PSY1101 – Midterm 2 Study Guide

Introduction to Psychology: Foundations (University of Ottawa)

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Consciousness

What is a drug?

- Not food and usually not a toxin either (so most foods are not drugs and neither are most poisons)

Working definition: A substance that alters the psychology of the body but is not a food or nutrient. OR Chemicals that are administered to the body to bring about some desired change (*intent*)

Substance Abuse Disorder

- Addiction is the most extreme form of substance abuse disorder (context of psychoactive drugs)

Four defining categories:

  - Diminished control (trouble controlling the use of the drug)
  - Diminished social function (detrimental to normal social activities)
  - Hazardous use (using despite physical and psychological dangers)
  - Drug action (evidence of tolerance and withdrawal)

Tolerance and addiction

Tolerance: With repeated use, the desired effect requires larger doses.

Addiction: compulsive craving of drugs or certain behaviours (such as gambling) despite known harmful consequences.

Withdrawal: discomfort and distress that follow discontinuing an addictive drug or behaviour (evidence for physical dependence)

Tolerance graphed – the Dose-Response Curve

The first time a drug is used, most drugs follow a distinct dose-response pattern – larger doses associated with bigger effect → effect not as great in high doses.

- With continued use, the curve shifts to the right. (more drugs needed to get a similar effect)

What Roles Do Tolerance, Withdrawal, and Addiction Play in Substance Use Disorders?

- Psychoactive drugs alter perceptions and moods.
  - They may produce tolerance – requiring larger doses to achieve the desired effect – and withdrawal – significant discomfort accompanying attempts to quit.
- Those with a substance use disorder may exhibit impaired control, social disruption, risky behaviour, and the physical effects of tolerance and withdrawal.

How Has the Concept of Addiction Changed?

- Two major interpretations (historically)
  1. It's a choice (i.e. weak people do drugs; drug addicts have poor willpower)
  2. It's a disease needing treatment (inherited genetic predisposition)

The Evolving Concept of Addiction

- Extended to cover many behaviours
- Degree and scope of what people can be addicted to is debated
- DSM (Diagnostic and Statistical Manual of Mental Disorders) includes gambling disorder
- DSM is proposing the study of internet gaming disorder
  - The disease model suggests:
    - That we can offer treatment for many driven, excessive behaviours that become compulsive and dysfunctional
    - However, without social and development perspectives, this would be likely be less effective → this is slowly being taken into consideration

Are drugs addictive?

No, that would mean anyone who has ever had a glass of wine would be an alcoholic.

Type of Psychoactive Drugs

Three Main Categories:

1) Depressants
   a) Drugs such as alcohol, barbiturates (tranquilizers), and opiates
   b) These drugs tend to calm neural activity and slow body functions

i) **The Example of Alcohol**
- Slows neural processing and is a potent sedative when paired with sleep deprivation
- Disrupts memory and has long-term effect on brain and cognition; impairs growth of synaptic connections (animal studies)
- Reduces self-awareness and self-control
- Produces myopia (near-sightedness) by focusing on arousing situation at expense of normal inhibitions and future consequences → alcohol is a "disinhibitor"

ii) **Expectations influence behaviour**
- Attribution of social behaviours or sexual responses to alcohol releases inhibitions (whether or not a person consumes alcohol)
- Fourteen interventions studies with college students have shown lowered positive expectations of alcohol and reduced drinking in the ensuing month

iii) **Barbiturates**
- Depress the activity of the central nervous system, reducing anxiety but impairing memory and judgment
- Can impair memory and judgment; potentially lethal combined with alcohol → possible contribution to the death of Marilyn Monroe

iv) **Opiates**
- Include opium and its derivatives, such as codeine, morphine and heroin – also fentanyl and others
- Constricts pupils, slows breathing, causes lethargy
- Depresses neural activity, temporarily pain and anxiety
- Causes withdrawal when ingestion is stopped

2) Stimulants

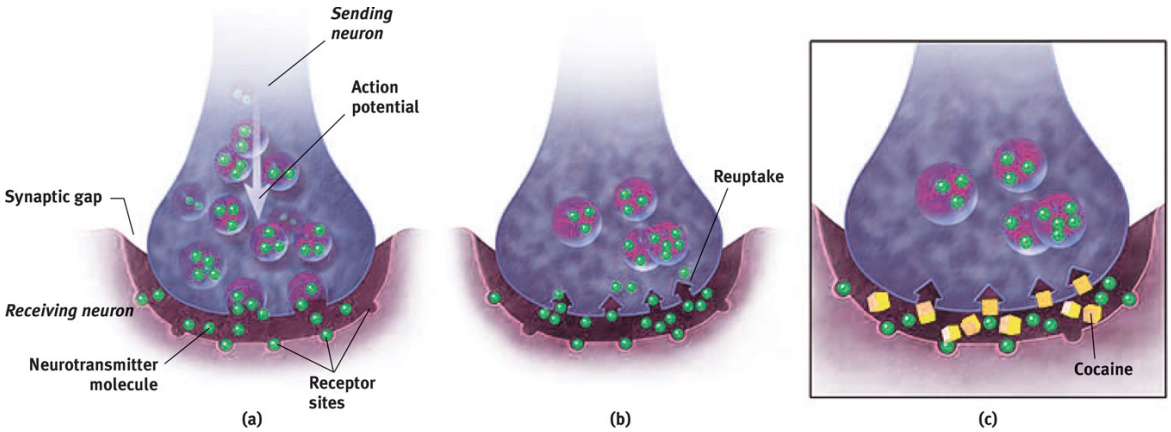
i) **Stimulant drugs**
- Includes caffeine, nicotine, and the more powerful amphetamines, cocaine, Ecstasy (MDMA), and methamphetamine that excite neural activity and speed up body functions
- Involves dilation of pupils, increase in hear and breathing rates, rise in blood sugar, and drop in appetite
- Often involves increase in energy and self-confidence

ii) **The Example of Nicotine**
- Is the stimulating and psychoactive drug in tobacco
- Signals the central nervous system to release a flood of neurotransmitters
- Diminishes appetite, boosts alertness and mental efficiency, calms anxiety, and reduces sensitivity to pain
- Involves challenging acute craving and withdrawal symptoms which contribute to relapse

iii) **the Physiological Effects of Nicotine**
- Nicotine reaches the brain within 7 seconds
- Within minutes, the amount in the blood soars

iv) **Cocaine**
- Produces quick rush of euphoria
- Involves crash of agitated depression within 15 to 30 minutes after neurotransmitters drop
- Produces psychological effects depending on dosage and form consumed user's expectations and personality

How Cocaine Works – blocks reuptake (mainly of dopamine)



Neurotransmitters carry a message from a sending neuron across a synapse to receptor sites on a receiving neuron.

The sending neuron normally reabsorbs excess neurotransmitter molecules, a process called *reuptake*.

By binding to the sites that normally reabsorb neurotransmitter molecules, cocaine blocks reuptake of dopamine, norepinephrine, and serotonin (Ray & Ksir, 1990). The extra neurotransmitter molecules therefore remain in the synapse, intensifying their normal mood-altering effects and producing a euphoric rush. When the cocaine level drops, the absence of these neurotransmitters produces a crash.

v) Caffeine

- Main sources are coffee and tea, but more recently energy drinks
- An energy drink can contain caffeine up to the equivalent of 2 or 3 cups of coffee
- Read labels → 1 cup of coffee contains about 100 mg of caffeine

vi. Effects of caffeine

- Increases rate and depth of breathing
- Constricts blood vessels in brain (can help some with headaches)
- At high doses, can cause agitation → possible to overdose

3) Hallucinogens

a) Distort perceptions and calls up sensory images without any input from the senses

b) Examples are lysergic acid diethylamide (LSD), marijuana, ecstasy, psilocybin (in mushrooms)

i) LSD

- Powerful hallucinogenic drug
- Hallucinations may consist of tunnels, emotional experiences, or out-of-body experiences
- Interferes with serotonin neurotransmitter system

ii) Marijuana

- Can relax, disinhibit, impair motor and perceptual skills, and reaction time
- Experience varies with situation
- Can remain in the body for over a week

*Note: many people use (1) and (2)

Why Do Some People Become Regular Users of Consciousness-Altering Drugs? (Big Question)

- Some people *may* be biologically vulnerable to particular drugs, such as alcohol.
- Psychological factors (such as stress, depression, and hopelessness) and social factors (such as peer pressure) combine to lead many people to experiment with – and sometimes become addicted to – drugs.
- Cultural and ethnic groups have differing rates of drug use
- Each type of influence – biological, psychological, and social-cultural – offers a possible path for drug misuse prevention and treatment programs

Drug Prevention and Treatment Programs

- Educate people about the long-term costs of a drug's temporary pleasures.
- Help people find other ways to boost their self-esteem and purpose in life.
- Attempt to modify peer associations or to "inoculate" youth against peer pressures by training them in refusal skills.

Sensation and Perception (1)

Basic Concepts of Sensation and Perception

Sensation: bottom-up process by which the physical sensory system receives and represents stimuli at the very basic level of sensory receptors and works up.

Perception: top-down mental process of organizing and interpreting sensory input from experience and expectations.

a) Bottom-up processing is sensory analysis that begins at the entry level, with information flowing from the sensory receptors to the brain.
b) Top-down processing is information processing guided by high-level mental processes, as when we construct perceptions by filtering information through our experience and expectations.

Disruptions of Perception

- Prosopagnosia – the inability to read faces
    - Face recognition is associate with activity in a particular brain area
    - Occurs before you are conscious of it → about 150 ms
- Phonagosnia – the inability to recognize familiar voices

All our senses:

i. Receive sensory stimulation, often using specialized receptor cells
ii. Transform that stimulation in to neural impulses
iii. Deliver the neural information to our brain

- Transduction
    - Sensory information is acquired from energy sources (light, sound waves, chemicals, pressure, etc.). Transduction is conversion of one form of energy into another.

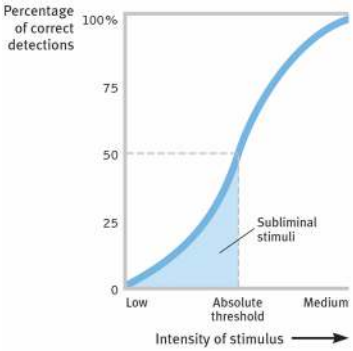
History

- In the late 19th century, field of "psychophysics" was established
- Many experiments were done
- Trying to establish the limits of how we detect energy and make a psychological interpretation
- Initially, researchers studied "thresholds" – i.e., at what point can we detect something?
- This is an ongoing field of study

Absolute threshold: The minimum stimulus necessary for us to perceive it 50% of the time

- Shown by our ability to detect faint light or slight touch
    - This differs from person to person depending on the strength of the signal and also our experience, expectation, motivation, and alertness

Difference threshold: The minimum difference between two stimuli necessary for us to detect the difference 50% of the time (also known as JND or "just noticeable difference")



How much stimuli does it take to have a sensation? (Absolute threshold)

- Typical "ogive" curve showing how stimuli are detected.

Signal Detection

Signal detection theory:

i. Predicts how and when we will detect a faint stimulus amid background noise
ii. Implies that there is no single absolute threshold

iii. Think about hearing an important signal (like the voice of your instructor) in a room full of people who are talking (noise)

Unconscious Perceptions: Subliminal Persuasion

Subliminal stimuli: are those that are too weak to detect 50% of the time

- Big excitement about this in the 1970s – advertiser thought they would be able to convince people to buy things
- Why doesn't this work? Such sensations are too fleeting to enable exploitation with subliminal messages

Subliminal persuasion: may produce a fleeting, subtle, but not powerful, enduring effect on behaviour

Unconscious Perceptions

Priming: activating, often unconsciously, associations in our mind, thus setting us up to perceive, remember, or respond to objects or event in certain ways

- Can set this up experimentally by showing stimuli and then "masking" them before the brain has finished its processing
- These kinds of experiments demonstrate the "dual-track" mind

How much stimuli does it take to have a sensation? (just a noticeable difference)

Difference threshold

- Minimum difference a person can detect between any two stimuli half the time; increase with stimulus size
    - Example: if music is set 40 decibels we can detect a 5-decibel change; if level is increased to 100 decibels we probably can't detect the 5-decibel change → we need a bigger difference when the stimulus is larger

JND and Weber's Law

Weber's law:

- For the average person to perceive a difference, two stimuli must differ by a constant minimum percentage (not constant amount); exact proportion varies, depending on the stimulus. (lights 8%, weights 2%)
- This law holds true for many (but not all) situations

Sensory Adaptation

- Is diminished sensitivity as a consequence of constant stimulation
- Aids focus by reducing background chatter
- Influences how the world is perceived in a personally useful way → we perceive the world as it is useful for us and within the capacity of our sensory systems
- We seek novelty in the environment, rather than similarity
- Influences emotions

Perceptual Set

- Mental tendencies and assumptions that affect (top-down) what we hear, taste, feel and see (expectations)
    - What determines our perceptual set?
        - Schemas organize and interpret unfamiliar information through experience
        - Pre-existing schemas influence top-down processing of ambiguous sensation interpretation, including gender stereotypes

Perceptual Set and Context

Context effects: a given stimulus may trigger different perceptions because of the immediate context.
Perceptual biases: Ex, envisioning a target as larger improves performance (for athletes).

Terms to Learn

Wavelength: Distance from the peak of one light or sound wave to the peak of the next. Electromagnetic wavelengths vary from the short blips of cosmic rays to the long pulses of radio transmission.
Hue: Dimension of colour that is determined by the wavelength of light; what we know as the colour names blue, green, and so forth.

Intensity: amount of energy in a light wave or sound wave, which influences what we perceive as brightness or loudness. Intensity is determined by wave's amplitude (height).

Sensory and Perceptual Processing in Vision

- What is seen as light is only thin slice of the broad spectrum of electromagnetic energy.
    - The portion visible to humans extends from the blue-violet to the red-light wavelengths.
    - After entering the eye and bring focused by a lens, light energy particles strike the eye's inner surface, the retina.
    - The perceived hue in a light depends on its wavelength, and its brightness depends on its intensity.

Light Energy: From the Environment into the Brain

- Waves vary in *wavelength*, the distance between successive peaks.
- *Frequency*, the number of complete wavelengths that can pass a point in a given time, depends on the length of the wave.
- Waves also vary in *amplitude*, the height from peak to trough (top to bottom). Wave *amplitude* determines the brightness of colors (and also the loudness of sounds).

Rods and Cones

- Cones and rods each provide a special sensitivity
    - Cones are sensitive to detail and colour
    - **Rods are sensitive to faint light**

Vision: Visual Information Processing

How does the brain turn light stimuli into useful information about the world?

- Collection and analysis of sensory information
- Linkage of optic nerve with neurons in thalamus

<u>Sensation and Perception (2)</u>

Light Energy

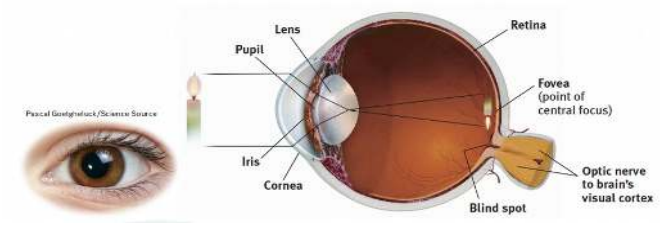
- Waves vary in wavelength, the distance between successive peaks. (blue is shorter than red) (expressed in nanometers)

Frequency: the number of complete wavelengths that can pass a point in a given time, depends on the length of the wave. (expressed as cycle/second or hz)

- Waves also vary in amplitude, the height from peak to trough (top to bottom). Wave amplitude determines the brightness of colors (also the loudness of sounds).

The Eye

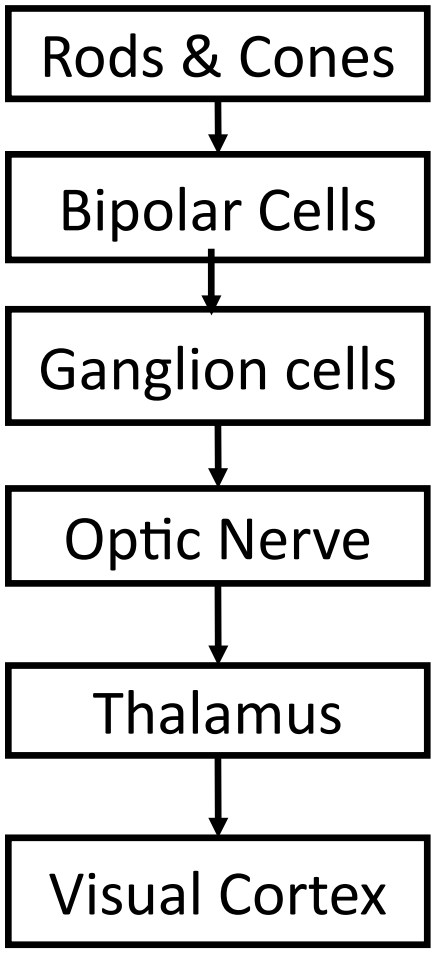
- Vision
    - Light (rays) passes through the cornea, the pupil, and the lens.
    - The lens focuses light onto the retina (by changing its curvature and thickness)
    - Light reflected from the candle arrive upside down and reversed.

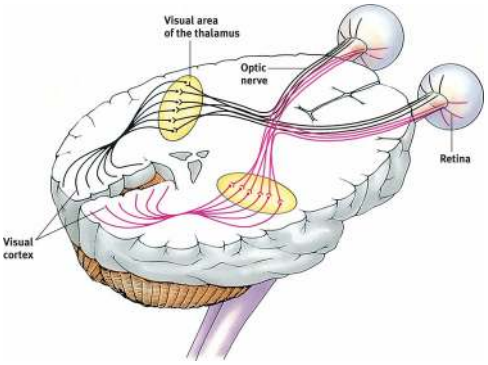


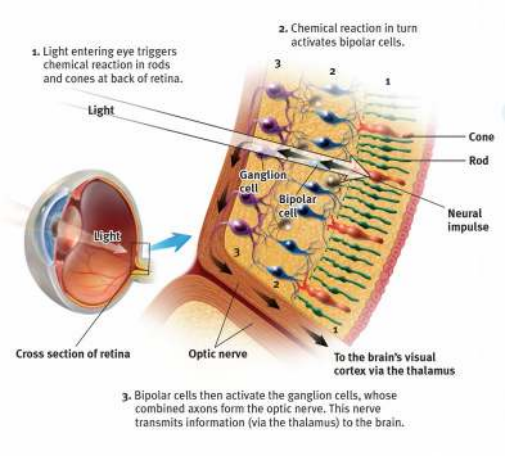
Retinal Processing and Paths to the Cortex

- The Retina's Reaction to Light
    1. Light entering eye triggers chemical reaction in rods and cones at the back of retina.
    2. Chemical reaction in turn activates bipolar cells.
    3. Bipolar cells then activate the ganglion cells, whose combined axons from the optic nerve. This nerve transmits information (via the thalamus) to the brain.

- Retinal processing







  - Light goes to the back of the eye – where the rods and cones are located
  - Chemical changes at the rods and cones transduce light into neutral signals.
  - These neural signals activate the bipolar and then ganglion cell.
  - The axons of the ganglion cells form the optic nerve – these axons exit and the eye at the blind spot.
  - Information from the optic nerve is received by the thalamus (remember it's a sensory relay) and then sent on to primary visual cortex.
- Rods
  - Rod-shaped – not many
  - In periphery of retina
  - Responsible for peripheral vision
  - They share bipolar cells, so the info they send is less detailed
  - Sensitive to faint light
- Cones
  - Con-shaped – lots of them

- In the center of retina (at fovea)
- Responsible for central vision
- Direct connection to bipolar cells, so info is detailed
- Sensitive to color and detail

Color Processing

- Example:
  - When your tomatoes are in the garden, all by themselves, are they red?

No, but they do reflect long light wavelengths (red) and absorb the remaining light. It takes a processing system in living organisms (like us) to detect and interpret the reflected wavelengths as "red".

Stage 1

- Inferred by the Young-Helmontz trichromatic theory (19th century)
- The human retina does have three types of cone dedicated to interpreting different color stimuli → these are red, green, and blue
- Lack of cones cause what we often call "color blindness" (usually missing the red or green cones)
  - Example:
    - How do we see yellow?
    - Via information form red and green cones
    - So, why can colour-blind individuals see yellow?

Stage 2

- Enter Hering and Opponent Process theory
- Got his idea from observing after-images
- Once the cones have responded, information is further processed by opponent-process cells, located at the retina and in the thalamus
- Opponent-Process Cells are in opposition – and in pairs (some are activated by green and shut off by red; some cells are activated by red and shut off by green)

Feature Detection – What did Hubel and Wiesel Discover?

- Most basic finding was that specialized neurons in the visual cortex respond to specific feature of the stimulus, such as:
  - Edges, lines, angles, and movements
- The specialize neurons are called "feature detectors"
- Feature detectors pass information to other areas (supercell clusters) so that complex patterns can be interpreted

What about these complex patterns?

- They correspond to objects important to us → e.g., faces
- Damage to an area of the temporal lobe can cause loss of face recognition, but not loss of recognition of objects like houses or chairs.
- We appear to have widely distributed (in occipital and temporal cortex) specialized cells for particular aspects of biological objects (like other humans) in the environment → e.g., posture, body movement, etc.

Information Processing in the Eye and Brain

- Hubel and Wiesel
  - Showed brain's computing system deconstructs and then reassembles visual images

How does all this construction and deconstruction happen?

- The magic of parallel processing
- That is, the brain does many things at once (motion, form, depth, colour) → speedy integration allows us to perceive the object as whole
- Disruption of one of these will cause deficits in visual perception

Perception Organization: Gestalt Principles

- Gestalt mean "whole"

- Gestalt psychologists propose principle used organize sensations into perception
    - Form perception
    - Depth perception
    - Perceptual constancy

Gestalt Principles: Form Perception

- Figure-ground
    - Organization of visual field into objects that stand out from their surroundings
        - Example:
            - Visual → reading
            - Hearing → paying attention to one person's voice in a crowd
        - Grouping
            - Perceptual tendency to organize stimuli into meaningful groups by:
                - Proximity
                - Continuity
                - Closure

Gestalt Principle: Depth Perception

- Represents ability to see objects in three dimensions, although the images that strike the retina are tow dimensional
- Allows us to judge distance
- Is present, at least in part, at birth humans and other animals
    - Example:
        - Test of early 3-D perception. Most infants refuse to crawl across the visual cliff. Crawling, no matter when it begins, seems to increase an infant's fear of heights.

Seeing Depth: Binocular Cues

- Binocular cues
    - Two eyes help perception of depth
- Retinal disparity
    - Binocular cue for perceiving depth
    - By comparing images from the two eyes, the brain calculates distance
    - Used by 3-D film makers

Seeing Depth: Monocular Cues

- Monocular cue
    - Depth cue, such as interposition or linear perspective, available to either eye alone
        - Light and shadow
        - Relative motion
        - Relative size
        - Linear perspective
        - Interposition
        - Relative height

Perceptual Constancy

- Objects are perceived as unchanging (having consistent color, brightness, shape, and size) even as illumination and retinal images change.
- We experience constancy of color, brightness, shape, and size
- Constancy is" top-down" – lighting and view angle don't matter

Gestalt Principles: Colour Constancy

Colour Constancy

- Perceiving familiar objects as having consistent color, even if changing illumination alters the wavelengths reflected by the object
- Possible because colour perception is based on *surrounding* colours

Visual Organization: Shape and Size Constancy

Size Constancy

- Perception of objects as having constant size even when distance from them varies
- Perception of form of familiar objects as constant even when retinas receive changing images

Experience and Visual Perception: Perceptual Interpretation

- Restored vision and sensory restriction
  - Effect of sensory restriction on infant cats, monkeys, and humans suggest there is a critical period for normal sensory and perceptual development
  - Without stimulation, normal connections do not develop
- Perceptual adaptation
  - Ability to adjust to an artificially displace or even inverted visual field
  - We adapt to our environment
  - Combination of nature/nurture

Hearing and Other Senses

Hearing

- What sounds do we hear best?
  - Those within range of the human voice
- What would happen if we were more sensitive to sounds?

Sound: an energy source in the environment

- Sound waves briefly compress and expand air molecules
- Ears detect these brief pressure changes

Audition: the sense or act of hearing

Hearing: Sound Characteristics

- Amplitude (height) determines intensity (loudness) in sound waves
- Length (frequency) determines pitch
- Sound is measured in decibels (dB) – 0 dB just above "absolute threshold"; 60 dB is normal hearing range; 85+ dB is dangerous when prolonged
  - dB are exponential (each 10 dB = 10x the intensity)
  - lawnmower = 90 dB; loud rock concert = 120 dB

Sound Characteristics

A violin's short, fast waves create a high pitch. The longer, slower waves of a cello or bass create a lower pitch. Differences in the waves height or amplitude, also create differing degrees of loudness.

Hearing: Decoding Sound Waves and How We Transform Sound to Hearing

1. Sound waves strike the ear drum, causing it to vibrate.
2. Tiny bones in the middle ear pick up the vibrations and transmit them to the cochlea, a coiled, fluid-filled tube in the inner ear.
3. Ripples in the fluid of the cochlea bend the hair cells lining the surface, which trigger impulses in nerve cells.
4. Hair cell movements trigger impulses at the base of the nerve cells, whose fibers converge to form the auditory nerve.
5. Axons from these nerve cells transmit a signal to the auditory cortex.

Hearing Loss

- Sensorineural hearing loss (nerve deafness) → most common type
  - Damage to cell receptor (hair cells) or associated nerves
  - In young people, headphone may be a big culprit
- Conduction hearing loss (less common)
  - Damage to mechanical system that conducts sound waves to cochlea

Cochlear implant: a device for converting sounds into electrical signals and stimulation the auditory nerve through electrode threaded into the cochlea.

Perceiving Loudness, Pitch, and Location

- Loudness or softness?

    - The number of hair cells activates (cells respond to frequency)
- Pitch: place theory in hearing
    - Theory that links the pitch heard with the place where the cochlea's membrane is stimulated; best explains high pitches
- Pitch: frequency theory (temporal theory) in hearing
    - Theory that the rate of nerve impulses travelling up the auditory nerve matches the frequency of a tone, thus enabling its pith to be sensed; explains low pitches
- So, some combination of place and frequency theories
    - Handle the pitches in the intermediate range

How Do We Locate Sounds?

- Sound waves strike one ear sooner and more intensely than the other
- From this information, our brain can compute the sound's location

Touch is a Mix of Senses

- Four distinct skin senses
    - Pressure
    - Warmth
    - Cold
    - Pain
- Other skin sensations are variations of the basic four.
    - Ex: touching cold/pressure sensors → sensation of wetness
    - Repeated stimulation of pain receptors → itch

What is the Function of Pain?

- It is a warning system → tells us something is wrong
    - Ex: don't touch that again! Don't walk on your sore foot! Etc.…
- Rarely, people don't experience pain → this is dangerous

Pain Experience

- Both bottom-up and top-down
- Many influences → biological, social-cultural, psychological

The Basic Pain Circuit: Biology

- Sensory receptors (nociceptors) respond to potentially damaging stimuli by sending an impulse to the spinal cord, which passes the message to the brain, which interprets the signal as pain.
- Gate Control Theory (Melzack and Wall)
- Two kinds of nerves (large and small)
- Large (gates) can slow pain response
- Info to large can come from brain

Controlling Pain

- Placebo
    - Reduces CNS attention and responses to pain
- Distraction
    - Draws attention away from painful stimulation.
    - fMRI reveal virtual reality play reduces brain's pain-related activity
- Hypnosis
    - Social influence theory (distracts)
    - Dual processing state sensory information does not reach areas where pain-related information is processed (dissociation)
    - Selective attention

Taste

- Involves several basic sensations
- Can be influence by learning, expectations, and perceptual bias
- Has survival function

Taste: A Chemical Sense

- Inside each little bump on the top sides of the tongue are 200+ taste buds
- Each bud contains a pore with 50-100 taste receptors
- Each receptor reacts to different types of food molecules and sends messages to the brain

Smell

- Is a chemical sense
- Involves hundreds of different receptors
- Combinations of receptors identify smells
- Involves odors that can evoke strong memories
- Information from taste buds from the taste buds' travels to an area between the frontal and temporal lobes of the brain
- Like a "hotline" to emotion and memory areas of the brain
- Also, smell interacts with the taste in the brain

Body Position and Movement

- Kinesthesis
    - System for sensing the position and movement of individual body parts (sensors in tendons and joints)
    - Interacts with vision
    - What happens when this goes wrong? → we rely on vision
- Vestibular sense
    - Sense of body movement and position, including the sense of balance

Sensory interaction

- When a hard-of-hearing listener sees an animates face forming the words being spoken at the other end of a phone line, the words become easier to understand
- Embodied cognition: influence of bodily sensations, gestures, and other states on cognitive preferences and judgments
    - Ex: physical warmth may promote social warmth
    - Social exclusion can literally feel cold
    - Political expressions may mimic body position
- Unusual sensory interaction is known as "synesthesia". One sensation produces another.

Thinking Critically: Perception Without Sensation?

- Most relevant ESP claims
    - Telepathy
    - Clairvoyance
    - Precognition
    - Psychokinesis

Bem (2011): nine experiments that suggested participants could anticipate future events (minimally).
Critics: methods or analysis viewed as flawed. Most research psychologist and scientists are skeptical.

Learning

Basic Learning Concepts and Classical Conditioning

- What is learning?
    - "Process of acquiring through experience new information or behaviors"

How do we learn?

- Through association: certain events occur together (classical conditioning); stimuli that are not control are associated and response is automatic (respondent behavior)
    - Ex: cringing when you see a flash of lighting (because you expect thunder)
- Through consequences: association between a response and consequences is learned (operant conditioning). We repeat actions that get good results and avoid actions that get bad results. The resulting behavior is operant behavior.

    - Ex: a child saying "please" receives a cookie; the child is more likely to say please in the future (behavior is strengthened due to good result)
- Through cognition: acquisition of mental information that guides behavior: cognitive learning. A type of cognitive learning is observational learning → learning by watching
    - Ex: learning something at university (by reading) that changes your future behavior

Behaviorism

- Classical and operant condition are phenome studied by the behaviorists (Pavlov, Watson, Skinner, and others)
- The term behaviorism was coined by Watson to emphasize that:
    - Psychology should be objective
    - Psychology should be the study of observable behavior
    - Basic laws of learning apply to all animals
    - Mental processes (like consciousness) are not important
- Today we agree that psychology should be objective, there are basic laws of learning BUT the field of psychology now includes the study of consciousness

Ivan Pavlov (1849-1936)

- Russian medical doctor
- Won Nobel Prize in 1904 for his studies of the digestive system
- In his 50s, he noticed that dogs salivate not only when they have food in their foods but also at the sight of food.

Classical Conditioning – Pavlov's Apparatus

- Demonstrated associative learning via salivary conditioning

Basic Definitions

Classical Conditioning: type of (associative) learning in which one learns to link two or more stimuli and anticipate events.

Neutral stimulus (NS): in classical conditioning, a stimulus that elicits no response before conditioning.

- In Pavlov's experiments this was a bell or buzzer

Unconditioned response (UR): in classical conditioning, an unlearned, naturally occurring response to an unconditioned stimulus (US).

- In Pavlov's experiments the UR was salivation and the US was the food in the mouth
    - Dogs don't have to learn to salivate so the response is not conditioned until it is associated with other stimuli

Unconditioned stimulus (US): in classical conditioning, a stimulus that unconditionally – naturally and automatically – triggers an unconditioned response (salivation)

Abbreviations

NS → neutral stimulus (bell/tone)
US → food
UR → salivation

Pavlov's Experiment

- Repeated pairing of the tone (NS) and food in the mouth (US) cause the dog to salivate in the presence of the tone alone
- That is, no food is necessary in order to elicit the salivation response
    - The tone is now a conditioned stimulus (CS)
    - The salivation is now a conditioned response (CR)
- The dog has learned by association that the tone will be followed by food

Some Additional Points

- Note that:
    - Unconditioned = unlearned
    - Conditioned = learned
- Note that Pavlov's experiment has three phases

    - Before conditioning
    - During conditioning
    - After conditioning

Classical conditioning – what Pavlov studied

- Acquisition (what goes on during conditioning)
    - Initial stage of linking the NS with the US
    - Pavlov asked questions about timing
    - Also discovered higher order conditioning – association of a second US and the CS (such as a light with the tone)
- Extinction (what happens if US is removed?)
    - Diminishing of a conditioned response; occurs in classical conditioning when an unconditioned stimulus (US) does not follow a conditioned stimulus (CS)
    - In Pavlov's experiments, the food was no longer provided and dogs salivated less and less

BUT

- Spontaneous recovery (what happens if US is reintroduced?)
    - Reappearance, after a pause, of an extinguished conditioned response
    - Extinction suppresses but does not eliminate the response

Classical Conditioning – What Pavlov Studied

- Generalization (does conditioning happen to other (similar) stimuli?)
    - Tendency, once a response has been conditioned, for stimuli similar to the conditioned stimulus to elicit similar responses
- Discrimination
    - Learned ability to distinguish between a conditioned stimulus (which predicts the US) and other irrelevant stimuli
    - In Pavlov's experiment, dogs learned to respond to specific tones and not others
        - Human example: guard dog vs. assistance dog

Generalization

- Pavlov demonstrated generalization by attaching miniature vibrators to various parts of a dog's body.
- After conditioning salivation to stimulation of the thig, he stimulated other areas.
- The closer a stimulated spot was to the dog's thigh, the stronger the conditioned response. (From Pavlov, 1927)

Take Home Messages about Classical Conditioning

- Is it adaptive – helps us prepare for good or bad events
- The importance of Pavlov's work?
    - Classical conditioning is how all organisms learn to adapt to their environments
    - The experiments showed that processes like learning can be studied objectively

Applications of Classical Conditioning

- Pavlov's principles are used to influence human health and well-being
    - Areas of consciousness, motivation, emotion, health, psychological disorders, therapy, etc.
        - Addicts counseled to avoid stimuli that may trigger cravings
        - Pairing particular taste with drug that influences immune responses may eventually lead to response from taste alone
- Pavlov's work provided a basis for Watson's ideas that human emotions and behaviors, though biologically influenced, are mainly conditioned responses.
- Watson applied classical conditioning principles in his studies of "Little Albert" to demonstrate how specific fears might be conditioned.

Classical vs. Operant Conditioning

- Classical

    - Associations between stimuli
    - Automatic (respondent) behaviors
- Operant
    - Organisms associate their own actions with some consequence
    - Behavior operates to produce reward or punishment
        - Action → reinforcer → increased action
        - Action → punishment → decreased action

B.F. Skinner (1904-1990)

- Modern behaviorist
- Began as an English major – wrote books about behaviorism.
- Controversial figure and very influential
- Based his work on *Thorndike's Law of Effect*
    - "Rewarded behavior is likely to recur and punished behavior is less likely to recur"

Skinner and Skinner's Experiments

- expanded on Thorndike's work
- developed behavioral technology and principles of behavior control
- designed and used the skinner box (operant chamber) for experiments and recorded responses (many experiments)
    - A Skinner's box: inside the box, the rat presses a bar for a food reward. Outside, a measuring device records the animals accumulated responses.

'Shaping' Behavior

- Everyday behaviors are continually reinforced and shaped
    - Reinforcement: any event that strengthens a preceding response
    - Shaping: gradually guiding toward closer and closer approximations of the desired behavior. Reward (positive reinforcement) is provided for each approximation
        - Ex: how would you get a rat to press a bar for food? Or get you kids to clean the table after dinner?

Operant Conditioning: Types of Reinforcers

- Positive reinforcement
    - Increases behaviors by presenting positive reinforcers
        - Positive reinforcer: is any stimulus that, when presented after a response, strengthens the response.
- Negative reinforcement
    - Increases behaviors by stopping or reducing negative stimuli

Negative reinforcer: is any stimulus that, when removed after a response, strengthens the response.

Example of Positive and Negative Reinforcement

Positive reinforcement: Parents let child sleep with them (reinforcer) and this strengthens the response (crying). Child is being rewarded for crying.

Negative reinforcement: The child stops crying once in the parents' bed. Crying (the negative reinforcer) is removed after the response (letting the child into the bed). The child is rewarding the parents for letting her into their bed.

<u>Learning</u>

Operant Conditioning: Reinforcers and Shaping

- Animal behavior can be shaped with incremental rewards. This is how skinner got his rats and pigeons to perform various tasks (and to do things like peck or press a bar when a light can on or a buzzer sounded)
- So far, we have learned about positive reinforcers (usually pleasurable stimuli) negative reinforcers (removing something negative). Both of these types of reinforcers strengthen a response.

Types of Reinforcers

Primary: is unlearned; innately reinforcing stimuli.
- Ex: food or removal of pain

Conditioned (secondary): gains power through association with primary reinforcer.
- Ex: a rat turning in a light (the secondary reinforcer) to get food (the primary reinforcer)

Immediate: occurs immediately after a behavior.
Delayed: involves time delay between desired response of and delivery of reward.

Reinforcement Schedules

- Reinforcement schedule:
  - Includes pattern that defines how often a desired response will be reinforced
- Continuous reinforcement schedule:
  - Involves reinforcing the desired response every time it occurs
  - Good for quick learning
- Partial (intermittent) reinforcement:
  - Includes a schedule reinforcing a response only part of the time; results in *slower acquisition* of a response but much *greater resistance* to extinction than does continuous reinforcement

Schedules of Reinforcement

	Fixed	Variable
Ratio	Every so many: reinforcement after every nth behavior, such as buy 10 coffees, get 1 free, or pay workers per product unit produced	After an unpredictable number: reinforcement after random number of behaviors, as when fly fishing
Interval	Every so often: reinforcement for behavior after a fixed time, such as Tuesday discount prices	Unpredictable often: reinforcement for behavior after a random amount of time, as when checking for a Facebook response

Punishment

- Up to now, we have mostly been talking about reinforcing (strengthening a behavior)
  - Recall: negative reinforcement is not punishment
- Punishment is the opposite
  - Administers an undesirable consequence or withdraws something desirable in an attempt to decrease the frequency of a behavior
  - Ex: withdrawing a toy to reduce a child's disobedience

Two Kinds

Positive punishment: presenting a negative consequence after an undesired behavior is exhibited, making the behavior less likely to happen in the future.
- Ex: traffic ticket for speeding

Negative punishment: removing a desired stimulus after particular undesired behavior is exhibited, resulting in reducing behavior in future.
- Ex: removing computer privileges from a misbehaving teen

Problems with Physical Punishment

- Punished behavior is suppressed, not forgotten. This temporary state may (negatively) reinforce parent's punishing behavior.
- Punishment teaches discrimination among situations.
- Punishment can teach fear.
- Physical punishment may increase aggression by modeling aggression as a way to cope with problems.
  - These studies are correlational

Punishment Applied in the Real-world Setting

- Reinforcement tells the animal (or person) what to do
- Punishment tells the animal (or person) what not to do
- Skinner's view – punishment often teaches how to avoid the punishment rather than how to adopt an appropriate behavior
- These are big ideas that appear in a lot of literature on child rearing
    - Current thinking → when the child does something well, tell them
- Framing may help
    - Ex: "If you don't clean your room, you don't get to use the computer!" would be better framed as "You're welcome to use the computer after you have cleaned your room".

Skinner's Legacy: Applications of Operant Conditioning

- Skinner was a strong proponent of behaviorism and insisted that operant principles could be applied to improve people's lives.
    - He thought that reinforcement was better than punishment
    - Critics thought that this was controlling and anti-freedom

At school: computer and adaptive learning software used in teaching and learning
In sports: behavioral methods implemented in shaping behavior in athletic performance
At work: rewards successfully used to increase productivity
At home: basic rules of shaping used in parenting

Contrasting Classical and Operant Conditioning

	Classical conditioning	Operant conditioning
Basic idea	Organism associates events	Organism associates behavior and resulting events
Response	Involuntary, automatic	Voluntary, operates on environment
Acquisition	Associating event; NS is paired with US and becomes CS	Associating response with a consequence (reinforcer or punisher)
Extinction	CR decreases when CS is repeatedly presented alone	Responding decreases when reinforcement stops
Spontaneous recovery	The reappearance, after a rest period, of an extinguished CR	The reappearance, after a rest period, of an extinguished response.
Generalization	The tendency to response to stimuli similar to the CS	Organism's response to similar stimuli is also reinforced
Discrimination	The learned ability to distinguish between a CS and other stimuli that do not signal a US	Organism learns that certain responses, but not others, will be reinforced.