attention to the other.
- **Inattention blindness** - You can look right at something without "seeing" it if your attention is on something else (**like this video**)
- Our motives and experiences affect what we pay attention to. We are also quicker to respond to threatening stimuli, and are very precise at discerning between threatening and non-threatening stimuli.

Figure-Ground Relations - we organize stimuli into foreground and background

- Central figure (foreground) has a more distinct shape and is more striking in perception and memory
- Same with music (melody, chords)

Gestalt Laws *of* **Perceptual Organization** (Max Wertheimer)



Similarity
We group similar objects.

Proximity
We group close objects.

Closure
We close gaps.

Continuity
We follow paths.

Patterns in how we perceive things. Illustrates the importance of context in perception.

Perceptual schema

- A mental image to compare a perception with so we can recognize it
- Every perception is a "hypothesis" and the perceptual system searches a giant library of schemas to find the best interpretation.

Perceptual set

- Readiness to perceive stimuli in a particular way
- If I tell you someone is a jerk, when you meet them you are more likely to interpret what they do as jerk stuff

Perceptual constancies - allow us to recognize familiar stimuli in different conditions

- **Shape constancy** - recognize things at different angles
- **Brightness constancy** - relative brightness remains the same
- **Size constancy** - size of objects remains relatively constant at different distances

These must be learned - small kids don't do this.

Depth, Distance and Movement

Monocular Depth Cues - allow you to detect depth with one eye

- Light and shadow
- Linear perspective
- Interposition/overlap
- Height in horizontal plane
- Texture gradient
- Clarity
- Relative size
- Motion parallax - nearby objects move faster than far ones

Binocular Depth Cues - require two eyes

- **Binocular/retinal disparity** - each eye sees a very slightly different image because they are on different sides of your head. The brain processes them together.
- **Convergence -** feedback from muscles that turn your eyes inward

Stroboscopic movement - illusion of movement when lights are flashed nearby each other milliseconds apart.

- This is the effect you see on theater marquees.

Theater marquee

Critical period - certain experiences must happen in this time for the brain to develop normally

Deprivation experiment - test critical periods

- Cats raised in an environment with no vertical lines could not see vertical patterns
- Culture and experience plays a huge part on perception: People that don't live in societies with square buildings and rooms don't see certain illusions
- Blind people who get their sight back later in life have lots of trouble identifying objects, and judging distances

Perceptual Problem Solving

- How do we recognize and make sense of patterns?
- **Constructionists**: believe that we create meaning from basic elements or features (bottom up)
- Register small components and build into larger, meaningful units
- **Geons** - Biederman believes these are the elementary shapes of perception (cylinders, rectangles, etc)

SLEEP CHAPTER 6

THE BASICS

Consciousness - moment-to-moment awareness of ourselves and our environment

- Subjective and private
- Dynamic
- Self-reflective and central to our sense of self
- Intimately connected with the process of selective attention - consciousness reflects what is spotlighted at the moment

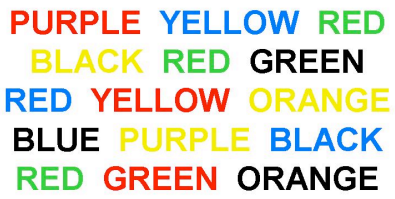
Psychodynamic Perspective

- **Conscious** - thoughts, perceptions

- **Preconscious** - not currently available but could be (memories)
- **Subconscious** - unaccessible, unacceptable urges and desires; may "leak" out

Daydreaming
- Happens every 90 mins
- Topics: Failure/success, aggression, sex, guilt, problem solving (in order of frequency)
- Alters mood in positive direction
- Low risk way to deal with problems
- Increases arousal

Cognitive
- Unconscious works in harmony with conscious
- **Controlled (effortful) processing** - voluntary use of attention. Aware.
- **Automatic processing** - little or no conscious effort (type, drive, eat). Unaware.
- **Divided attention** - perform more than one activity at the same time



Stroop effect - Saying the colors instead of the words is hard because reading is an automatic process.

CIRCADIAN RHYTHMS

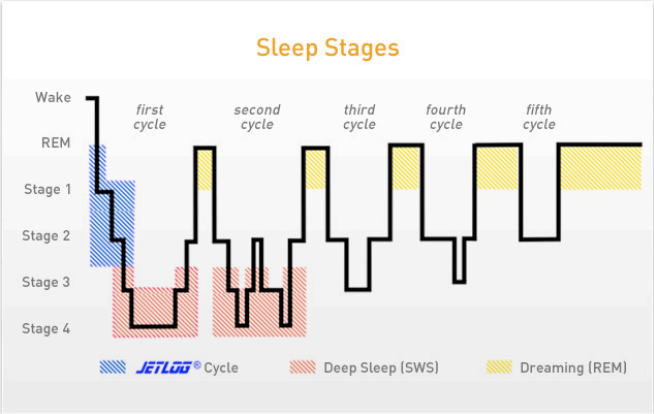
- These are your daily temperature, hormone and body function rhythms
- Late afternoon is best for physical tasks. Everything in your body is optimized - even taste!
- **Suprachiasmatic nuclei (SCN)** - The Brain's clock. In the hypothalamus. It regular circadian rhythms.
- **Melatonin** - secreted by pineal gland, relaxing effect on body.
- When SCN neurons are stimulated by daylight, they *inhibit* melatonin. This raises body temperature and alertness. This is why daylight makes you feel awake.
- **Free-running circadian rhythm** - without day/night cues to guide you, your body would drift into a longer 24.2 - 24.8 hour cycle. This happens to blind people.

Disruptions of Circadian Rhythms
Seasonal affective disorder - tendency to become depressed during certain months
- Winter has less sunlight so your melatonin isn't inhibited and you are sleepy all the time.

Jet lag - easier to lengthen day (fly west), more compatible with free running cycle

• Can you take melatonin pills to solve it? Questionable.
• Hydrate, avoid alcohol, stretch, light meals, expose to sunlight

Night Shiftwork
• Accidents much more likely
• **Rotating shiftwork** - takes advantage of it being easier to increase the day than to compress it
• Even Daylight Savings Time causes increased accidental deaths



SLEEP AND DREAMING

Your body goes from awake to Stage 4 and back again in 60-90 mins. Except, instead of waking up every hour, your body goes into REM sleep before starting the cycle all over.

Sleep Stage	Brain Waves	EEG Tracings	
Awake/Alert	Beta waves	High Hz, low amp	
Relaxed/Drowsy	Alpha waves	Slower Hz	
Stage 1 Sleep	Theta waves	Slower Hz	Easily awoken
Stage 2 Sleep	Sleep Spindles & K-Complexes	Fast bursts	Most common stage of sleep.
Stage 3 Sleep	Delta waves	Slow Again	These two stages are slow wave sleep. Very hard to awake.
Stage 4 Sleep	Delta waves		
REM	Theta & Beta waves	High Hz, low amp	**(discussed below)**

K Complex - most dramatic brain activity change that ever happens to humans
• Occurs in Stage 2 sleep
• Huge drop in the EEG tracing.
• Can be triggered externally. Related to RLS and epilepsy.

REM Sleep - Rapid Eye Movements beneath your eyelids as you sleep

- Brain waves like an awake person
- Over the course of the night, REM gets longer and Stage 4 gets shorter.
- If you are woken up here, you always report a dream.
- Physiological arousal closer to daytime level
  - Faster heart rate, breathing
  - Erection, vaginal lubrication (even without sex dreams)
- Voluntary muscles cannot contract. Called REM sleep paralysis.
  - **Paradoxical sleep** - highly aroused, cannot move
- Non-REM dreams are shorter and less story-like. They resemble daytime thoughts - sleep-thoughts.
- REM sleep decreases dramatically during infancy and early childhood

When we get older we need less sleep & we have less slow-wave sleep.

Sleep Deprivation

- Sleep deprivation causes attention lapse, irritability
- Sleep deprived people do worse on critical-thinking tasks but think they did great
- All kinds of sleep deprivation are bad: short term, long term, partial

WHY DO WE SLEEP?

Restoration Model - sleep recharges our running bodies, recovers us from fatigue

- Some believe cellular waste called 'adenosine' accumulates and slows body down

Evolutionary/circadian sleep models (Webb) - sleep increases a species chance of survival in relation to environmental demands

- Conserve energy and stay inside during dangerous nighttime

Learning & Memory - sleep is a time when we store memories

- REM deprived subjects show reduced ability to retain information

Mood adjustment - speed of cycling into REM is correlated with positive mood on following morning

- Depressed people cycle into REM very quickly, perhaps to get a mood increase

REM Rebound effect - brain increases REM sleep after it is deprived of it

- REM may be related to learning and memory
- When learning new tasks, there are more REM's during sleep
- Other sleep states may be involved in specific learning tasks

SLEEP DISORDERS

Insomnia

- Chronic difficulty in falling asleep, staying asleep or having restful sleep
- You can fall asleep easily and still have insomnia
- **Stimulus control** - conditioning your body to associate environment with sleep. Do only sleeping in your bedroom, not studying.
- **Situational insomnia** - specific stressor causing it
- **Chronic insomnia** - possibly circadian rhythm problem
  Thermoregulation problem - failure to lower body temp. Activation remains high and normal sleep cycle fails to develop.

Narcolepsy

- Extreme daytime sleepiness and sudden, uncontrollable sleep attacks
- Sleep goes directly to REM
- Instant muscle weakness
- May experience **cataplexy** - abnormal version of sleep paralysis with laughter, excitement and other strong emotions
- Genetic and environmental causes

REM-Sleep Behavior Disorder

REM sleep paralysis doesn't happen so you are acting out your REM dreams

Sleep Apnea

- Interruption in breathing during sleep
- This is normal... but people with the disorder do not start breathing again unless they wake up
- In severe cases may stop for 1 minute, hundreds of times a night Causes insomnia.
- **Cause?**
  Sometimes obstruction of air passage (snoring) - easy to deal with.
  Sometimes abnormal brain function.
  Some think Sudden Infant Death (SID) is caused by this.

Parasomnia

Sleepwalking
- Occurs in stage 3 or 4 - so you're **not** acting out a dream
- More common in children
- Waking them up is **not** dangerous
- Genetic

Sleep talking
- Stage 1 or 2
- Sometimes in REM
- Sensitive to external world

Nightmares and Night Terrors
- Nightmares are just frightening dreams
- Night terrors are more intense. More common during Stage 3 and 4. Person jumps up, may try to escape room but doesn't remember this state of panic.
- They're still asleep and hard to wake up (because they're in deep sleep)

THE NATURE OF DREAMS

There are many REM periods a night. Thats why its the "sleep *cycle*"

When do we dream?
- 45 seconds into sleep, 25% of people report visual images
- 15-40% in 6 minutes
- More dreams in REM and later in sleep
- We remember the dreams from the last REM period of the night
- The stronger the emotions, the more likely we are to remember them

Nightmares
- Vivid, high anxiety dream
- Significant stress is correlated with frequency
- In adults, correlated with psychopathology (anxiety)
- More common with children
- Some drugs cause them: antidepressants, beta blockers, antihistamines
- Normal people: self reported mean = 9 per year
- With a dream log = 25/year

What do we dream about?
- Most are very normal. Flying is very uncommon.
- 80% involve negative emotions
- Recent experiences shape dream content
- Dreams are fleeting and happen in real time

- Women dream equally about women and women.
- Men dream mostly about men.

Why do we dream?

Psychoanalytic theory (Freud)

- **Wish fulfillment** - gratification of our unconscious desires and needs
- Manifest content (surface story of our dream) vs latent content (hidden meaning)
- The unconscious Id: repressed wishes strive for expression
- Ego is conscious control manager
- Ego disguises Id's wishes in dreams (for example sex urges disguised as a train)
- Symbols for sex: ladder, staircase, elevator, bridge, tunnel, plane

Activation-synthesis theory

- Dreams are just the brain making sense of random neural activity.
- Dreams serve no function.
- Periodic firing of Pons fires other parts of the brain

Cognitive approaches

- **Problem-solving dream models** - dreams help us find creative solutions to problems
- **Cognitive-process dream theories** - focus on the process of how we dream: dreaming and waking thought are produced by the same mental systems.
    - 3 year olds don't report dreams in REM sleep cause they haven't developed imagery skills yet.
    - Rapid content shifts that happen in dreams also happen in everyday thought.

DRUGS

Agonistic - increase neuron activity (opiates, amphetamines)
Antagonistic - inhibits or decreases activity (antipsychotics)
Tolerance - decreasing responsivity
Compensatory responses - You body tries to get back to a normal state by doing the opposite of the drug.

- Physical setting where you take drugs triggers the compensatory responses
- So, overdose is more likely caused by unfamiliar setting than dosage

Withdrawal - continuing compensatory responses after drug stops

Misconceptions

- - Drugs don't always lead to significant withdrawal
- Physiological dependence is not the major cause of addiction, psychological dependance is

DEPRESSANTS

- Decrease nervous system activity
- Reduce anxiety, relaxed euphoria

Alcohol

- Increases GABA, an inhibitory transmitter
- Decreases glutamate, an excitatory one
- Upper phase followed by downer phase
- **Alcohol Myopia** - "shortsightedness" in thinking, inability to pay attention to as much info

    Drunk people find drunk driving more favorable than when they are sober because they latch on to one factor i.e. "its a short drive"

Barbiturates and Tranquilizers

- Sleeping pills and anti-anxiety drugs (valium)
- Also increase GABA
- Overdoes, esp. with alcohol can cause coma, death
- Immediate withdrawal may cause cause

STIMULANTS

- Increase neural firing and arouse nervous systems
- Boost heart rate, alertness, mood, irritability

Amphetamines

- Reduce fatigue and appetite
- Increase dopamine and NE
- Repeated use can cause heart failure or stroke
- Schizophrenic hallucinations are caused by too much dopamine - these can cause the same thing **(amphetamine psychosis)**
- **Meth** - insomnia, hyperactivity, anxiety, paranoia, meth mouth, heart attack
- **MDMA/ecstasy** - boosts serotonin

    Produces longterm cognitive impairment
    Sleep disturbance, sexual dysfunction, impaired immune responses
    Depletes serotonin, linked with suicidal depression and death

Cocaine

- Blocks reuptake of NE and dopamine
- Excitation, sense of muscular strength, euphoria
    - Once used as anesthetic (Novocaine still is)
    - High doses cause fever, vomiting, hallucinations, delusions

OPIATES

- Morphine/codeine/heroin/oxycontin
- Pain relief and mood changes
- Increase endorphins and dopamine
- Heroin originally a cough suppressant; causes peaceful euphoria at great risk of death

HALLUCINOGENS

- Mushrooms, LSD (not well understood how it works)
- Hearing colors, seeing sounds
- Violent outbursts, panic, flashbacks

MARIJUANA

- Hard to classify (hallucinogen, sedative)
- **THC** - bind to receptors; brain produces its own THC-like things called cannabinoids
- Increases GABA and dopamine
- Doesn't cause amotivational syndrome or gateway-drug but still dangerous

Determinants of Drug Effects

- Genetics plays a role in the strength of drug effects on you
- Also learning from parents - although alcohol abuse correlates more with biological parents than adoptive ones
- Setting and other people around you affect drug arousal
- **Cultural learning:** in the Camba culture people are not aggressive or promiscuous when drunk
- Expectancies influence experiences
- **Personality:** people with little contact with reality are more likely to have bad trip

HYPNOSIS

- Named after Anton Mesmer (animal magnetism to cure things)
- You can't be hypnotized against your own will
- Your ability to be hypnotized can be measured by the **hypnotic susceptibility scales**

Explanations for Hypnosis

- Does not cause action against own will - more to do with authority
- Many of the special things hypnotized people do can also easily be done by non-hypnotized people
- Hypnosis can reduce pain tolerance beyond placebo, but so can mental imagery.
- Hypnosis does not increase memory. People make more recall errors and are confident in them.

Theories for Hypnosis

- **Dissociation theory** - division of consciousness; one part listening to hypnotist and one part "hidden observer"
- **Social cognitive theories** - "hypnosis" is just caused by the expectations of participants
    - The bogus suggestion that "hypnosis may cause hand-stiffening" to participants increases its chances of happening by a lot.
    - People can be made to believe they are drunk by giving smell and taste cues in drinks. We can alter our own mental states.

Meditation

- **Mindfulness** - free flowing of thoughts, feelings
- **Concentrative** - focus on a specific sound, sensation (breathing)
- Most commonly affects cingulate cortex and and frontal cortex

LEARNING CHAPTER 7

Learning - process by experience produces a relatively enduring change in an organisms behavior or capabilities

Habituation - decrease in response strength to a repeated stimulus

- Learning to not respond to familiar stimuli saves energy and attention
- For example, you are not constantly feeling your clothes on your body
- You are unaware of habituated stimuli at the moment but if there is some reason to become aware of it, you can

Habituation differs from sensory adaptation. It is a form of learning and occurs in central nervous system, not sensory neurons

Sensitization - increase in strength response to a repeated stimulus

- For example if you get shocked by a door twice, you react more the second time

Behaviorism

- Focus on stimulus & response
- Purely care about observable events
- Strict behaviorism is called "black-box psychology".

    Stimulus → **black box** → response. Don't try to figure out whats in the box.

CLASSICAL OR PAVLOVIAN CONDITIONING

- Association of a **neutral stimulus** with one that **consistently elicits a response**
- **Acquisition** - period during with response is being learned
- Each time the conditioned stimulus (CS) and the unconditioned stimulus (UCS) are paired, it is a **learning trial**
- The more intense the UCS, the quicker the learning

1. Unconditioned stimulus → unconditioned response
2. Pair conditioned stimulus with unconditioned stimulus
3. Conditioned stimulus → conditioned response

Pavlov's Dog

1. Dog's see meat powder (UCS) → Dogs salivate (UCR)
2. Pair meat powder with ringing of bell (CS)
3. Ringing the bell (CS) → Dogs salivate (CR)

The UCR and the CR are not the same. The are similar actions but they are caused by different things.

Central nervous system causes the CR. Sympathetic nervous system causes the UCR.

Classical conditioning is **not** *response contingent - it* doesn't matter what the dog does when you give him food and ring the bell.

Examples of Classical Conditioning

Dentist's Office

1. Drill (USC) → Fear (UCR)
2. Pair dentist with drill
3. Dentist (CS) → Fear (CR)

Why do students who do well on exams tend to like their profs?

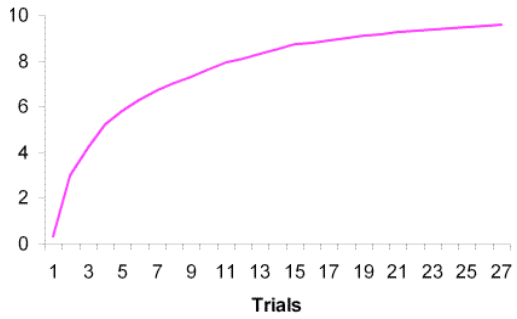
1. Get an A (UCS) → Feel good (UCR)
2. Pair prof with getting an A
3. Prof (CS) → Feel good (CS)

Love

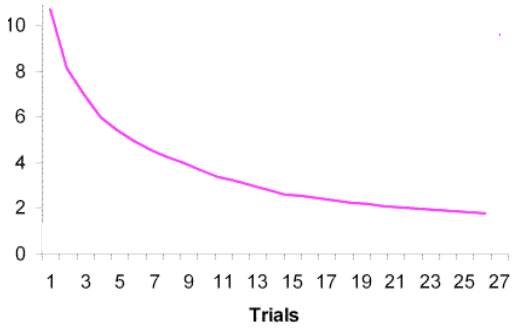
- People rate attractiveness of people in photos with different music playing (bad music, good music)
- Same photos get rated higher when theres good music in the background

1. Good music (USC) → Positive feelings (UCR)
2. Pair music with stranger
3. Stranger (CS) → Positive feelings (CR)

Acquisition Curves - Measures of responsiveness



This chart measures the **response strength** (ex. amount of dog saliva in response to bell). In the early trials there is almost none, but as the dog becomes conditioned it quickly grows and flattens at the maximum.



This chart measures the **latency** between the CS (bell) and CR (salivating). As the trials go on, the dog salivates quicker and quicker in response to the bell, eventually reaching a minimum response time.

Types of Pairing

- **Forward trace pairing** - bell first, still ringing when food arrives. Good learning.
- **Forward short-delay pairing** - bell rings and stops, then food. Best learning.
  Maximum interval: 0.5s. It is the best method because it acts as a *cue*.
- **Simultaneous pairing** - bell and food at the same time. Very slow learning.
- **Backward pairing** - Food, the bell. No learning at all.

Extinction - the CS (bell) is presented repeatedly without the UCS (food) so the classical conditioning breaks

- However, if you extinguish a response, its not "unlearned"
- If you recondition the response, it is learned faster the second time (called "**savings**")
- You can test conditioning strength by testing resistance to extinction

Spontaneous recovery - reappearance of CR after a rest-period without new learning

- The new CR is weaker than the initial one
- This is why phobia treatment requires multiple sessions. The fear response will often reappear suddenly after a long time of being gone.

Stimulus generalization - a similar CS causes the CR

- For example, bells of similar loudness and pitch will also cause salivating in the dogs
- This has an survival function - you wouldn't be very good at avoiding bad stimuluses if your responses didn't generalize.

- You can determine how good an animal is at hearing/seeing/feeling by testing their stimulus generalization.
    - For example, you condition them to respond to a specific pitch.
    - If you lower the pitch by a tiny bit, and the animal stop's responding - it means they have really good hearing.

Discrimination - when the CR occurs to one CS but not others (opposite of generalization)

Higher-order conditioning - using the CS as the UCS in *another* conditioning
- If you don't keep giving the food after the bell, the second CS will eventually stop working because the first CR extinguishes

1. Bell (USC) → Dogs salivate (UCR)
2. Pair bell with a light
3. Light (CS) → Dog's salivate (CR)

FEAR

Phobia - relatively common, intense and irrational, anxiety disorder
- Realize that the fear is irrational but can't help it.
- Little Albert was classically conditioned to be afraid of mice, and then he feared anything white and furry - ***fears generalize.***

Behavior therapy
- Uses classical or operant conditioning to cure fear
- Phobia viewed as an error in learning, so the cure is to relearn

Systematic desensitization (Wolpe)
- Patient learns muscle relaxation techniques and is exposed to the fear stimulus
- The fear stimulus gets gradually more intense
- **Probably the best method**

Exposure therapy - expose phobic patient to fear stimulus without any UCS (the real thing they fear), allowing extinction to occur
- Highly effective

Flooding - immediately expose the person to the fear stimulus
- **Problem:** the person may not be willing to expose themselves & it's not always possible

Implosion - patient must imagine fearful situation **(ex. think about being in a room full of snakes)**

Counter-conditioning - replace conditioned response with something else
- Pair feared object with positive stimulus-response

- Careful though, if you don't build up the intensity of the fear stimulus slowly, you will end up fearing the *positive* stimulus too - the conditioning will go the other way

Aversion Therapy - believes behavior maintained because of reinforcement
- I.e. Alcohol relaxes body; staying home avoids fear; gambling causes thrill
- Change behavior by changing reinforcement to punishment
- Ex. Using antabuse to cure alcoholism. If you take antabuse, drinking makes you ill.
- Mixed results; often very short term effects

- Virtual-Reality exposure can be just as effective as in vivo (real life) exposure
- Fear is easier to condition than any other stimuli
- Easier to condition aversion to taste by pairing it with illness because your body is primed to associate bad taste will illness. It is much harder to associate vision with illness.

Attraction
- Marketers pair their products with already favorable stimuli to create favorable attitudes
- This can be used to create negative attitudes too, like to smoking/drugs

Allergies
- Allergic reactions can be caused by neutral stimuli that are paired with an allergen
- For example if you pair a fishbowl with the triggers of asthma, eventually Asthma attacks can be caused by a fishbowl

OPERANT CONDITIONING

- Unlike classically conditioned responses, these are voluntary - classical responses happen automatically

Thorndike's Law of Effect
- A response followed by a satisfying consequence will become more likely to occur, and opposite of unsatisfying consequences
- **Instrumental Learning** - because behavior is instrumental to bringing certain outcomes

Model
1. Dominant response for a cat in a box is initially to scratch the walls.
    - You are trying to change this response to: press the lever.

2. Choose and reinforce **target response**

3. Stimulus situation → target response

This model *is* response contingent.

Skinner's Operant Behavior

- **Operants** are broader than responses
- **Response-reinforcement** bond is critical - responses that get reinforced are more likely to occur
- Reinforcement-response is strengthened by an outcome that follows it

Operant Model

A) *Antecedent stimuli* - IF I say "sit"
B) *Behavior* - AND my dog sits
C) Consequence - THEN she gets a treat

These are known as **contingencies** - getting food is contingent to response of sitting.

Differences Between Classical and Operant Conditioning

Classical: association between *two stimuli*
stimulus occurs before behavior
Operant: association between *behavior and consequences*
behavior changes because of events that occur after it
Classical: reflex caused by preceding stimulus
Operant: organism generates response itself

The operant conditioning model and the Instrumental Learning model are very similar. Operant/Instrumental learning is very different, however, from operant conditioning.

Many learning situations involve both

- Teacher becomes classically associated with squeaking chalk
- Teacher raising chalk to board then triggers plugging ears (plugging ears is operantly reinforced because it has a pleasant consequence - we don't hear the screeching)
- Chalk has classical and operant effects

Antecedent Conditions

- If you pushing a button dispenses food only when a light is on, that light is a **discriminative stimulus;** sets the occasion for operant responses
- The sight of teacher raising chalk to board was discriminative stimulus
- Class bells, words people say, sight of friend's face: all discriminative stimuli

Operant Consequences

- **Positive reinforcement** - food for pressing lever, praise for job well done
- **Negative reinforcement** - umbrella to avoid rain, Advil to stop headache
- **Operant extinction** - weakening/disappearance of response because it is no longer enforced

GIVING SOMETHING GOOD
REMOVING SOMETHING BAD
REMOVING REINFORCER

- ex. Treating attention-seeking misbehavior in a child with a time-out
- The child is misbehaving because he wants attention, and he learned that doing so gives him attention. Giving him a time out teaches him that misbehaving no longer gives you attention.

- **Positive punishment** - spanking, pain - response weakened by presentation of stimulus GIVING SOMETHING BAD
  - May fail to generalize - ex. child only doesn't swear when parents aren't present
  - Children may learn aggressive behavior form their parents
  - Punishment only works if its swift, consistent & aversive - otherwise not good
  - **Discrimination training** actually works the best - punish bad **AND** reward good
- **Negative punishment** - fines, loss of privileges (AKA response cost) REMOVE SOMETHING GOOD
  - Differs from operant extinction because thing being removed is not cause of behavior. The child's bad behavior was being rewarded with attention, so taking it away is operant extinction. But if you take away his video game system instead, its negative punishment.
  - Less likely to create hatred of punishing agent than positive punishment

Primary reinforcers - naturally reinforcing, satisfy biological needs (food and water)
Secondary/conditioned reinforcers - associated with primary reinforcers ($$, grades)

- Money is secondary reinforcement: you want the stuff money can get you.
- "Good dog" becomes a secondary reinforcer due to it becoming associated with food
- There is also secondary punishment. Cat is told NO and sprayed with water if it touches plants. Soon, only saying NO is enough.

Delay of gratification - the timing of consequences affects humans less than animals. Some people (drug addicts) can't overcome immediate gratification.

Shaping - reinforcing successive approximations toward a final response

- Ex. Rewarding a shy child for speaking at louder and louder volumes

Chaining - reward each response with opportunity to perform next response

- Ex. The bell turns on the light → If the light is on, the lever gives food.
- Works better than higher-order *classical* conditioning because the food is still given
- The light becomes a secondary reinforcer, food is primary.

Operant generalization - child learns not to touch his own stove; doesn't touch all stoves
Operant discrimination - child learns to only raid cookie jar when parents aren't home

- Operant response will occur to one antecedent but not another
- When discriminative stimuli influence behavior it is called stimulus control; ex. police cars exert stimulus control over people's driving

- We can use this to tell if animals can see color. If they can discriminate between different colors of light stimuli, they can see color.

Reinforcement Schedules

CONTINUOUS VS PARTIAL

Continuous reinforcement schedule - all responses are reinforced (FR-1)
- Every time you push the lever, you get food
- Produces very rapid learning, but extinguishes faster.
  - Once the lever stops giving you food, you just stop pushing it.

Partial (intermittent) reinforcement schedule - only some are reinforced
- Slot machines are like this. Sometimes you get money, sometimes you don't.
- Slower learning, more resistant to extinction.
- You don't give up when it stops giving you money because that's normal.
- **Partial reinforcement effect** - experience with extinction maintains responding because reinforcement is unpredictable

RATIO VS INTERVAL

Ratio schedules - certain % of responses are reinforced
Interval schedules - certain amount of time must pass before the next response is reinforced

FIXED VS VARIABLE

Fixed schedule - reinforcement occurs after fixed number of responses
(ex. after 3 lever presses you get food)
Variable schedule - number of responses necessary for the next reinforcement varies
(ex. after an *average* of 3 lever presses you get food)

Fixed-ratio schedule - FR-3 means reinforcement occurs after every third response
- Produces high response rates. Used in workplace a lot.
- After reinforcement is delivered, there is a pause, since you know the next response is not going to be reinforced.

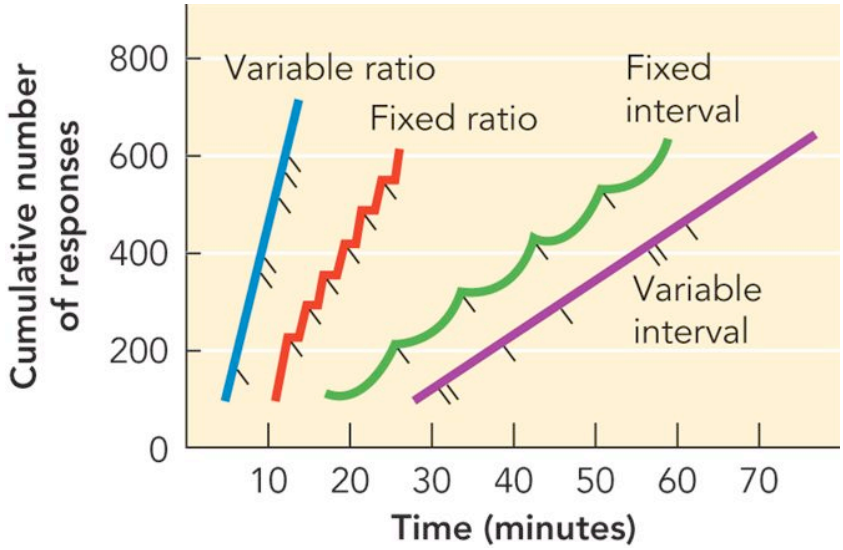
Variable-ratio schedule - VR-3 means three responses on average are required for a reinforcement
- Very resistant to extinction, less pausing after reinforcement
- Slot machine uses this

Fixed-interval schedule - first response after a fixed time interval is reinforce
- FI-3min schedule, rat presses lever over and over and gets one treat every 3 mins
- Exam schedules are like this: they cause very uneven performance. No studying after an exam, and a lot of studying right before exam.
- Slow responses to start, then gradually sloping up to a very fast response

Variable-interval schedule - first response after a variable time interval is reinforced
- VI - 1min means the interval is 1 min on average
- Produces steadier and lasting response rate, but a lot slower learning
- Ex. Pop quiz, random drug test, speed traps

VI/VR (especially VI) are better than FR/FI at resisting extinction.

You should be able to identify these.



To produce fast learning with high resistance
1. Start continuous
2. Then shift to partial, preferably variable

Applications of Operant Conditioning
Skinner: believed positive reinforcement can solve social problems
- Social influence is part of human nature
- We use too much punishment

Training Animals
- Train pigeon to peck at orange dots, use them to find victims in life jackets
- Dogs for law enforcement
- Sea lions to retrieve sunken test weapons

Human Applications
- Software learning is based on *immediate feedback* and *self-paced learning* (Skinner's ideas)
- **Skinner:** bad performance is not due to laziness, its lack of motivation

- **Token economies** - give a star for good behavior, lose a star for bad behavior. Then, exchange stars for tangible rewards.
- **Applied behavior analysis (AKA behavior modification)** - use positive reinforcement to change behavior and solve individual and societal problems

    Used for seat belts, to reduce workplace injuries, and for energy conservation

BIOLOGY AND LEARNING

- Behaviorism ignores evolutions influence on learning
- **Preparedness** - though evolution, animals are biologically prewired to easily learn behaviors related to survival of species
- Behaviors contrary to evolution are learned slowly, if at all

Learned Taste Aversion

- **Conditioned taste aversion** - pairing smell or taste with toxin so that the the taste/ smell now repulses you
- Animals show taste aversion even when the food and the illness are hours or even a days apart
- Rats are biologically primed to form taste-illness associations
    - If you give them 3 UCS's at the same time (buzzer, light, drink) and make them sick with x-rays, only the drink will become the CS
    - But if you pair the buzzer, light and drink with electric shock, the drink doesn't cause a fear response. Biologically, sights and sounds, not tastes, signal fear.
- Chemotherapy causes nausea so patients have to be careful not to cause associations with the food they eat before chemo and the nausea

    One way to do this is with a "scapegoat" candy given before the chemo that has a very distinct taste

Biologically Prepared Fears

- Much easier to classically condition fear of neutral stimulus if it is snake, spider, angry face than if it is flower, house, happy face
- Phobias to cars, guns, cigarettes, knives are rare but fears of snakes, spiders are not
- Is this due to culture (cognitive) or evolution (biological)

Immune System

- The immune system can be conditioned
- Rats given sweet water and made sick with immunosuppressant
- Later given sweet water without drug and they got sick again, some even died
- Classical conditioning can also be used to boost immune system; sherbet with epinephrine causes sherbet to increases immune system

- A girl's overactive immune system disease was treated by conditioning cod liver oil (distinct taste) to an immunosuppressant

Constraints on Operant Conditioning

- Brelands tries to teach a chicken to play baseball. The conditioning worked well until the ball was introduced: the chicken chased it and pecked at it thinking it was the food. This behavior couldn't be extinguished.
- Racoons were taught to drop token into a box for food, but they kept washing the tokens like they would wash food
- This is called **Instinctive drift** - drifting back to instinctive behavior
- You can train a pigeon to peck for food, but not to peck to stop shock; *flying* is for fleeing, not pecking
- You can train rats to press a lever for food but they will often drift to scratching and biting it

Learning and the Brain

- **Cerebellum** - classically conditioned movements (blinking)
- **Amygdala** - classical conditioned fears
- **Nucleus accumbens**, **dopamine** - rewards
- Rich learning environment causes better brain development and therefore better learning ability

COGNITION AND LEARNING

- Behaviorists focus on Stimulus-Response (SR) psychology but they ignored thoughts and feelings
- Some acknowledge that the organism is between the S and R; called S-O-R psychology
- Learning involves the formation of **cognitions** - internal processing of information (thoughts, beliefs), making predictions

Insight and Cognitive Maps

- **Thorndike**: Chimps learn by insight, not trial-and-error
    - Monkey stacks boxes to reach bananas (Kohler)
    - Behaviorists argue that insight is a combination of previously reinforced responses
- **Tolman**: Cognitive map - mental representation of a maze
    - If a rat is placed in a maze, and then the maze is changed, the rat knows the new path to the food

Escape and Avoidance Conditioning

Escape conditioning - organisms learn a response to terminate an aversive stimulus

- Acquired and maintained through negative reinforcement
- Ex. Putting on a sweater to escape cold, taking aspirin to escape headaches

Avoidance conditioning - organism learns to completely avoid aversive stimulus
- Learn to respond before stimulus even begins
- Putting on sweater before you go outside
- Harder to extinguish

Example:
- Mouse learns to run to other platform when the platform it is on gets shocked (escape)
- Mouse learns that if the light is on, its platform is about to get shocked so it runs to other platform (avoidance)
- Animal doesn't hang around long enough to know if the shocks stopped, so its hard to extinguish

Two-Factor Theory of Avoidance Learning - classical and operant are involved
- The light causes fear through classical conditioning
- And the fleeing is negatively reinforced by fear leaving
- Doesn't explain everything about avoidance
    - Why move towards something you fear (the light)?
    - Why do some people develop phobias easier than others; biology and thinking patterns play a role
    - We have to admit that the animal is thinking: the animal *expects* a shock if the light is on

Seligman
- Animals who had no control over their environment (i.e. both platforms have shocks in them) develop "**learned helplessness**"
- Learn that there is no contingency between response and reinforcement
- Even if you give them a safe chamber, and show them that it is safe, they sit in the corner and look clinically depressed
- **Pet/plant therapy** - give a person a pet/plant so they have control over something

Perception of Control (Glass and Singer)
- People put in a room with loud noises and tell them to do a task and they do poorly
- But if they give you a button that can "turn off the noise", they perform better - but they don't use the button

Amygdala is responsible for fear conditioning (predicting danger)
- Sometimes fear conditions leads to misdirected fear response (PTSD, phobia)
- In PTSD, amygdala is unchecked by higher-mental process and becomes overactive

Cognition in Classical Conditioning

- Behaviorists believe classical conditioning creates a reflex-like connection
    - Pavlov though a neural bond was formed
- Cognitive theories believe an expectancy link is formed
- **Expectancy model** - what matters is not how well the CS and UCS are paired buy how well the CS predicts the UCS
    - If you are pairing a tone and a shock, and you add random shock between the tone + shocks, it ruins the pairing as the expectancy model predicts
    - This is why other things present when you are conditioning (the light in the room) do not become CS: these things do not consistently predict the response
    - This is highly adaptive: we would have crazy reflexes without it
    - The fact that forward pairing > simultaneous pairing > backward pairing is proof the of the expectancy model

Cognition in Operant Conditioning

Awareness

- You have to be aware of the pairing
- The ***perceived*** connection is what matters, not the actual one (superstition, or misinterpretation)

Latent Learning

- Rats put in a maze without food for 10 days
- Then suddenly give them food for solving the maze
- These rats can find the food as well as rats that have been trained to solve the maze
- They were **latently learning** - learning the occurs but is not demonstrated until there is an incentive

Self Evaluation

- Why do we resist temptation for some things even if we have no chance of punishment?
- Cognitive self-evaluations are internal reinforcers/punishers
- Through socialization, we internalize social standards that influence our actions

There is a third kind of learning called Observational Learning

- This is when you watch **models** and learn from them
- You aren't actually being conditioned in any way

MEMORY CHAPTER 8

THE BASICS

Encoding (acquisition) - getting info into the system by translating into neural code
Storage (retention) - retaining info over time
Decoding (retrieval) - pulling info out of storage and using it

THREE COMPONENT MODEL

1

Sensory memory - holds incoming sensory info (visual or auditory mostly) just long enough for it to be recognized

- **Sensory registers** - initial info processors
    - **Iconic store** - visual sensory register; impossible to retain purely visual info longer than a fraction of a second - called an icon
    - **Echoic store** - auditory sensory register; longer than iconic - about 2 seconds - called an echo
    - Sensory register for other systems is very poor

2

Short-term/working memory - small portion of sensory memory enters this part, which holds info we are conscious of. Called "working memory" because it is consciously processing.

- Working Memory is also involved in recall:
  Recall info goes from Long Term Memory → Short Term Memory → Output.
- **Memory codes** - forming mental image (visual), coding by sound (phonological), focusing on meaning (semantic), patterns of movement (motor)
    - ex Visually represent a phone number in your mind
    - The form of the memory code does not always correspond to original stimulus - words are visual stimulus but semantic/phonological coding
    - You are more likely to have trouble remembering 10 words that sound the same, not 10 words that mean the same thing. Hence words are coded *phonologically*.
    - In STM, everything ends up as auditory code eventually so things that sound the same are the most interfering
- **Capacity/Duration** - **7∓2** - "the magic number" of meaningful items that can be in STM
    - A word is one unit, but if its letter are presented separately they are different units. Combining units to aid memory is called **chunking**.
    - Without rehearsal, short term info has **20 second** lasting time.
    - **Maintenance rehearsal** - ex. repeating a phone number to yourself - shallow processing, useful for short-term

    - **Elaborative rehearsal** - focusing on *meaning* of into, relating it to things we know - more effective in transferring to long term, deeper processing
- Short term memory is not just a loading bay to the long term, it is "working memory" that categorizes and cross-references info
    - **Auditory working memory** (phonological loop) - repeating words to yourself
    - **Visual-spatial working memory** (visuospatial sketchpad) - mental maps/images
    - **Episodic buffer** - space to integrate long term memory with visual and auditory working memory
    - **Central executive** - directs the action, decides how much attention to give to what (prefrontal cortex is involved)
- **Forgetting** (this also also applies in LTM)
    - **Decay** - material gets old, fades away over time
    - **Interference** - new material pushes old stuff out
        - If you go to sleep right after learning, you retain info much worse because of interference.

3

Long Term Memory

- We can form long-term memories until we die; there is unlimited storage
- In LTM, things are coded semantically (according to meaning) - so things that *mean the same* are most interfering

Serial position effect - It is easier to remember first and last items in a list
Combination of two effects:

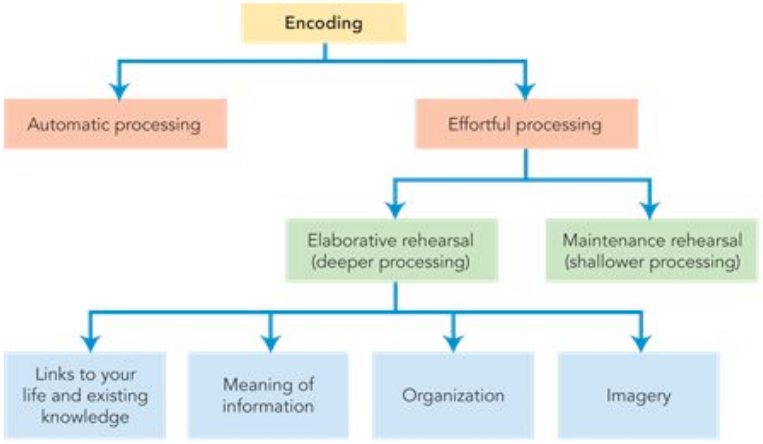
- **Primacy effect** - early words transfer to long term memory
- **Recency effect** - last words are still in short term memory
    - Primacy effect can be removed by saying the list items faster
    - Recency effect can be removed by asking you to count to 30 after the last item

Evidence that STM and LTM exist?

- People with brain damage, e.g. Clive Wearing
- One guy with STM loss gets better at a task, but doesn't remember doing it

Effortful and Automatic Processing

Effortful - rehearsing, making lists, and taking class notes (ex. studying for test)
Automatic - info about frequency, spatial location, sequence, and timing (ex. the order you did stuff in a day)



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ENCODING

Structural encoding - how the word looks (are the letters capital)
Phonological/phonemic encoding - how the word sounds (does it rhyme with _____)
Semantic encoding - what the word means (does it make sense here)

Levels of processing - the more deeply we process, the better we remember
- Sometimes it's hard to know which activity is deep processing
- Even thousands of shallow processes won't bring something to long term memory

Want proof? Which one is the real penny. →

Using **Organization and Imagery** to enhance memory

Hierarchy - meaningful hierarchy causes better memory than random hierarchy
- Enhances understanding and uses imagery to supplement memory code
- Organizing stuff you're trying to remember into hierarchy will help you remember it

Chunking - organize info into smaller meaningful chunks
- Phone numbers are organized into three parts (999 - 8888 - 7777)
- CTVFBIKGB is easier to remember when you split it into CTV, FBI, KGB

Mnemonic devices - any sort of memory aid (hierarchy, chunking, acronym)
- Some argue acronyms don't aid memory, only help you recall it if you are already familiar with it

Visual imagery
- **Dual coding theory** - coding using both verbal and non-verbal cues enhances memory, because it increases odds that one of the cues will be available

  Dual coding is hard for some things - firetruck is easier to code visually, jealousy is easier to code semantically

- **Method of loci** - imagine a distinct environment and form an image linking the place to the item you want to remember

Prior Knowledge Shapes Encoding

Schema

- Schemas are "concepts"
- They are mental frameworks. An organized pattern of thought about something.
- Creates a readiness to perceive info a certain way

Acquiring "expert knowledge" is developing a schema

- Expert chess players are better than novices at remembering the pieces on a board, but only when the pieces are in a logical position
- If they are placed randomly, they both remember just as well
- This is because the expert's schema is only useful when the pieces are in a logical order
- You own schemas influence what you encode and remember

Memory as a Network

Associative network

- Memory is a massive network of associated ideas and concepts
- Memories are connected nodes in a web
- Nodes that are related are closer together (Semantic network)
- **Priming** - activation of one concept by another (spreading activation)

Neural networks

- In this model, neurons in your brain do not actually store any info
- Each neuron is small info processing unit
- "Concepts" or "memories" are activated when a specific *pattern* of neurons are fired

Types of Long Term Memory

- We have several LTM systems that interact
- **Declarative memory** - factual knowledge
  - **Episodic memory** - factual knowledge concerning personal experiences (when, where and what happened)
  - **Semantic memory** - general factual knowledge about the world, language
- **Procedural memory** - skills and actions
  - ex. Typing, bike, instrument
  - These are classically conditioned responses

Explicit Vs Implicit Memory

Explicit memory - conscious and intentional memory retrieval

- **Recognition** - decide if a stimulus is familiar (multiple choice quiz, police lineup)

- **Recall** - spontaneous memory retrieval (essay, short-answer, fill in the blank)
    - **Cued recall** - hints given to simulate memory

Implicit memory - memory unconsciously influences behavior
- Riding a bike, driving
- **Priming** - quickly read a list of words and later asked to finish fragments like KIT__, MO____. You will finish them with the words you were read, even if you couldn't recall them originally.

RETRIEVAL

Retrieval cue - internal/external factor that stimulates info in LTM (ex. priming)
- Having multiple self-generated cues is the best way to remember
    Involves deeper processing to self-generate multiple cues
    They have personal meaning to you
    And if one fails you have the others

Distinctiveness - if something is distinct from surrounding stimuli it is easier to remember
- Weddings, romance, births/deaths, vacations are easier to remember because they are distinct from everyday life
- To prevent study material from "all looking alike", associate it with distinct personally meaning info

Flashbulb memories - vidid clear snapshots of memories
- Can be positive or negative events
- Despite confidence people may have in them, they are not necessarily accurate
    - Students asked 3 years apart about these memories give different responses, even though they are confident each time
    - People confidently say they saw the plane crash video on 9/11, or Diana's crash on TV even though thats impossible - neither was available at that time

Encoding specificity principle - memory is enhanced when conditions present during retrieval match those during encoding
- **Context-dependent memory** - sights of school may trigger memories of friends, teachers
- If you learn words underwater or in noisy rooms, they are remembered better in the same environments

State-dependent memory - better retrieval when internal states are the same during encoding and recall

- ***For example:*** Material learned while running is better recalled while running
- This may be part of the reason drugs seem to affect memory
- It works with arousal, but mood-dependent memory is not a reliable phenomenon. We don't need to be happy when we're recalling if we were happy when we were learning.
- However, **mood congruent recall** is reliable: we tend to recall happy events if we are happy - causes moods to perpetuate

FORGETTING

Ebbinghaus - studied relearning and savings percentage

- Studied memory by seeing how well he can recall "nonsense syllables" (DAX, BOK, YAT)
- The problem was that he was his only subject, so his studies aren't very generalizable to the population

Improving Memory

- **External aids** - shopping lists
- **General memory strategies** - organizing, rehearsing
- **Formal mnemonic techniques** - acronyms
- **Overlearning** - continued rehearsal past point of initial learning

  Sounds like it would bad, but its actually good. The more the better.
- Distributed learning is better than massed. Don't cram.
- Arousal moderately high - not too high, not too low is the best for learning.
- Use imagery

Keyword method - think of highly visualize image and link it with new concept, have words interact

Method of loci - place each item at a different "location", also best with interaction

Peg method - take an easy list (ex. 1,2,3 or ABC) and use the items as "pegs" to hang new info

Why do we forget?

- **Encoding failure** - not necessarily forgetting what we knew, but never encoding it to begin with
- **Decay theory** - with time and disuse, the physical memory trace fades away
  - Theory in debate
  - Sometimes, when you are tested twice you do better the second time, which is inconsistent with decay theory
- **Proactive interference** - material learned in the past interferes with recall of newer material (your old phone number messes with remembering new one)

- **Retroactive interference** - new info interferes with your ability to recall old info (you can't remember your old phone number)
    - The more similar the material, the more likely interference is
    - **Tip-of-tongue** - when you feel like you're just about to remember something. A study shows that it's possible that you never the knew the info at all, and the tip-of-tongue was just an illusion.
- **Repression** - motivated forgetting of anxious events. Controversial idea.

Amnesia
- **Retrograde amnesia -** forget events prior to the amnesia
- **Anterograde amnesia** - can't form new memories (Korsakoff's syndome)

Dementia and Alzheimer's

Dementia - impaired memory & other cognitive deficits that come with brain degeneration

Alzheimer's - most common among in those over 65. Half a million people have it.
- Forgetfulness, poor judgement, confusion, disorientation
- Death within 10 years
- Degeneration of temporal lobe, hippocampus - areas that turn STM into LTM
- Disrupts acetylcholine system (important for memory)
    - Drugs that maintain acetylcholine temporarily improve it
- Anterograde and retrograde amnesia
- Affects procedural, semantic, episodic and prospective memory

Cause?
- Chromosome 21 defect (same as Down's syndrome)
- Abnormal amount of "plaques and tangles"
- Viral damage to blood-brain barrier
- Not true that aluminum/zinc causes it

Treatment
- Nourishment and exercise
- "Smart drugs" (called nootropics) - piracetam, aspirin, or advil slows progression
- Brain grafts & vaccine being developed

Infantile (Childhood) Amnesia
- We can't remember anything that happened when we were infants
- Why? Maybe we don't encode them deeply? Maybe infants don't have a self-concept?

Prospective Memory

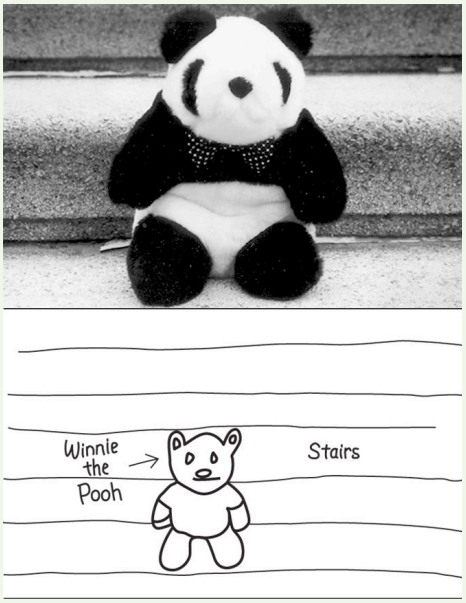
- Remembering to do things in the future (ex. Remember to get eggs when I'm at the grocery store)
- Good retrospective memory ***doesn't*** mean good prospective memory
- Older adults tend to have worse prospective memory, but they are fine with pill-taking tasks

MEMORY AS CONSTRUCTIVE PROCESS

- We can "reconstruct" memories by piecing together bits of info
- Student remember their grades as higher than they were, and are more likely to remember A's than D's

Memory Distortion and Schemas

- "The War of the Ghosts" was an aboriginal tale retold by englishmen
- The more time passed, the more "english" the story becomes because of the teller's schemas



Boundary extension - remembering something you saw as being "wider-angle" than it really was

Misinformation effect - distortion of memory due to misleading post-event info

- If the police officer is interviewing you about an accident you say and he says "How fast were the cars going when they smashed" or "...when they collided" or " ... when they bumped"
- The word he chooses will affect how fast you will say they were going.

Source confusion - we recognize a thing as familiar but don't know where we saw it
Ex.

- Show a witness 5 mugshots and ask them to identify the criminal - they say none of them did it
- Then, two weeks later, show them 4 random mugshots and 1 mugshot from before
- Witness is very likely to say the one face they've already seen two weeks ago was the criminal

They confuse the source of the familiarity.

People often forget that something they were *told* (ex. the thief wore gloves) was told to them by someone else. They genuinely believe they saw the thief with gloves because they forgot the source of the info.

People are very susceptible to suggestions! Eye-witnesses are notoriously **inaccurate**.

- Alcohol negatively affects witness accuracy
- Visual cues are easier to remember than audio cues
- Men and women are equally inaccurate witnesses, but men are more confident are their inaccuracies

Children

- They are even more susceptible to suggestions
- They believe what they are saying is true, they aren't lying

Recovered Memories

- When a therapist gets someone to "remember" sexual abuse that they had supposedly repressed
- Are recovered memories of sexual abuse accurate?
- Why were they forgotten for so long?
- Memory loss **can** follow psychological trauma, even retrograde amnesia for info presented before the event
- However, inability to forget traumatic events (flashbacks) is more likely than forgetting
- "Recovered memory therapy" may be implanting memories by suggestion - approach with caution

BIOLOGY OF MEMORY

- Lashley couldn't find the "**engram**" - the area of the brain where memories are stored
- Penfield was able to trigger memories by poking parts of the brain, but these are most likely constructions rather than memories
- Flatworms can inherit the memories of other flatworms by **EATING THEM.** Results in a theory that RNA is involved in memory. However, this experiment was not replaceable in other organisms.

Sensory and Working Memory

- Using the visuospatial sketchpad (imaging something in your head) activates the same parts of visual cortex as looking at actual object
- **Frontal lobe:** deeper encoding produces more frontal lobe activity

Long Term Memory

- Hippocampus helps convert STM into LTM, but it is not where LTM are stored
- **Memory consolidation** - the various components of a memory are processed in different regions of the cortex and gradually bound together in the hippocampus
- Several brain regions are involved
- Thalamus damage also results can impair the encoding of new memories and the retrieval of old ones
- Amygdala is responsible for emotional arousing aspects of LTM
  Usually emotional stimuli are easier to remember. But if you have damage to amygdala, this "memory advantage" disappears.
- Cerebellum is responsible for procedural memory

YOU MADE IT!

HOW WAS IT? GREAT? GREATEST?
TALK TO US AT HELLO@WUCKEXAMS.COM