Psych 1101 Final Exam Study Notes

Chapter 1: Thinking Critically With Psychological Science

Limits of Intuition

- Although it could be useful in some scenarios
- Can be very misleading and cause serious errors in judgement
- Hindsight, Overconfidence and tendency to perceive order in random events leads us to overestimate our intuition
- Scientific inquiry can help us sift reality from illusion

Limits of Common Sense

- It does not generate new information
- Cannot be used when encountering something never experienced before
- Because it develops as a result of experiencing and learning

Did We Know it All Along? Hindsight Bias

- Error in our thinking & we all do it
- Once we know the facts and conclusion about something we tend to believe we could have predicted the conclusion/outcome because it's "obvious"
- Scientific research says we don't know the conclusions, it isn't that obvious
- Happens all the time

Overconfidence

- Tend to overestimate how accurate our knowledge is, we are much more confident than accurate
- Tend to underestimate risk of danger
- Overestimate our abilities to predict and control
- Reality: we make more mistakes with less control and a higher risk
- Knowing the answers tends to make us overconfident
- Those who were overconfident in a study and got the answer wrong claimed they were "almost right"

Perceiving Order in Random Events

- As humans we are uncomfortable with uncertainty so we look for patterns and explanations to make the world appear more orderly
- Ex. some people perceive a face on the moon
- *Random sequences often don't look random*

Illusory Correlation

- Our tendency to see a relationship between 2 variables when there is no relationship
- Effects: influence how we think and feel because we remember and pay more attention to any info that supports our illusory correlation & disregard other info

THE SCIENTIFIC ATTITUDE:

Curiosity & Passion

- Scientists are hungry for knowledge and seek answers
- Due to that, we are able to teach, perform surgeries, etc.

Open Mindedness

- Open to different ideas and perspectives
- Especially ones opposite to yours
- Don't need to adapt them, but give a fair chance

Skepticism

- Think critically and show/find evidence whenever coming across something
- Always balance open mindedness and skepticism

Awareness

- Must be aware of own biases

Humility

- Get ego and prestige out of the way
- No matter how smart you are you will make mistakes
- Others are smart too and have a contribution to make

THE SCIENTIFIC METHOD:

- Any field of study that follows scientific method is a science
- Not topic but methodology that determines if something is a science or not

Observation (always starts with observation)

- **What starts with casual observation must become systematic observation**
- May develop a theory (going to help organize, summarize & integrate my observations)
- However, theory is not fact
- It's an attempt at explaining something

Hypothesis Testing

- Extract hypothesis from theory & use rigorous scientific methodology to test it
- It's a TENTATIVE statement/prediction about relationship between two variables

ONE RULE WE MUST FOLLOW

- We must **operationally define** our variables
- The researcher must state with clarity and precision how he **MEASURED** his variables

Optimism:

- Seeing a glass half full
- A definition, not an operational definition because he's not measuring anything
- Ex. obtaining a score of 30 & above on the haddad optimism scale

Replication

- Replication is essential in science
- Must repeat our study with different sets of subjects
- Retest multiple times to make sure our results are reliable and not just a fluke/one time thing

Generate on refine

- On results, either generate new questions or refine existing questions

TYPES OF RESEARCH STUDIES:

Descriptive Research

Purpose: goal is to **observe and describe**

Case Study:

- research studies are done on either one single person or a very small group of people
- Research is done in depth

Advantages:

- The most in depth research you can do
- Great step when we know nothing about something
- Allows us to keep records of rare cases that would otherwise be lost

Disadvantages:

- Researcher biased
- Researcher hears and sees what he wants to see
- Interprets data through assumptions and expectations
- Therefore it's important to use objective devices such as cameras to record data
- Sample is so small we cannot generalize to rest of population

Survey:

- Asks questions of a large number of people
- Questions a topic she's interested in

Representative Sample:

- In order for a survey to be scientific, the sample that is used must be representative of the population, otherwise not scientific

How do we get a representative sample?

RANDOM SAMPLING

Random Sampling:

- Every person in my population has an equal chance of being included in the research/survey
- AND **chance** and ONLY chance will determine who will participate

Advantages:

- Cheap and easy to administer
- Reach people we don't usually reach in research
- Ex. people who are homebound from a disability or are illiterate
- Sometimes only way to know something is to ask a question

Disadvantages:

- Just because you ask a question doesnt mean its going to be the truth
- People can lie unintentionally or intentionally
- Words we use could significantly affect our results and change them

- Characteristics of the person asking the questions could affect results (person's age/gender...)

Naturalistic Observation:

- Researcher goes out into real world to do research outside of the lab
- MUST NOT interfere in any way shape or form

Advantages:

- Does not get more real than this
- Watch real behavior in real time in the real world
- No artificial interference
- May allow you to discover info you may not have discovered otherwise (in lab)

Disadvantages:

- Researcher bias
- Solution: **objective recording** or multiple researchers
- Very own presence could interfere with results
- When subjects realize they're being observed they change their behaviors
- Therefore, you must blend in

Correlational Research:

- Purpose is to **describe and predict**
- Find out if there's a systematic and reliable relationship between 2 or more variables
- Ex. relationship between hair colour and sun sensitivity
- Asking 3 questions:

1. Do they covary? (3 variables)
    - Is there a **relationship** between both variables?
    - If one changes does the other change too?
2. In what direction do they change?
    - Change in same **direction** or opposite direction?
    - Positive or Negative Correlation?
    - Positive: Drinking milk increases bone strength
    - Negative: More depression decreases motivation
3. To what extent?
    - How **strong is the relationship**?
    - Correlation coefficient: **r**
    - R tells us if theres a relationship and if it's negative or positive

Advantages:

- Excellent first step
- Before doing a time consuming and expensive experiment, let's find out if theres a relationship between variables
- Sometimes this is the only option available to us otherwise it is unethical

- Describes and predicts
- Predicts: once i know there's a correlation between 2 variables then having info on just one of them allows me to make **predictions** about the other

Disadvantages:

- Cannot infer causality
- Cannot say 1 variable causes a change in the other one
- **Cannot CONCLUDE cause & effect**

Experimental Research

- Observe, describe, predict and **explain**
- An experiment is the only type of research that **allows me to talk about cause and effect**
- Allows me to say variable A causes a change in variable B

Why?

- Allows me to manipulate independent variable being studied
- Researcher going to control all other independent variables that could affect his results

Independent Variable:

- Causes change in another variable (influences & affects)
- Is the variable that the researcher will either manipulate or control

Dependent Variable:

- Variable being **affected and changed by the IV**.
- Variable that the researcher is measuring
- Ex. Yoga (IV) lowers stress levels (DV)
- Milk (IV) increases bone density (DV)

Manipulating the IV:

- Manipulating the IV we are studying
- Researcher is going to create at least 2 levels of the IV
- (Researchers must create at least two groups)
- **Group 1 (of IV): experimental group**, and is exposed to IV
- Ex. they will consume milk
- **Group 2 (of IV): control group**, not be exposed to IV
- Ex. will not consume milk
- At the end of the study, compare results of two groups to see if there's a difference

Controlling all other IV:

- Controlling other IV that could affect your results is an absolute MUST in an experiment
- <u>WHY?</u> IF we do not control for them then we are not sure what caused the change in the results
- <u>KNOWN IV</u>: variables we know from research, knowledge and experience that they could affect the results
- <u>UNKNOWN IV</u>: In order to control unknown IV that could affect results we do

- Random Assignment: every single subject in my study has an equal chance of being either in the experimental or control group
- Also means that change and ONLY CHANCE will determine who will be in the experimental group & who will be in the control group
- When we are researching efficacy of a treatment, we must control for placebo effect
- **Placebo:** a fake treatment/pill., It has no therapeutic value.
- Yet, when people are given a placebo & believe it's effective, they may end up feeling better based on belief
- There's scientific evidence that the placebo effect is real

Blind Procedure:

- Keep **subject** blind (in the dark as to the most important aspects of your research)
- If they know why you're doing what you're doing it could affect what they're doing & it will affect your results

Double Blind Procedure:

- Keep subject & researcher dealing with subject in the dark
- Prevents subject & research bias
- Ex. shouldn't know which pill is what & giving unpurposeful hints (smirk w/ viagra)

STATISTICAL REASONING:

- Statistics are essential in scientific research
- Mathematical tools that allow the researcher to **organize, summarize & describe their data**
- Also allows researchers to draw conclusions from data

2 major statistics

Descriptive Statistics

- Purpose: allow researcher to **summarize, organize & describe data in a clear and meaningful way**
- Ex. **histograms and bar graphs**

Measures of Central Tendency

- Definition: descriptive statistics that allow the researcher to have an idea of the typical score of his data set.

3 Kinds of Measures of Central Tendency

1. The Mean: mathematical average of a data set
    - Good because it takes **every score into consideration**
    - BUT be careful because it takes every score into consideration, it's very **sensitive to extreme scores** (can be distorted by them artificially)
2. The Median:
    - score that falls right in the middle of a data set that's been arranged from highest to lowest or vice versa
    - **50th percentile means the same thing as median** (50% scores above and below)
    - The median **loses a lot of info** & doesn't reflect typical score

3. The Mode:
    - Most **frequently** occurring score in a data set
    - BUT be careful because the more frequently occurring score is not necessarily the most typical

Measures of Variability

- Measures allow researchers to have an idea about typical difference/variation in a data set

1. The Range: take **highest & lowest score and subtract**
    - Limitation: can lose lots of data and cause it only takes extreme scores into consideration. May not give typical difference in a data set.
2. The Standard Deviation: a better measure of variability because it takes every single score and data set into consideration & takes deviation of every single score from mean into consideration. Gives me an **average of the difference between scores and the mean.**
    - The more the scores are clustered around the mean, the smaller the standard deviation is
    - More scores are dispersed, the most variability there is and therefore the larger/higher the standard deviation is

Regression towards the mean:

- Tendency for extreme or unusual scores to fall back towards the average

Inferential Statistics

Purpose: allow researcher to draw **conclusions from data & make inferences**

- Allow her to generalize from sample to population
- Allow her to determine if her results are statistically significant
- **When results are statistically significant, they are not likely to be a fluke,** anabolic/due to chance, RATHER, they are likely to reflect real differences or real relationships
- In order for results to be statistically significant, the probability that they're due to chance must be extremely small (**P-val must be 5% or less**)
- That's why when you run statistics, you find the P-value
- P-value tells me if the probability is due to chance, varies between 0-1
- Ex. If 0.6 = 60% that means the probability results are due to chance is 60%
- Must be <0.05 = 5%

Endocrine;

- norepinephrine/epinephrine: ANS fight or flight (adrenaline)
- Oxytocin: contractions associated w giving birth, milk flow during nursing and orgasm. Also promotes pair bonding, group cohesion and social trust.
    - Produced by posterior pituitary

Chapter 2: Biology of The Mind

Theory

- Plato correctly located the mind in the spherical head - his idea of perfect form
- Plato's student Aristotle believed your mind was in the heart which pumps warmth and vitality into the body
- Phrenology is the study of bumps on the skull which could reveal a person's mental abilities and character traits (Franz Gall is the founder)

NERVOUS SYSTEM

2 Divisions:

- Central nervous system (brain & spinal cord)
- Peripheral nervous system (all nerves in the body outside of the CNS)

Nervous system:

- A **communication** network that receives info from the external environment both externally and internally
- Analyses, organizes and integrates this info
- Uses this info to send out messages to muscles and glands, **producing emotions, behaviors**, etc.
- Creates our conscious experience as well
- Being conscious means being aware of ourselves and our environment

The Basics (Neurons):

- They are the basic unit of communication in the system
- 3 types of neurons based on their function
    - ***Sensory Neurons****:* collect info from environment and send it to **CNS**
    - ***Interneurons:*** only found in CNS and only communicate with other neurons & have the most complex job (they're the ones analysing, integrating and organizing, etc.)
    - ***Motor neurons:*** carry messages from CNS to muscles

Basic Structure:

- **Soma:** cell body
- **Dendrites:** increases surface area of soma and recieves info/messages from other neurons
- **Axon:** when a neuron wants wants to communicate with another neuron, it creates an electrical impulse called **"action potential",** axon carries the electrical impulse
    - Axon's surface is selectively permeable
- **Axon Branches:** branches off of the axon
- **Terminal Buttons:** this is where we find neurotransmitters
- **Neurotransmitters:** chemicals used to communicate with one another

- **Myelin Sheath:** white, fatty-like substance that covers SOME of the axons of the nervous system. Provides insulation & speeds up the transmission of info between neurons. If it's harmed, multiple sclerosis could happen.
    - Glial cells are worker bees that provide nutrients and insulation to myelin sheath
    - They guide neural connections and mop up ions and NT
    - Glia also play a role in learning and thinking by "chatting" with meurons they participate in info transmission and memory
    - In more complex brains, proportion of glia to neurons increases (ex. Einstein's brain)
- **Synapse:** Where neurons meet to communicate and exchange info
- **Synaptic cleft or gap:** Little distance between neurons at the synapse
- **Presynaptic Neuron:** Neuron that's going to transmit messages
- **Postsynaptic Neuron:** Neuron that receives messages
- (a neuron can be both) (dendrites are thicker and shorter than axon branches)

Communication:

- When a neuron wants to communicate with another neuron, it fires and produces an **electrical impulse** called an action potential
- Ultimately, action potential releases chemicals called neurotransmitters
- Neurotransmitters are what delivers messages to other neurons
- Communication between neurons is an **electrochemical** process
- Myelin sheath is laid down up to about age 25
- AP/nerve impulse travels at speeds ranging from 2mph to >200mph

Within a neuron:

- **Brain is 80% water that has dissolved chemicals in it**
- Ex. Na+, Cl-
- Those ions are found both inside and outside of the neuron
- Found in different concentrations
- Those concentrations change depending on what's happening with the neuron

Neuron at rest (neuron not firing):

- Inside of the neuron has more negative ions
- Outside has more positive ions
- If you measure electrical charge, -70mV is inside
- Membrane is polarized
- Even at rest, ar neuron is constantly receiving messages
    - 2 Types of Messages:
        - **Inhibitory:** messages that instruct the neuron not to fire/communicate. It will change the concentration of ions so that it is more negative inside and more positive outside. Ex.

from -70mV to -76mV inside. This is **hyperpolarized**. This process makes the neuron less likely to fire.

- **Excitatory:** messages instruct neuron to fire/communicate. This changes the concentration of ions so that the inside of the neuron becomes less negative. Ex. from -70mV to -63mV. This membrane is **depolarized**. This process makes the neuron more likely to fire.

When will a neuron fire?

- When the depolarization reaches about- **55 mV** (**threshold of excitation**)
- We have an action potential

Action Potential:

- An all or none phenomenon
- Once a neuron fires, it fires
- Every time a neuron fires, the action potential is the same strength
- Action Potential travels down the axon in a domino-like effect, NOT like an arrow
- Distinguishing a stab and a soft touch: more neurons fire (same level of AP)

Refractory Period

- After repolarization, the refractory period occurs where the neuron pumps the positively charged ions back inside so that an action potential can occur again **(Relative refractory period)**
- During an **absolute refractory** period, the **Na+ channels are still ope**n and an AP can absolutely not be reached

Between Neurons:

1. Presynaptic neuron fires
2. Action potential travels all the way down the axon until it reaches the terminal buttons
3. **Synaptic vesicles** (little bags that contain neurotransmitters) inside the terminal buttons attach to the membrane of the neuron for exocytosis to occur
4. Synaptic vesicles burst open to release the chemicals into the **synaptic gap**
5. Neurotransmitters cross the gap and attach to receptor sites to deliver their message

Fate of Neurotransmitter:

- After delivering the message, the neurotransmitter will be deactivated
- Ways of deactivation are: Reuptake and Degradation
- **Reuptake:** the neuron that released the neurotransmitter will take it back and recycle it. Uses norepinephrine.
- **Degradation**: an enzyme comes and breaks the neurotransmitter down
- WHY does deactivation happen?
    - If it doesn't get deactivated, it will deliver the message over and over again
    - This could over excite or over inhibit the nervous system
    - Ex. Nerve gas stops degradation of acetylcholine which in turn causes suffocation due to constant contraction of lungs
    - Uses acetylcholine

Neurotransmitters:

- Chemical that neurons use to communicate with one another
- There is a variety of them in our nervous system
- Healthy levels of neurotransmitters are essential to physical and mental functioning
- An imbalance causes problems
- Ex. Dopamine: healthy levels put us in a good mood, gives us good motor function, higher levels of motivation and pleasure. Unhealthy levels leads to schizophrenia, depression, a lack of motivation, no pleasure, and possibly parkinson's disease
- Key which fits a lock on the postsynaptic neuron (binds to the receptor site)
- Acetylcholine plays a role in learning and memory
    - When released to muscle cell receptors, muscle contracts
    - When transmission is blocked, muscles cannot contract/are paralyzed
- Natural neurotransmitters released by body : endorphins

Some Neurotransmitters and Their Functions

Neurotransmitter	Function	Problems Caused by Imbalances
Serotonin	Affects mood, hunger, sleep, and arousal	Undersupply linked to depression; some antidepressant drugs raise serotonin levels
Dopamine	Influences movement, learning, attention, and emotion	Oversupply linked to schizophrenia; undersupply linked to tremors and decreased mobility in Parkinson's disease and ADHD
Acetylcholine (ACh)	Enables muscle action, learning, and memory	ACh-producing neurons deteriorate as Alzheimer's disease progresses
Norepinephrine	Helps control alertness and arousal	Undersupply can depress mood and cause ADHD-like attention problems
GABA *(gamma-aminobutyric acid*	A major inhibitory neurotransmitter	Undersupply linked to seizures, tremors, and insomnia
Glutamate	A major excitatory neurotransmitter; involved in memory	Oversupply can overstimulate the brain, producing migraines or seizures; this is why some people avoid MSG (monosodium glutamate) in food

DRUGS & THE BRAIN

- Happens at the level of synapse (coffee, drugs, etc.)
- Interferes in the communication process between neurons
- Done at 3 levels:
    - Could affect activity of presynaptic neuron
        - Enhance, reduce or block release of neurotransmitter
    - Could affect activity in the cleft
        - Affects degradation or reuptake
        - Enhancing, reducing or blocking them
    - Could affect activity of postsynaptic neuron

- Can do in one of three ways:
    - LOCK & MIMIC, LOCK & BLOCK, LOCK & ENHANCE

LOCK & MIMIC

- Drug molecules will attach in receptor site and deliver messages to neurons as if they were neurotransmitters

LOCK & BLOCK

- Drug molecules attach to receptor & block it
- Drug does not send messages
- Attach to receptor in such a way that the neurotransmitter cannot send a message

LOCK & ENHANCE or DIMINISH ACTIVITY OF A NEUROTRANSMITTER

- Drug attaches in a way that a neurotransmitter can still attach and deliver its message
- Drug will either enhance or reduce the power of the message

Drugs:

- **Agonists:** drugs that enhance/facilitate the activity of a neurotransmitter (heroin, morphine)
    - Blocks reuptake so that drug works
- **Antagonists**: drugs that reduce, diminish, or clock the activity of a neurotransmitter (alcohol, caffeine)

Peripheral Nervous System

- Connects CNS to rest of body

Components: Somatic and Autonomic

Somatic: enables **voluntary** control of **skeletal muscles.** Not self-regulating. Includes motor output and sensory input.

Autonomic: controls our glands and internal organ muscles, thus influencing glandular activity, heartbeat and digestion. Is self-regulating. Includes sympathetic and parasympathetic.

- In a moment of danger, the ANS orders the **adrenal glands** on top of the kidneys to release epinephrine and norepinephrine which increase heart rate, blood pressure, blood sugar, providing a surge of energy.

Sympathetic System

- Dilates pupils
- Accelerates heartbeat
- Inhibits digestion
- Stimulates glucose release by liver
- Stimulates secretion of epinephrine and norepinephrine
- Stimulates ejaculation in male

Parasympathetic System

- Contracts pupils
- Slows heartbeat

- Stimulates digestion
- Stimulates gallbladder
- Contracts bladder
- Allow blood flow to sex organs (erection)
- Urination and feces
- Overall allows for body repair

Central Nervous System

Components:

- Sensory neuron
- Interneuron: communicates within the CNS and processes info between incoming and outgoing messages
- Motor neuron
- Spinal cord (REFLEXES)
    - A simple spinal reflex pathway is composed of a single sensory neuron and a single motor neuron, usually communicating via interneuron
    - Highway of info since all info the brain sends to the body has to go through it
        - Rhythmic movement: **Pattern Generators** are activated by the brain, which then kick in to produce Rhythmic movement
    -
- Brain
- Muscle
- Skin receptors

Endocrine System

What is it?

An electrochemical info system that secretes chemical messengers which travel through the bloodstream and affect other tissues including the brain. They influence our interest in sex, food and aggression.

- Some hormones are chemically identical to NTs
- Slower than NT because it travels through bloodstream
- Outlasts effect of neural messages
- Most influential endocrine gland is the pituitary gland
    - Pituitary gland is the pea sized structure located in the core of the brain and controlled by the hypothalamus
    - Among hormones released by the pituitary is growth hormone that stimulates physical development (anterior pituitary)
    - Oxytocin and antidiuretic (regulates amount of water in blood) hormone are the only ones produced in the posterior pituitary
        - Oxytocin enables contractions associated with birthing, milk flow during nursing and orgasm. Also promotes pair bonding, group cohesion, and social **trust.**

Hormone Types

1. Hormones that maintain **Homeostasis**

- a healthy balance in the body, ex. Insulin

2. **Reproductive** Hormones
    - Ex. testosterone
3. **Stress** Hormones
    - Ex. cortisol

Hormones and what they control

Hypothalamus: brain region controlling pituitary gland (anterior and posterior)
Pituitary gland: secretes many different hormones, some of which affect other glands
Thyroid gland: affects metabolism
Parathyroids: help regulate level of **Ca** in blood
Adrenal gland: part of fight or flight response
Pancreas: regulates level of sugar in the blood
Ovary: secretes female sex hormones
Testis: secretes male sex hormones

Observing Our Brain

Brain Plasticity

- The brain is plastic
- **Plastic**: changeable/modifiable/flexible, changes with experience
    - Everything we do and do not do will influence it
- Functional Plasticity
    - The brain can shift functions from a **damage area to a healthier area**
- Structural Plasticity:
    - An area of the brain can **increase or decrease** size as a result of **experience**
- Neurogenesis:
    - Brain's ability to **make new neurons even at an old age**

Our Divided Brains

- Functional Asymmetry
    - While the two hemispheres carry out similar functions, they also seem to excel at different tasks
    - Ex. Left hemisphere - language
    - We learned about functional asymmetry from clinical observation but mostly split brain patients
    - **Split Brain Patients** are patients who once suffered from epilepsy and to cure this doctors cut off their corpus callosum because they didn't realize how important it was. As a result, patients felt as if they had two different minds in one
    - **Corpus Callosum**: large band of neural fibers connecting the two brain hemispheres and carrying messages between them

- KEEP IN MIND
    - We have a right and left visual field, this does not mean right and left eye
    - Info sent to the left visual field goes to the right hemisphere of the brain and vice versa
    - Normal Brain: When you send info to one hemisphere, the other will know about it since they can communicate
    - Split Brain: if we send info to one hemisphere; however, the other is unaware

Areas of the Brain and Their Function

Left hemisphere: Recieves info from the right side of the body and also controls right side of the body.

- When a person speaks or calculates, activity incr in left hem.
- Left hem dominant people are more logical

Right hemisphere: Recieves info from the left side of the body and also controls the left side of the body

- Perceptual tasks (brain waves, blood flow , glucose consumption reveal increased activity in right hem)
- Right hem dominant people are more creative

- Together L&R hemisphere make up 85% of the brain's weight
- Covering those hemispheres is the cerebral cortex (like bark on tree), it is a thin surface layer of interconnected neural cells and the body's ultimate control and info processing centre. Each cerebral cortex (on each of the two hemispheres) is divided into four lobes separated by prominent fissures (folds)

Each hemisphere consists of 4 lobes:

- Frontal (behind forehead)
- Parietal (at top and to the rear)
- Temporal (just above ears),
- Occipital (back of head)

Each lobes consists of two areas:

- Primary
- Association

Primary Areas are found in each lobe, and linked and associated with the processing of either motor or sensory information. The primary areas are:

- P.**Visual cortex:** located in the **occipital** lobes (processes visual info)
- P.**Auditory cortex**: located in the **temporal** lobes (processes auditory info)
- P.**Sensory cortex**: also known as P.somatosensory cortex, located in **parietal** lobes and arches from one ear to the next. Recieves info from skin, muscles and joints and processes info pertaining to touch, pain, temp, etc.
    - The right part of the parietal cortex receives info from the left side of the body and vice versa

- Each body part is represented in the parietal cortex. Body parts adjacent to each other, (ex. Hand and arm) are serviced by areas in the brain that are adjacent to each other
- The actual size of a body part has nothing to do with the size of the area the brain devote to this part.
- P**.Motor cortex**: located in **frontal lobes,** arches from one ear to the next and controls voluntary movements.
    - The right part of the motor cortex services the left side of the body and vice versa

Association Areas are found in each lobe and are linked and associated with higher and more complex mental functioning (ex. Reasoning). Also involved in the processing of complex motor or sensory info. Link with stored memories.

- "Uncommitted" areas that make up about three-fourths of the cerebral cortex

A.Frontal Lobes: Prefrontal cortex

- Attention
- **Planning**
- Abstract thinking
- Some aspects of memory (**processing new memories**)
- Some aspects of personality
- Some aspects of language (**Making sense of what you're hearing)**
- Impulse control
- Decision making/**Judgement**
- Emotions

A.Temporal Lobes:

- Some aspects of **language**
- **Recognizing faces**
- Music
- Some aspects of **memory**
- **God spot**

A.Parietal Lobes:

- Nonverbal thinking (e.g. **math, spatial reasoning**)
- Sense of space
-

A.Occipital Lobes

- Processing of complex visual information

Keep in mind however that:

The brain's lobes work in tandem to produce complex human behaviours & mental processes (ex. language)

Tools of Discovery:

Clinical Observation

- Oldest method and it's still useful today
- Research systematically observes and documents (ex. What happens when the brain has trauma, aged, a tumor, etc.)
- We have learned a lot from this

Brain Manipulation

- Research intentionally interferes with the brain
- Systematically observes and documents what happens as a result of this manipulation
    - Surgical: remove part of the brain (connections, etc.) and see what happens
    - Chemical: inject chemical in a certain part of the brain and see what happens
    - Electrical Manipulation: implant electrodes/send electrical impulses in the part of the brain that we want to study
    - Magnetic Stimulation: expose an area of the brain that you want to study to a magnetic field and observe

EEG

- A technology that allows me to see what the brain is doing & how it **responds to a stimulus**
- **Electrodes** pick up electrical activity of the brain

Neuroimaging Techniques

- CT/CAT Scan:
    - use **X RAY** technology to take sophisticated images of the brain
    - Does **not allow me to see the brain in action/what it's doing**
    - Shows me the **structure** of the brain and tells me if there's a stroke, tumor, etc.
- MRI:
    - To date, considered safe and non invasive
    - In an MRI, we're exposed to a powerful **magnetic field**, causing our **tissue to emit electromagnetic signals**
    - Computers and Machines use those signals to create sophisticated images of the brain
    - Does **not allow me to see brain in action**, we can only see if there's a tumor, aging, etc.
- PET SCAN:
    - Brain consumes glucose (the more active an area of the brain is, the more glucose it consumes)
    - Injects you with **radioactive glucose so that they can trace i**t
    - This helps them **see the brain in action** (how active, where, etc.)

- FMRI (functional MRI)
    - **Allows me to see activity of the brain/the brain in action**
    - Exposed to a powerful **magnetic field** that tracks blood flow to the brain
    - The more active an area of the brain is, the more blood is gonna flow to it

Tour of the Brain

Lower Brain Structures

- Brain Stem/Medulla:
    - Connects your brain to your spinal cord
    - Relays all info coming into and leaving the brain (it has to go through the brain stem)
    - Crossover point for info picked up from one side of body to crossover to the left side of the brain
    - Life center of the brain, it contains structures that control vital functions (ex. **Medulla controls breathing, heart rate,** etc.)
    - Reticular formation, used for arousal, consciousness, sleep, etc.
- Thalamus (sitting on brain stem):
    - Gateway to the brain, all senses except smell are sending info to the thalamus and the thalamus relays it to appropriate area of the brain
    - Recieves info from cortex and relays it to lower area of brain
    - Filters info and highlights what's important
    - Regulates attention, arousal, motivation, etc.
- Cerebellum (little brain):
    - Controls voluntary movements, coordination, balance, etc.
    - Involved in learning motor skills that become automatic (reading, writing, biking)
    - Linked with higher cognitive functioning
    - When you get drunk so does your cerebellum
- Cerebrum/Cortex:
    - The cerebrum or cortex is the largest part of the human brain, associated with higher brain function such as thought and action. The cerebral cortex is divided into four sections, called "lobes": the frontal lobe, parietal lobe, occipital lobe, and temporal lobe. *Will be discussed more in later pages ..*
- Limbic System: ??????
    - Includes amygdala, hippocampus, thalamus (gateway to the brain^), hypothalamus
    - Consists of a variety of structures and linked with lots of functions including **learning, memory, emotions, motivation**
        - AMYGDALA: linked and associated with emotions (especially fear)
            - Also linked with perception of emotions & emotional memories

        - **Can pick up life threatening stimuli in environment even though you may not consciously be aware of them**
    - HIPPOCAMPUS
        - Regulates emotion
        - Long term memory

    - HYPOTHALAMUS: size of a pea yet it's very powerful
        - Controls drives (sex, hunger, thirst, etc.)
        - Controls homeostasis
        - Controls endocrine system (hormones)
        - Controls autonomic system
        - Linked and associated with **pleasure centers** in the brain
            - Some scientists believe in ***Reward Deficiency Syndrome***: people who over eat or take drugs because their pleasure centers are under functioning and they use food or drugs to perk them up
        - The initial reward center discovered by Olds and Milner was located here
    -

The Brain's Plasticity

To what extent can a damaged brain reorganize itself, and what is neurogenesis?

- Our brain is not only sculpted by our genes but also by our experiences
- 2 hard facts:
    - severed brain and spinal cord neurons, unlike cut skin, usually do not regenerate.
    - Some brain functions seem pre assigned to specific areas. One newborn who suffered damage to temporal lobe facial recognition areas later remained unable to recognize faces. However, some neural tissue can reorganize in response to damage. **The brain is constantly changing, building new pathways as it adjusts to little mishaps and new experiences.**
- Brain plasticity may occur after serious damage, especially in young children.
- Good for some deaf or blind patients (enhanced in other senses)
- **Neurogenesis:** although brain often attempts self-repair by reorganizing existing tissue, it sometimes attempts to med itself by producing new brain cells. The process is called neurogenesis.
- Master stem cells that develop into any type of brain cell have also been discovered in the human embryo.
- **GO OVER SPLIT BRAIN ONLY SHOWING STIMULUS TO ONE SIDE WITH IDA**

Handedness

- 90% of us are right handed
- Handedness is not largely affected by genes

- Neither R or L is “better”
- Since prehistoric times, R was always more common
- More left handed people have reading disabilities, allergies, migraine headaches
- Left handed people tend to outperform and it is common among musicians, mathematicians, etc.

Chapter 3: Consciousness and The Two-Track Mind

Consciousness: Our awareness of ourselves and our environment. This focuses our attention when we learn a complex concept or behaviour. Also promotes our survival by anticipating how we seem to others and helping us read their minds, “he’s angry, i’d better run!”
Some states occur spontaneously: daydreaming, drowsiness, dreaming
Some are physiologically induced: hallucinations, orgasm, food or oxygen starvation
Some area psychologically induced: sensory deprivation, hypnosis, meditation
Cognitive Neuroscience: the interdisciplinary study of the brain activity linked with our mental processes. Also is relating specific brain states to conscious experiences.

- When asked to imagine playing tennis, fMRI scans of the woman revealed activity in a brain area that normally controls arm and leg movements (mirror neurons). Even in a motionless body, the brain and the mind may still be active.

Stimuli: If a stimulus activates enough brain-wide coordinated neural activity - with strong signals in one brain area triggering activity elsewhere - it crosses a threshold for consciousness. A weaker stimulus - perhaps a word flashed too briefly to consciously perceive - may trigger localized visual cortex activity that quickly fades. A stronger stimulus will engage other brain areas, such as those involved with language, attention, and memory.

Dual Processing: The Two Track Mind

Beneath the surface of consciousness, lots of unconscious information processing occurs.
Two track mind: one is conscious the other is unconscious.

- Perception, memory, thinking, language, and attitudes all operate on two levels - conscious, deliberate “high road” and an unconscious, automatic “low road”.
- **High road:** reflective
- **Low road:** intuitive
- Today’s researchers call this dual processing - we know more than we know
- The human brain is a device for converting conscious into unconscious knowledge.
- Blindsight: patient suffers brain damage where they are left unable to discriminate objects visually; however, he/she still acts as though they can see
    - Goodale and Milner knew from animal research that the eye sends info simultaneously to different brain areas, which support certain tasks.
    - Our vision is a dual processing system
        - **A visual perception** track enables us “to think about the world” - recognize things and plan for future actions.

        - **A visual action track** guides our moment-to-moment movements
        - A man who is blind on the left eye can still sense the emotion expressed in faces which he does not consciously perceive
        - Brain areas below the cortex are are processing emotion-related
    - If you move your wrist at will, you consciously experience the decision to move it about 0.2 seconds before the actual movement; but, your brain waves jump about 0.35 seconds before you consciously perceive your decision to move. This tells us: **consciousness sometimes arrives late to the decision-making party.**
    - **The actual decision to move occurs when the brain activity crosses a threshold (about 0.15s before the movement)**

Selective Attention

- **Unconscious parallel processing is faster than sequential conscious process, but both are essential**
- Parallel processing enables your mind to take care of routine business; Sequential processing is best for solving new problems that requires our focused attention
- **Through selective attention, your awareness focuses on a minute aspect of all that you experience**
- Your conscious brain only processes a fraction of the sensory information you receive
- EX. cocktail party: you are using selective attention to focus on what one person is saying
- Could cause accidents, ex. You are just focusing on the music while driving

Selective Inattention

- At the level of conscious awareness, we are “blind” to all but a tiny sliver of visual stimuli
- **Inattentional Blindness**
- Ex. for a video game every time someone scored, the person must press space bar. By the end most didn't notice the person walking across the court with an umbrella because they were intentionally blind to the rest of the game

Change Blindness

- A form of inattentional blindness
- Ex. choose a face out of the two, conductor takes the other one and continues w question, guest does not realize the change.
- Ex. can be seen in a social experiment where a lady asked for directions but the woman was changing (most focused completely on the map and failed to notice the change in women).

Change Deafness

- Fail to notice change in voice of person speaking to them
- Ex. telemarketer changed completely but person did not notice because they were focusing on what they were saying more

Sleep

- Our bodies roughly synchronize with the 24-hour cycle of day and night thanks to an internal biological clock called the circadian rhythm
    - As morning approaches, body temp rises and peaks during the day then dips for a time in early afternoon then again in the evening
- Age and experience can alter our circadian rhythm. Most 20-year-olds are evening-energized "owls," with performance improving across the day (May & Hasher, 1998). Most older adults are morning-loving "larks," with performance declining as the day wears on.
    - Transition from owl to larks starts at age 20
- Women become more morning oriented as they have children and also as they transition to menopause
- sleep overtakes us and consciousness fades as different parts of our brain's cortex stop communicating
- **About every 90 minutes, we cycle through four distinct sleep stages.**
- jerky eye movements were accompanied by energetic brain activity.
- **Dreaming occurs in REM sleep**
- **EEG the relatively slow alpha waves of your awake but relaxed state**
- The transition into falling asleep is marked by the slowed breathing and the irregular brain waves of non-REM stage 1 sleep
    - During this brief **NREM-1** sleep you may experience fantastic images resembling **hallucinations,** irregular brain waves
    - ***NREM-2*** sleep, with its periodic ***sleep spindles*** — bursts of **rapid, rhythmic** brain-wave activity. **Easy to awaken**
    - Then you transition to the **deep sleep** of ***NREM-3***. During this **slow-wave** sleep, which lasts for about 30 minutes, your brain emits large, slow **delta waves** and you are **hard to awaken**
    - **An hour after you falling asleep**, you returning to **NREM-2 (where you spend about half your night)**, you enter the most intriguing sleep phase—**REM sleep**. For about 10 minutes, your brain waves become **rapid** and saw-toothed, more like those of the nearly awake NREM-1 sleep. But unlike NREM-1, during REM sleep your **heart rate rises, your breathing becomes rapid and irregular,** and every half-minute or so your **closed eyes dart around** in momentary bursts of activity. These **eye movements announce the beginning of a dream**—often emotional, usually story-like, and richly hallucinatory.
    - Your brain's motor cortex is active during REM sleep, but your brainstem blocks its messages. This leaves your muscles relaxed
    - As the night wears on, deep **NREM-3 sleep grows shorter and disappear**s. The **REM and NREM-2 sleep periods get longer**
    - Sleep patterns are genetically influenced

Why do we sleep?

- Sleep protects

- Helps us recuperate (immune system and repair brain tissue, gets rid of toxic metabolic waste)
- ***Sleep helps restore and rebuild our fading memories of the day's experiences.*** Sleep consolidates our memories. It reactivates recent experiences stored in the hippocampus and shifts them for permanent storage elsewhere in the cortex
- ***Sleep feeds creative thinking*.**
- ***Sleep supports growth.*** During deep sleep, the pituitary gland releases a growth hormone that is necessary for muscle development. As we age, we release less of this hormone and spend less time in deep sleep
- A regular full night's sleep can also "*dramatically* improve your athletic ability,"
- Slow-wave sleep, which occurs mostly in the first half of a night's sleep, produces the human growth hormone necessary for muscle development. REM sleep and NREM-2 sleep, which occur mostly in the final hours of a long night's sleep, help strengthen the neural connections that build enduring memories, including the "muscle memories" learned while practicing tennis or shooting baskets.
- The optimal exercise time is late afternoon or early evening
- Newborns sleep 2/3 of their day
- Adults sleep less than 1/3 (adults avg 7-8h of sleep)
- Sleep patterns are genetically (study done on twins) and culturally influenced
- Light disrupts of 24h circadian clock by activating l**ight-sensitive retinal proteins** (which trigger signals to the brains **suprachiasmatic nucleus**)
    - SCN causes brain's pineal gland to decr production of melatonin in the morning and incr in evening
- Sleep consumes around 1/3 of our lives
- Sleep debt cannot be satisfied by naps or one long sleep
- Sleep loss is s predictor of depression (REM prevents depression)

Major Sleep Disorders

- **Insomnia:** persistent problems **falling asleep/staying asleep**
    - Even if we have been awake only an hour or two, we may *think* we have had very little sleep because it's the waking part we remember.
    - The most common quick fixes for true insomnia—**sleeping pills and alcohol—can aggravate the problem**, reducing REM sleep and leaving the person with next-day blahs.
- **Narcolepsy**: people who have sudden attacks of overwhelming sleepiness, usually lasting less than 5 minutes.
- **Sleep apnea (**could be confused with snoring), it was unknown before modern sleep research. *Apnea* means "with no breath," and people with this condition intermittently **stop breathing during sleep. Associated with obesity.**

- **Night terrors** are not nightmares (which, like other dreams, typically occur during early morning REM sleep); night terrors usually occur during the first few hours of **NREM-3.**
- **Sleepwalking**—another **NREM-3** sleep disorder—and **sleeptalking** are usually childhood disorders and, like narcolepsy, they run in families
- **REM Rebound:** tendency for REM sleep to increase following REM sleep deprivation (created by repeated awakening during REM sleep)

Dreams

Our two-track mind continues to monitor our environment while we sleep. Sensory stimuli—a particular odor or a phone's ringing—may be instantly and ingeniously woven into the dream story.

Sleep

- ***To satisfy our own wishes***
- ***To file away memories.***
- ***To develop and preserve neural pathways.***
- ***To make sense of neural static***
- ***To reflect cognitive development***
- **Manifest content**: according to Freud, the remembered story line of a dream.
- **Latent content:** according to Freud, the underlying meaning of a dream (what Freud was most interested in)

Sleep Deprivation Effects on Hormones

- Increases ghrelin (makes you hungry, partner is leptin which makes you feel full)
- Decreases metabolic rate
- Increases cortisol (makes body fat)
- Enhances limbic brain responses to the mere sight of food an decreases cortical inhibition
- Sleep boosts immune cells and allows for more concentration

Treatment of Sleep Deprivation

- Go to sleep 15 mins earlier every day

Neural Actvation Theory

- Dreams are the brain's attempt to make sense of random neural activity

DRUGS & CONSCIOUSNESS

- If one culture assumes that a particular drug produces euphoria (or aggression or sexual arousal) and another does not, each culture may find its expectations fulfilled.
- A person may be diagnosed with ***substance use disorder*** when drug use continues despite significant life disruption
- **Resulting brain changes may persist** after quitting use of the substance (thus leading to strong cravings when exposed to people and situations that trigger memories of drug use).

Diminished Control
1. Uses more substance, or for longer, than intended.
2. Tries unsuccessfully to regulate use of substance.
3. Spends much time acquiring, using, or recovering from effects of substance.
4. Craves the substance.
Diminished Social Functioning
5. Use disrupts commitments at work, school, or home.
6. Continues use despite social problems.
7. Causes reduced social, recreational, and work activities.
Hazardous Use
8. Continues use despite hazards.
9. Continues use despite worsening physical or psychological problems.
Drug Action
10. Experiences tolerance (needing more substance for the desired effect).
11. Experiences withdrawal when attempting to end use.

- Why might a person who rarely drinks alcohol get buzzed on one can of beer while a long-term drinker shows few effects until the second six-pack? The answer is **tolerance**. With continued use of alcohol and some other drugs (not marijuana), the user's brain chemistry adapts to offset the drug effect (a process called *neuroadaptation*). To experience the same effect, the user requires larger and larger doses
- **addiction**: The person craves and uses the substance despite its adverse consequences
- that labeling a behavior doesn't explain it. Attributing serial adultery to a "sex addiction" does not *explain* the sexual impulsiveness
- viewing addiction as an uncontrollable disease can undermine people's self-confidence and their belief that they can change
- Sometimes, though, behaviors such as gambling, video gaming, or online surfing do become compulsive and dysfunctional, much like abusive drug taking

psychoactive drugs: chemicals that change perceptions and moods

- The three major categories of psychoactive drugs are ***depressants, stimulants,* and *hallucinogens***

Depressants: are drugs such as alcohol, barbiturates (tranquilizers), and **opiates** that calm neural activity and slow body functions.

- Alcohol (equal opportunity drug)
  - Slows neural processing (slows sympathetic NS)
  - Can be a potent sedative when paired with little sleep
  - Can disrupt memory formation
  - Heavy drinking leads to long term effects on brain and cognition
  - Blackouts result partly from the way alcohol suppresses REM sleep, which helps fix the day's experiences into permanent memories.

    - Reduced self awareness and self-control
    - Expectations influence behaviour
- Barbiturates
    - Like alcohol, they depress nervous system activity
    - Barbiturates such as Nembutal, Seconal, and Amytal are sometimes prescribed to induce sleep or reduce anxiety
    - In larger doses, they can impair memory and judgment.
    - Can be lethal when combined with alcohol
- Opiates
    - Like Alc & Bar, depresses neural functioning
    - When using the opiates, which include *heroin,* **pupils constrict**, breathing slows, and lethargy sets in as blissful pleasure replaces pain and anxiety.
    - Extreme addiction & withdrawal symptoms
    - Many long term effects
    - When repeatedly flooded with an artificial opiate, the brain eventually stops producing *endorphins*
    - **Opiates** include the **narcotics, such as codeine and morphine** (and the synthetic methadone, a heroin substitute), which physicians may prescribe for pain relief and which can also lead to addiction.

Stimulants

- Excite neural activity and speed up body functions
- **Pupils dilate**, heart and breathing rates increase, and blood sugar levels rise, causing a **drop in appetite**. Energy and self-confidence also rise.
- Stimulants include caffeine, nicotine, the **amphetamines**, **cocaine, meth**amphetamine ("speed"), and Ecstasy.
- People use stimulants to feel alert, lose weight, or boost mood or athletic performance. Unfortunately, stimulants can be addictive,
- Cut off from your usual dose, you may crash into fatigue, headaches, irritability, and depression
- Mild dose of caffeine lasts 3-4h
- Nicotine: In cigarettes and any other tobacco products
    - A teen-to-the-grave smoker has a 50 percent chance of dying from the habit, and each year, tobacco kills nearly 5.4 million
    - Smoke a cigarette and nature will charge you 12 minutes
    - Life expectancy of smoker is 10 years shorter
    - Powerfully & quickly addictive
    - smokers develop *tolerance,* and quitting causes withdrawal symptoms, including craving, insomnia, anxiety, irritability, and distractibility. Nicotine-deprived smokers trying to focus on a task experience a tripled rate of mind wandering

        - **Epinephrine and norepinephrine diminish appetite and boost alertness and mental efficiency.**
        - For those who endure, the acute craving and withdrawal symptoms gradually dissipate over the ensuing six month
- Cocaine: Offers a fast track from euphoria to crash
    - Coca cola originally used it
    - Cocaine is now snorted, injected, or smoked
    - It enters the bloodstream quickly, producing a rush of euphoria that **blocks reuptake** of the neurotransmitters **dopamine, serotonin, and norepinephrine.** Within the hour, a crash of agitated depression follows as the drug's effect wears off.
    - Given a placebo, cocaine users who *thought* they were taking cocaine often had a cocaine-like experience
- Methamphetamine: triggers the **release** of the neurotransmitter **dopamine**, which stimulates brain cells that enhance energy and mood, leading to eight hours or so of heightened energy and euphoria. Its after-effects may include irritability, insomnia, hypertension, seizures, social isolation, depression, and occasional violent outbursts
- Ecstasy: street name for **MDMA** (molly as powdered form)
- Both a stimulant and a mild hallucinogen.
- Triggers **dopamine** release, but its major effect is releasing stored **serotonin** and **blocking its reuptake**
- Users feel the effect about a half-hour after taking an Ecstasy pill. For three or four hours, they experience high energy, emotional elevation, and (given a social context) connectedness with those around them ("I love everyone").
- can lead to severe overheating, increased blood pressure, and death
- suppresses immune system, impairs memory, slows thought, and disrupts sleep by interfering with serotonin's control of the circadian clock

Hallucinogens

- Distort perceptions and create sensory images when there's nothing
- Some, such as LSD and MDMA (Ecstasy), are synthetic. Others, including the mild hallucinogen marijuana, are natural substances.
- The experience typically begins with simple geometric forms, such as a lattice, cobweb, or spiral. The next phase consists of more meaningful images; some may be superimposed on a tunnel or funnel, others may be replays of past emotional experiences. As the hallucination peaks, people frequently feel separated from their body and experience dreamlike scenes so real that they may become panic-stricken or harm themselves.
- These sensations are strikingly similar to the **near-death experience**,
- LSD: Albert Hofmann, a chemist, created
    - uninterrupted stream of fantastic pictures, extraordinary shapes with intense, kaleidoscopic play of colors
- Marijuana: Marijuana leaves and flowers contain **THC**

- Synthetic marijuana is called spice
- Leads to agitation and mild hallucinations
- Amplifies sensitivity to colors, sounds, tastes, and smells. But like alcohol, it relaxes, disinhibits, and may produce a euphoric high.
- Both alcohol and marijuana impair the motor coordination, perceptual skills, and reaction time necessary for driving
- **The body eliminates alcohol within hours. THC and its by-products linger in the body for more than a week, therefore, less harsh withdrawal symptoms and tolerance**
- user's experience can vary with the situation (If the person feels anxious or depressed, marijuana may intensify the feelings)
- The more often the person uses marijuana, especially during adolescence, the greater the risk of anxiety, depression, or addiction
- Marijuana also disrupts memory formation and interferes with immediate recall of information learned only a few minutes before
- **Heavy adult use for over 20 years is associated with a shrinkage of brain areas that process memories and emotions**
- Marijuana smoke, like cigarette smoke, is toxic and can cause cancer, lung damage, and pregnancy complications

Drug	Type	Pleasurable Effects	Negative Aftereffects
Alcohol	Depressant	Initial high followed by relaxation and disinhibition	Depression, memory loss, organ damage, impaired reactions
Heroin	Depressant	Rush of euphoria, relief from pain	Depressed physiology, agonizing withdrawal
Caffeine	Stimulant	Increased alertness and wakefulness	Anxiety, restlessness, and insomnia in high doses; uncomfortable withdrawal
Nicotine	Stimulant	Arousal and relaxation, sense of well-being	Heart disease, cancer
Cocaine	Stimulant	Rush of euphoria, confidence, energy	Cardiovascular stress, suspiciousness, depressive crash
Methamphet-amine	Stimulant	Euphoria, alertness, energy	Irritability, insomnia, hypertension, seizures
Ecstasy (MDMA)	Stimulant; mild hallucinogen	Emotional elevation, disinhibition	Dehydration, overheating, depressed mood, impaired cognitive and immune functioning
LSD	Hallucinogen	Visual "trip"	Risk of panic
Marijuana (THC)	Mild hallucinogen	Enhanced sensation, relief of pain, distortion of time, relaxation	Impaired learning and memory, increased risk of psychological disorders, lung damage from smoke

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Chapter 6: Sensation and Perception

Basics of Sensation:

The Musts of Sensation:

- We must be able to **detect** the physical stimulation in the environment

    - As humans, we only detect a tiny portion of the stimulation/physical energy
- The physical energy we detect must be **transduced** (translated into a message the brain can understand through action potentials and neurotransmitters / convert one form of energy into another)
- Info must be **transmitted** to the brain

Sensory Receptors:

- Highly specialized receptors that detect, transduce and transmit the physical energy

***Sensation** is a **bottom-up process**:*

- This means we start with the basic elements and we build up (start from scratch)

Measuring the senses:

1. Psychophysics: Scientific study of how the physical characteristics of the environment translate into psychological experiences
2. Absolute Threshold: Even when we can detect to an energy, it needs to be strong enough for us to detect it. Absolute threshold is the minimum about of energy/stimulation that must be there in order for us to detect it 50% of the time.
3. Difference Threshold/JND: The minimum **change** in stimulation/energy that must take place in order for me to detect it 50% of the time.
    - Weber's Law (*MT*): "This law states that for an average person to perceive a difference, two stimuli must differ by a constant minimum *percentage*(not a constant *amount*). The exact proportion varies, depending on the stimulus. Two lights, for example, must differ in intensity by 8 percent. Two objects must differ in weight by 2 percent. And two tones must differ in frequency by only 0.3 percent"
4. Signal Detection Theory: Our ability to detect stimulation/energy does not only depend on the strength of the energy/stimulation. Rather, a variety of factors influence this ability. Ex. **Mood, motivation, state of health, previous experience/knowledge**
    a. Predicts when we will detect weak signals (measured as a ratio of hits to false alarms)
5. Subliminal Persuasion (*MT*): Subliminal persuasion is a kind of persuasion in which techniques used below the level or threshold of human consciousness. These are directly sent to subconscious mind from where it understand and relate message and send it to conscious mind for performing specific actions according to message perceived.
        - Stimuli you cannot detect 50% of the time is subliminal
        - **Priming:** the activation, often unconsciously, of certain associations, thus predisposing one's perception, memory or response
            - A certain word can briefly prime your response to a following question

Sensory Adaptation:

- Repeated exposure to a stimulus that is not changing leads to **sensory adaptation**
- Our sensory neurons will adapt to it and therefore will respond less to it/stop responding to it

Value:

- 2 main benefits:
  - We are bombarded with physical stimulation and we should be able to tune it out otherwise the nervous system will be over excited and we will crash
  - Our attentional resources are limited, therefore we should be able to tune out a stimulation that's not changing so we can pay attention to something more important in the environment
- Circumventing Sensory Adaptation:
  - It is not allowed to happen if there is **Intense Pain.** Body does not allow sensory adaptation because it signals a serious threat/danger.
  - **Eyes** do not sensory adapt otherwise objects would become invisible.

Basics of Perception:

What is it?

- Brain analyzes sensory information and organizes & interprets it in a meaningful way

Top - down processing

- Use previous knowledge and beliefs to interpret information.

Could we have sensation and but not perception?

- YES! Ex. Prosopagnosia (disease) causes individuals to not recognize faces. All senses are working because they can see the person but they are unable to recognize who they are.

Could we have perception but not sensation?

- YES! Ex. taking drugs causes hallucinations so you can perceive something that is not actually there/sensed.

Influences on perception:

1. Perceptual set: A **predisposition** to interpret life and its events in a certain way (shaped by all our experiences such as culture, family, school, etc.).
   - Can also affect what we hear and taste
2. Context effects: The context and situation we are in affects how we interpret something.
3. States of being: Mood, emotion, state of health, tiredness

VISION:

The Stimulus:

- There must be light
  - Light is a type of electromagnetic radiation that travels in a wave
  - It is part of the electromagnetic spectrum:
    - (*MT*)
    - 400 = purple
    - 500 = green/blue
    - 600 = yellow/orange

        - 700 = red
    - Characteristics of light:
        - 1. Wavelength: distance between 2 peaks in a wave
            - Physical characteristic translating into a psychological experience of hue/**colour**
            - (*MT*)
            - Long wavelength = red
            - Medium wavelength = green
            - Short wavelength = blue
        - 2. Amplitude: height of a wave that translates into a psychological experience of **brightness**

The Eye:

- To see, light must be on the eye and focused on the **retina**
- As it enters the eye, it goes through several structures and they all work to focus light onto the retina
- Light enters the eye through the cornea, which bends light to help provide focus
- Light then passes through pupil, surrounding the pupil & controlling its size is the iris, a coloured muscle that dilates or constricts in response to light intensity also responds to our cognitive and emotional states.
- Behind the pupil is a transparent lens that focuses incoming light rays into an image on the retina (a multilayered tissue on the eyeball's sensitive inner surface)
- Lens focuses the rays by changing the curvature & thickness in a [process called **accommodation.**
- The retina doesn't "see" a whole image. Rather, its millions of receptor cells convert particles of light energy into neural impulses and forward those to the **brain**. There, the impulses are reassembled into a perceived upright-seeming image.
- Message of vision is sent to the brain's visual cortex via the thalamus

Retina Structure:

- Innermost Layer of Retina: Rods and Cones (see later)
    - Connected to bipolar cells
    - Bipolar cells are connected to ganglion
    - Axons of ganglion cells cluster together to form **optic nerve**
    - **Optic nerve exits eyes and transmits information to the brain**
    - The place where the optic nerve exits the eye is the **blind spot** because there are no nerve cells to detect light there
- Center of Eye: **Fovea** is responsible for the eye to see fine details

Rods and Cones:

- Known as **photoreceptors** since they detect, transduce and transmit
- Rods and cones differ from each other in:
    - *Shape:* rods are straighter, cones look like cones
    - *Number:* there are more rods than cones

- *Function:* Rods are very sensitive to light and allow us to see black, white and grey, they're used when it's dim or dark at night. Cones are not sensitive to light and are used for day vision, they're used for us to see colour and fine details.
- *Location:* Cones are found in **phobia and periphery** and are of highest concentration in phobia. There are no rods in the phobia.
    - **Cones cluster around the fovea** (the retina's area of central focus)
- *Connection to bipolar cell:* cones have a one to one connection whereas multiple rods connect to one bipolar cell.

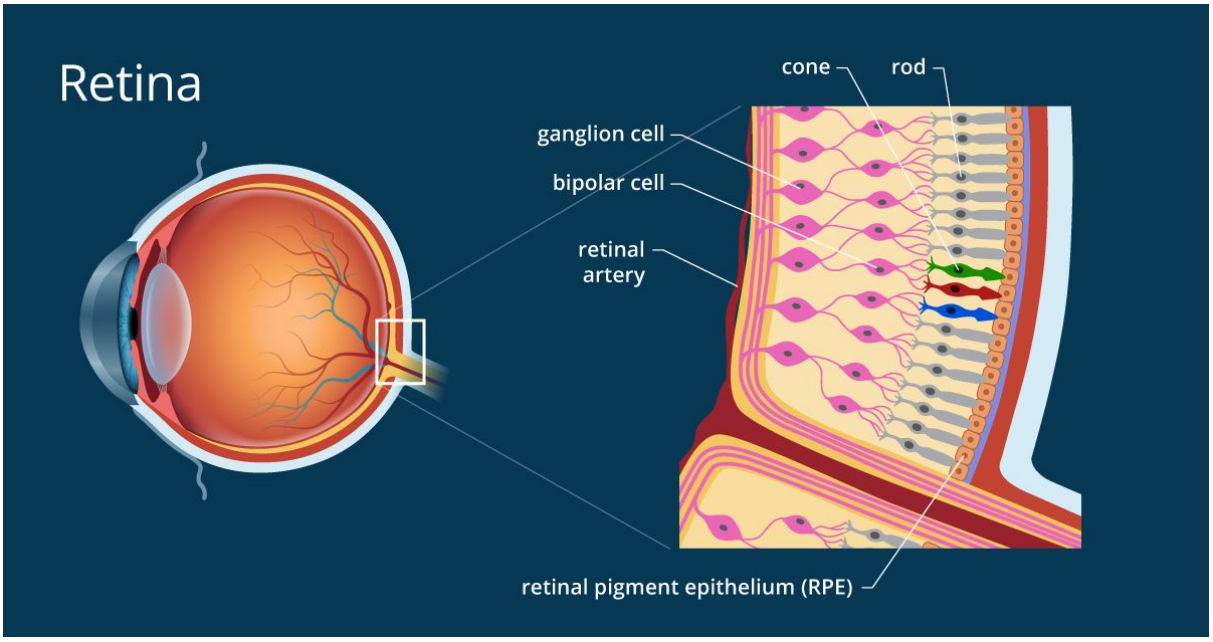
- When you enter a darkened theatre, your eyes adapt - your pupils dilate to allow more light to reach your retina but typically takes 20 mins to fully adapt

Visual Information Processing (in order of increasing complexity):

1. Retina begins process of info (ganglion cells begin to process the info)
2. Ultimately it reaches the visual cortex
    - **Feature detectors** are found (specialized nerve cells that respond to really specific stimuli) ex. Some respond to only vertical lines
    - Retina begins process of info (ganglion cells begin to process the info)
3. **Parietal** and **Temporal Lobes**
    - **Parietal Lobes:** *Where* pathway (P-here = pear)
        - Tells us where object is, how far it is and if it's moving
    - **Temporal Lobes**: *What* pathway
        - Tells us what you are looking at
4. **Parallel Processing**: Your unconscious mind processes info this way
    - **Parallel Pathway:** unconscious mind does this - we process **multiple steps** simultaneously (ex. Watching a scene from a movie, one group of neurons is processing colour, another = shape, another = movement, is all happening at the same time and when they are done they exchange info and we see a unified scene)

Serial pathway: conscious mind does this

- We process info **one step at a time**



Colour Processing

- If a tomato is red, it is really reflecting red

Young-Helmholtz Theory/Trichromatic theory

- At the time, people knew all we need are three primary light colours: Red, Green and Blue, in order for us to create any colour of light the human eye can see
- Based on this, Trichromatic theory concluded we must have RGB cones in our retina (does not refer to actual colour of cones_
- While each type of cone can be sensitive to a number of different wavelengths, it's maximally sensitive/responsive to a very specific wavelength
    - Ex. red cone - long wavelength/colour red
- Brain's constantly monitoring these 3 types of cones
    - To see what type is being activated in what combination and to what degree
        - Based on this info, your brain will determine colour
- Most people with color-deficient vision are not actually colorblind, they're simply lacking functioning red or green-sensitive cones or sometimes both

Opponent-Process Theory

Hering acknowledged the value of trichromatic theory. However, he thought it didn't explain all visual phenomenon SO he made his own. The one thing the Trichromatic theory did not explain is **complementary afterimages.**

*Afterimage***:** continuing to see an image even though the stimulation has ended

Complementary Afterimage: if you stare at green for a while then look at a white piece of paper, you will end up seeing red (same thing with blue, it will turn yellow)

- Green = red
- Blue = yellow

- Black = white

Hering's theory

- There are 4 primary colours: Red, green, blue, yellow
- 3 antagonistic colour system in usual system

RG (red-green system)

- Use this system as an example of how they all function (RG, BY, BW)
- Maximally responsive to red and green light
- However, neurons in the system respond to red and green light in different ways
- Excited by red light = inhibited by green light
- Excited by green light = inhibited by red light

BY (blue-yellow system)

BW (black-white system)

Bottom Line (to date)

- 2 theories attempting to explain colour vision
- BOTH theories have been supported by modern research
    - Research says we do have 3 colours and cones in the retina
- In retina, we have ganglion cells that function in **opponent processes** and neurons in the brain that function that way as well

How Brain Organizes & Interprets Sensory Info

Gestalt Psychology

- No longer exists
- However, their work continues to be valuable today
- They started research on Organization and Interpretation of Sensory Info
- Came up with gestalt principles
    - 1st principle: Brain organises info into gestalt
        - **Gestalt: unified whole**/a form (ex. A whole face, not separate parts)
    - 2nd principle: the whole may exceed the sum of its parts
        - Perceiving: brain doesn't perceive passively, it's quite active and constructs reality
        - **Uses its knowledge, assumptions to perceive, organize and interpret information (top-down process)**

Form Perception

Figure & Ground

- Your brain automatically organizes info into figure and ground
- *Figure*: stimulus you're focusing your attention on
- *Ground:* background
- The two continuously reverse
- Because of figure and ground, the same stimulus can be perceived in different ways

Grouping

Some of the rules:

- Proximity: elements in a visual scene that are physically closer together will be perceived as a single unit
- Similarity: elements in a scene that are similar to each other are perceived as a single unit
- Continuity: elements in a scene that seem to continue or flow in the same direction will be perceived as a single unit.
- Connectedness: elements in a scene that are connected to each other will be perceived in a single unit.
- Closure: when elements in a scene are missing, your brain will use its knowledge to fill in the blanks.

Depth Perception

- How far an object is from me
- Is it innate? Or does it require experience?
- Visual Cliff: Laboratory device
    - Use babies of 6-14 months old to test this experiment
    - Discovered: **Partly Innate**!
    - However, experience is a must for proper development of depth perception
        - Brain uses 2 types of clues to determine:
        - **Binocular Depth Cues:** Brain needs info from both ways eyes in order to determine depth
            - 2 types of binocular cues:
                - Convergence: degree to which your eyes rotate inwards when focusing on an object (higher rotation = closer an object is perceived to be)
                - Retinal Disparity: distance between our eye causes each eye to have a slightly different image of the object we're looking at (**higher retinal disparity = closer object is perceived to be, vice versa**)
        - **Monocular Cues:** Brain needs info from one eye to create depth
        - Relative size: when objects in a scene are known to be roughly of the same size, the one that looks larger will be perceived at closer

            Interposition: objects in a scene that seem to partially block other objects are perceived at closer

            Relative Clarity: objects in a scene that look clearer and crisper will be perceived to be closer than those that look hazier and foggier

            Texture Gradient: the coarser and more detailed the texture of an object is, the closer it will be perceived

            Relative height: objects in a scene that are higher up in my field of vision are perceived to be further away

Relative motion/motion parallax: perceiving: depth while we are moving, brain takes 2 things into consideration

- How fast is the object moving?
- What direction?
- **Fast object moving in opposite direction as ourselves: closer**
- **Slow object moving in same direction: further away**

Linear perspective: 2 parallel lines that meet

- Objects at point of meeting appear to be further away

Lights and Shadow: well-lit objects appear to be closer than dimmer objects and objects that cast a shadow on other objects appear to be further away

Motion perception: - if image casted on retina gets bigger, brain assumes it's getting closer

- Brain makes 2 basic assumptions:
  - Stroboscopic movement: you perceive lots of movement/motion however there is none - your brain is creating this action (ex. **Watching a movie)**
  - Phi Phenomenon: stationary lights that appear to be moving when there is no movement (turned on and off rapidly in a successive manner and brain perceives movement when there isn't any)
  - Perceptual constancy: our tendency perceive the size, shape and colour of object as remaining the same in spite of changes in sensory input (ex. Your parents can recognize you no matter if you're turned around, on the floor, etc.)
  - Colour constancy: perceiving familiar objects as having consistent colour, even if changing illumination alters the wavelength reflected by the objects
  - Shape constancy: sometimes an object whose actual shape cannot changes seems to change with the angle of our view, ex. A door, yet we still perceive it as rectangular not trapezoidal
  - Relative luminance: according to the book, relative luminance is an
  - explanation of colour constancy. When brain is assessing colour of an object, it takes into consideration how much light is being reflected off other objects in the environment.
    - Because of a certain environment, we perceive two identical colours to be different
  - Size-distance relationship: two are intertwined:
    - Brain uses size info to determine distance and vice versa
  - Perceptual adaptation: brain's ability to adapt and adjust to a world that has been artificially manipulated (ex. Turned upside down, shifted to the side, etc.)
  - Sensory Deprivation & restored vision: If most of your life you were blind, would you have normal perceptual abilities? Based on lots of research on human babies and baby animals, Cataract (in eye) blocks light so you can't see.

        - When we're deprived on vision and it is reposed later on in life, **colour, figure, light is ok, motion perception is somewhat ok, depth, face, shape perception will be problematic**

- **Kant** believed knowledge comes from our inborn/**innate** ways of organizing sensory experiences
- **John Locke** argued that it's not innate, it's as a result of **experiences** and learning to perceive the world

Hearing

- Helps us adapt and survive
- Amplitude determines loudness
- Length/frequency determines pitch
    - Short waves = high frequency
    - Long waves = low frequency
- Sound is measured in decibels - 0 decibels is the abs threshold for hearing
- Every 10 decibels = a tenfold increase in sound intensity

Physiology

- Sound waves first enter the **outer ear**
- Then a chain reaction begins as the visible outer ear channels the waves through the **auditory canal** to the **eardrum** (tight membrane) causing it to **vibrate**
- In the **middle ear**, a **piston** made of 3 tiny bones (hammer, anvil & stirrup) pick up vibration and transmit them to the **cochlea** (snail-shaped tube in the inner ear)
- The incoming vibration cause the cochlea's membrane (the oval window) to **vibrate**, **jostling the fluids in the tube**
- This motion causes ripples in the **basilar membrane**, **bending hair cells** lining the surface
- Hair cell movement riggers impulses in adjacent nerve cells
- Axons of those cells converge to form the **auditory nerve**, which sends neural messages (via the thalamus) to the **auditory cortex** in the brain's **temporal lobe**.
- We can hear!
- There are tiny bundles of cilia on the tip of a hair ell that alert the hair cell and triggers a neural response

Hearing Disorders/Complications

- **Sensorineural Hearing Loss** (nerve deafness): damage to **cochlea's hair cell receptors,** more common than conduction hearing loss (or damage to the auditory nerves)
    - The only way to restore hearing for people with nerve deafness is a cochlear implant
        - This electronic device translates sounds into electrical signals that, wired into the cochlea's nerves, convey info about sound to the brain (via the auditory nerve to the brain)

- **Conduction hearing loss:** caused by damage to the mechanical system that **conducts sound waves to the cochlea** (3 tiny bones ?)

How do we Determine Loudness?

- Soft tone = activation of few hair cells attuned to its frequency
- Loud tone = neighbouring hair cells also responds
- THEREFORE, your brain interprets loudness from number of activated hair cells
- Sound compression: harder-to-hear sounds are amplified more than loud sounds (feature in today's digital hearing aids)

How do we Determine Pitches?

- **Hermann von Helmholtz' place theory** presumes we hear different pitches because different sound waves trigger activity at different places along the cochlea basilar membrane
    - **Place theory**: the theory that links the pitch we heart with the place where the cochlea's membrane is stimulated
        - **Best describes high pitches**
    - **Frequency theory (temporal theory)**: the theory that the rate of nerve impulses traveling up the auditory nerve matches the frequency of a tone, thus enabling us to sense its pitch
        - **Best describes low itches**
    - Some combo of the two seem to handle pitches in the intermediate range

Sense of Touch:

- Some spots on our body are especially sensitive to pressure, others to warmth, others to cold, and others to pain
    - Stroking adjacent pressure spots = tickle
    - Repeated gentle stroking of a pain spot = itching
    - Touching adjacent cold and pressure spots = wetness
    - Stimulating nearby cold and warm spots = hot
- All produce different somatosensory cortex responses

    Pain: body's way of telling you something has gone wrong
        - Women are more sensitive to it than men
        - **Nociceptors:** sensory receptors that enable the perception of pain in response to potentially harmful stimuli
        - **Gate control theory:** the theory that the spinal cord contains a neurological gate that blocks pain signals or allows them to pass on to the brain. The gate is opened by the activity of pain signals traveling up small nerve fibers and is closed by activity in larger nerve fibers or by information coming from the brain
        - **Phantom limb sensations:** brain can create pain even after the certain limb has been amputated
        - **Tinnitus**: phantom sound of ringing in the ears
        - **In experiments, most preferred more net pain but less pain at the end**

- **In experiments, those who received the "last" piece of chocolate as opposed to the "fifth last" piece, enjoyed it better**
- We tend to perceive more pain when others seem to be experiencing pain
- Some people can be more tolerant (genetic)
- Controlling pain: placebos, distractions (diverting brain's attention)

Sense of Taste

Sweet - energy source
Salty - sodium-essential to physiological processes
Sour - potentially toxic acid
Bitter - potential poisons
Umami - proteins to grow & repair tissues (savory meaty taste, ex. salmon)

Physiology

- Each little bump on your tongue are 200 or more taste buds, each containing a pore that catches food chemicals
- In each taste bud pore, 50 to 100 taste receptor cells project antenna-like hairs that sense food molecules
    - Some respond to mostly sweet-tasting molecules, others to salty, etc.
- Taste receptors reproduce themselves every week or two
- As you grow older, the number of taste buds decreases, as well as its sensitivity
- Smoke use and alcohol accelerate these declines
- Expectations influence taste!

Sense of Smell

- Begins with inhale and ends with exhale
- Smell = olfaction
- We experience smell when molecules of a substance carried in the air reach a tiny cluster of 20 million receptor cells on top of each nasal cavity
- Instantly, they alert the brain through their axon fibers
- **Smell is primitive**
- Olfactory neurons bypass the brain's sensory control center - the thalamus
- Odor molecules come in many shapes and sizes
- Key & lock (receptor), produces over 1 trillion odors
- Gender and age affect our ability of smell
- Women and young adults have the best sense of smell
- Smokers, people with Alzheimer's, Parkinson's, alcohol disorder typically have a diminished sense of smell
- Smell peaks in early adulthood and gradually declines
- We're bad at describing smells
- Animals have better sense of smell than us
- Scents can bring back memories

Body Position and Movement

- Important sensors in your joints, tendons, and muscles enable your **kinesthesia**

- **Kinesthesia = Proprioception:** sense of the position and movement of your body parts
    - Interacts with vision
    - Kinesthetic sensors in joints, tendons and muscles
- **Vestibular sense:** the sense of movement and position, including the sense of balance
    - affected by inner ear
    - Head movement

Sensory Interaction: When a deaf listener sees an animated face forming the words being spoken at the other end of a phone line the words become easier to understand

- The principle that one sense may influence another
- Ex. when smell of food influences taste
- Smell + taste + texture = flavor

Embodied Cognition: the influence of bodily sensations, gestures, and other states on cognitive preferences and judgements

- **After holding a warm drink rather than a cold one, people are more likely to rate someone more warmly**
- After being given the cold shoulder by others, people were more likely to rate the room as cold
- Sitting at a wobbly desk and chair makes others' relationships seem less stable

ESP - Perception without Sensation

Telepathy: mind-to-mind communication
Clairvoyance: perceiving remote events, such as a house on fire in other state
Precognition: perceiving future event, such as an unexpected death in the next month
Psychokinesis: "mind over matter", ex. **Levitating table**
ESP: extrasensory perception - the controversial claim that perception can occur apart from sensory input; includes telepathy, clairvoyance, and precognition
Parapsychology: the study of paranormal phenomena, including ESP and psychokinesis

Chapter 7: Learning

Learning is a relatively permanent change in how we feel, think and behave as a result of experience

- Adaptability & Flexibility
    - Because of our ability to learn, we have adaptability and flexibility
- Force
    - We can use learning for good force or bad force
- Hope

- Gives us hope for the future

We learn in 3 major ways:

1. Classical Conditioning
2. Higher Order Conditioning
3. Operational Conditioning

- Conditioning: learning to form associations

CLASSICAL CONDITIONING (uses Pavlov)

- Occurs every day
- Learning to associate to events or stimulation
    - Learn that one event reliably announces the arrival of another event (essential for survival and adaptive)
- We can plan/anticipate events

Pavlov's Experiment:

- Food (US, unconditioned stimulus) = Salivation (UR, unconditioned response)
    - No need for learning UR, it is natural behaviour
- Bell (neutral stimulus) = No salivation
- Bell → Food = Salivation
    - Repeat and dog will eventually salivate at sound of bell
- Bell (CS, conditioned stimulus) = Salivation (CR, conditioned response)

HIGHER ORDER CONDITIONING (includes diff factors)

- Bell sound = salivation
- We train the dog to salivate to sound of bell & red triangle together
- Repeat this, ultimately, dog will salivate at red triangle only
- Process by which the dog learned to salivate at sound of bell is acquisition

Factors:

- Frequency: the more we represent bell and food together, the better the learning
- Timing: give food immediately after sounding the bell, it there is too much time between the two, learning may not happen
- Order of presentation: sound bell first, THEN food (CS before US)

OPERANT CONDITIONING (includes Skinner's Experiment)

- Associating a response (behaviour) and its consequence
- Repeat acts followed by good results and avoid acts followed by bad results
- Saying please is rewarded with a treat, therefore the act is more often repeated

Skinner's Experiment:

- In classical conditioning, we learn about stimuli (dog salivates at sound of bell)
    - Sound of bell is the respondent behaviour
- In Operant Conditioning, we learn to associate behaviours with their consequences (good or bad)

- Called operant conditioning because we're doing something that gives a consequence
- **Law of effect: behaviour is shaped by its consequences**
    - When behaviour results in a desirable consequence, we are likely to do it again and vice versa
- Principles of Reinforcement: reinforcer (a desirable consequence that's gonna make the behaviour more likely to repeat)
- All reinforcements are more effective than punishments
    - Positive reinforcer: as a result of a behaviour, something desirable is presented to us
    - Negative reinforcer: as a result of a behaviour, something undesirable is removed (more likely to repeat behaviour) ex. Weight loss/back pain
    - Primary Reinforcer:
        - Naturally satisfying (basic innate needs)
        - Ex. water
    - Conditioned/Secondary reinforcer:
        - Not naturally satisfying, only through experience we learn their value
        - Ex. money
    - Immediate Reinforcer:
        - Do behavior & get reinforced immediately/shortly after
    - Delayed reinforcer:
        - Do behaviour but we have to wait for a while before we get reinforced
        - Ex. get paid at work 2 weeks after
- Schedules of Reinforcement
    1. Continuous Reinforcement
        - Get reinforcements everytime the behaviour occurs
        - Good to teach a new behaviour
        - However, not good to keep behaviour long term because shortly after you stop reinforcing, behaviour may stop happening
    2. Intermittent Reinforcement
        - Behaviour is only sometimes reinforced
        - Good for long term
        - 2 types: ratio & interval
        - Ratio: response based
            - Number of responses determines when the reinforcements will take place
            - FIXED: very specific # of behaviour must occur before reinforcement takes place
                - Produces a high & steady response with a little break after reinforcement & then we start again
            - VARIABLE: # of times the behaviour is reinforced is unpredictable, little break in between
                - **More high and steady**

- Interval: time based about when we're gonna be reinforced
    - FIXED: very specific amount of time before reinforcement
        - Very high rate of response at time of reinforcement, **then drops**
    - VARIABLE: amount of time that must go by before we're reinforced is unpredictable & variable
        - Produces a **slow** and steady rate of responding

Punishment (still part of OP conditioning)

- Definition: we do a behaviour that produces undesirable consequences, because of this, we are less likely to repeat behaviour
- Positive punishment: do a behaviour and as a result, something unpleasant is added/presented. Because of this, we're less likely to repeat behaviour.
    - Ex. getting hit
- Negative punishment: do a behaviour and as a result, something pleasant is removed
    - Ex. phone taken away
- Side Effects: better to reinforce desired behaviour than negative behaviour
    - If punishment is harsh, behaviour will be suppressed rather than gotten rid of
    - Aggressiveness, fear & avoidance, helplessness, does not guide towards desirable behaviour

EXTINCTION:

- Dog has learned to salivate at sound of bell
- So we sound the bell & don't give food
    - Repeat.
- Ultimately, dog will stop salivating at sound of bell

SPONTANEOUS RECOVERY:

- Dog has stopped salivating at sound of bell
- One day out of the blue (no training), dog hears bell & salivates

GENERALIZATION:

- A dog bites you and you becomes of all dogs
- Teach the dog to salivate at sound of one particular bell, however, even though he isn't trained with other bells, he'll salivate to all similar sounds
- Can be adaptive (or maladaptive)

DISCRIMINATION:

- You train a dog to salivate at one specific bell & he only salivates to that sound (he can discriminate between stimuli)

Updating Pavlov's Understanding:

1. Cognitive Processes
    - Pavlov acknowledges the existence of cognitive processes but he felt we do not have to understand them to understand leaning so he disregarded it.

- Modern researchers do not agree.
- Rescoria says we cannot disregard them they are essential
- Animals are active learners (not passive, they learn like humans)
- Assess environment and only learn what gives them the most reliable info

2. Biological Constraints
    - Pavlov strongly believed that as long as you follow rules of classical conditioning, you can teach anything
    - Modern researchers **Garcia & Koelling** disagree
        - **Nature puts limits** on what you can teach
        - Mice in study are exposed to radiation (nausea), so they felt nauseous. Later, music is played and then radiation occurs & nausea
        - Mice did not learn association no matter how many repeats because they assumed it was something they ate
        - Same with light and radiation because light in nature does not cause nausea
        - Sugar water & radiation = yes because food in nature can cause nausea

Pavlov's Legacy

- **Discovered classical conditioning**
- Able to show that you can take complex psychological processes like learning and you can study them objectively
- Influenced **John Watson**
    - Before john watson, introspection (as subjects, we **observe our own mental processes** and we report on then) was used to study consciousness
    - However, this was totally subjective
    - John Watson was completely opposed to it because it was **subjective**
    - He believed the goal of psychology should just be of observable behaviors (prediction & control of behaviours was his goal). But he didn't have the scientific methodology (until Pavlov) and he used it to study behaviours
    - Pavlov is part of who started Behaviorism (dominated in 1920s - 1960s)

Shaping Behaviours

- Reinforcing successively closer approximations of a behaviour until the correct behaviour is displayed (ex. Teaching a dog to surf)

Updating Skinner

Cognition & Operational Conditioning

- Skinner acknowledged cognitive processes but believed we don't need to take them into consideration when it comes to learning and Operational Conditioning (same as Pavlov except Pavlov was learning in general) so he disregarded them
- Assumptions and beliefs are super important and cannot be disregarded
    - Latent Learning: strongly believed **trial and error, reward & punishment**
        - Learned by everyday actions
        - Remains hidden until we have the opportunity to use it
    - Cognitive map: mental map of space
        - Believed animals learned maze through trial & error, reward & punishment
        - In reality, they were forming a mental map of the maze in their brain
    - Intrinsic motivation: doing something for love & passion
        - No external rewards
        - Challenges skinner's beliefs
        - You genuinely like it
    - Extrinsic motivation: do something to get something else (class for a degree)
    - Insight learning: an **"Aha!" moment** & just get the solution
        - Challenges skinner's idea

Biological Predisposition

- Skinner strongly believed as long as you follow the principles of operant conditioning, you can teach anything
- However, this is not true because nature puts limits

Skinner's Legacy:

Skinner stirred a hornet's nest with his outspoken beliefs. He repeatedly insisted that external influences, not internal thoughts and feelings, shape behavior.

Examples:

- AT SCHOOL - textbooks that pace students and reinforce knowledge
- IN SPORTS - first reinforcing small successes and then gradually increasing the challenge.
- AT WORK - Rewards are most likely to increase productivity if the desired performance has been well defined and is achievable. The message for managers? Reward specific, achievable behaviors, not vaguely defined "merit."
- AT HOME (parenting) - parents should remember that basic rule of shaping: Notice people doing something right and affirm them for it. Give children attention and other reinforcers when they are behaving well. Target a specific behavior, reward it, and watch it increase. When children misbehave or are defiant, don't yell at them or hit them. Simply explain the misbehavior and give them a time-out.

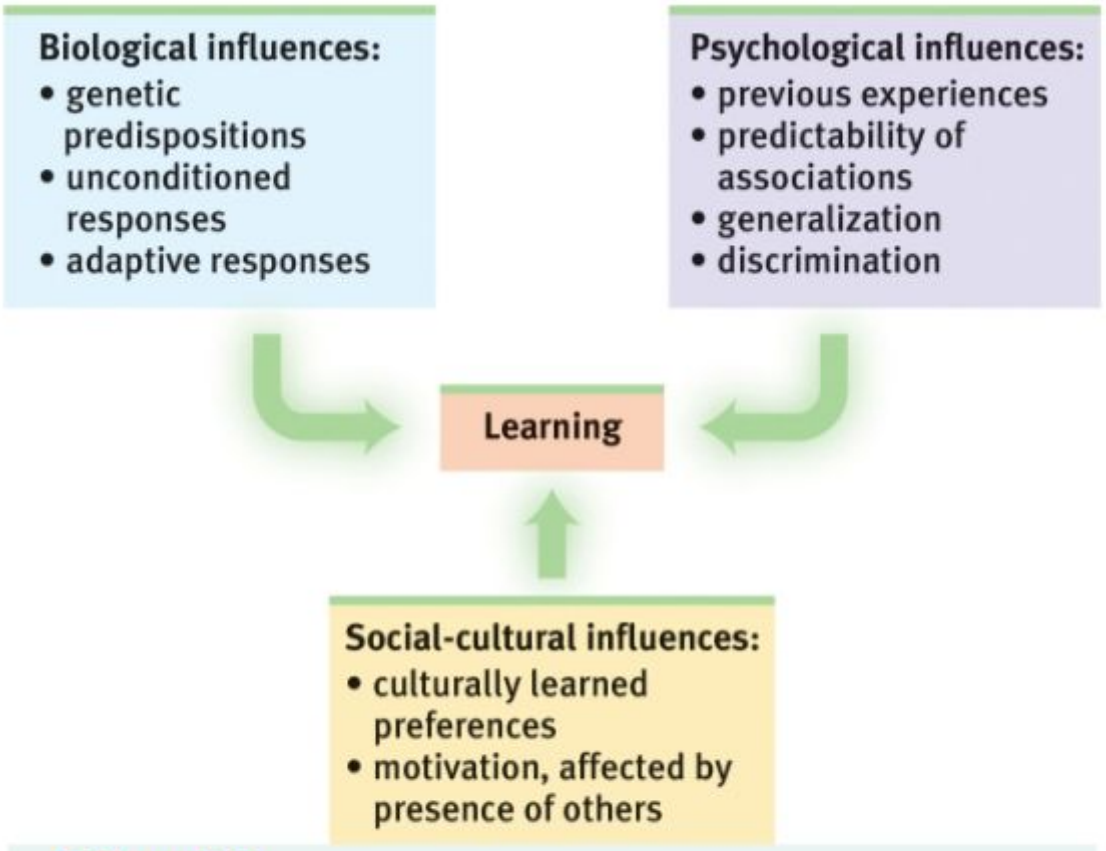
- Some people are very paralyzed and they want to live with dignity without another person's help so we train monkeys to do their jobs for them

Learning by observation **(Bandura)**

- Observe for what is being punished/reinforced & adjust accordingly
- More likely to repeat behaviours that are reinforced by others
- Learn through imitation & modeling (role models in our life)
- We are Biologically Predisposed to imitate others
- Evidence: infants begin to imitate & **mirror neurons in brain including motor cortex** (associated with learning and comprehension) are activated when we do an action and when we observe someone else do the action/infer that someone is doing an action

Comparison of 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 events; 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 respond 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.



▼ Figure 7.12
Biopsychosocial influences on learning Our learning results not only from environmental experiences, but also from cognitive and biological influences.

Advantages/Disadvantages of Learning by Observation:

- Advantage: learning from others' mistakes
- Disadvantage: Aggression. Based on solid scientific research, the national institute of mental health states there's a direct relationship between violence in the media (movies, video games, etc.) and real life
    - HOW?
        - 1. Imitation
            - Increased aggressive emotions and thoughts can lead to aggressive behaviour
            - Desensitizes us to violence (more tolerant)
            - More lenient to violent criminals & less sympathetic to victims

Chapter 8: Memory

What is memory and how is it measured?

- Memory is learning that persists over time; it is information that has been acquired and stored and can be retrieved.

Measuring Retention

- **Recall:** retrieving info that is not currently in your conscious awareness but that was learned at an earlier time. Fill in the blank questions tests your recall.
- **Recognition:** identifying items previously learned. A multiple-choice question tests your recognition.
- **Relearning:** learning something more quickly when you learn it a second or later time.
- **Ebbinghaus retention curve:** he found that the more times he practiced a list of nonsense syllables on Day 1, the less he required to relearn it Day 2. Speed of relearning is one measure of memory retention.
    - We remember more than we can recall!

Memory Models

- Our level of focus and "trying to remember" affects how much info we retain/learn
    - Effortful processing
- To remember any event, we must:
    - 1. Get information into our brain: **encoding**
    - 2. Retain that information: **storage**
    - 3. Later, Get the information back out: **retrieval**
- **Parallel Processing:** the processing of many aspects of a problem simultaneously; the brain's natural mode of information processing for many functions
    - Everytime you learn something new, your brain's neural connections change
- To explain our memory-forming process, Richard Atkinson and Richard Shiffrin proposed a 3 stage model:
    - 1. We first record to-be-remembered information as a fleeting **sensory memory**
    - 2. From there, we process information into **short-term memory,** where we encode it through *rehearsal*
        - *Ex.* digits of a phone number
    - 3. Finally, information moves into **long-term memory** for later retrieval
        - Ex. skills
- **Working memory:** a newer understanding of **short-term memory** that focuses on conscious, active processing of incoming auditory and visual-spatial information retrieved from **long-term memory.**
    - Ex. when you link info you're reading with your previously stored info

- **Explicit memory/declarative memory:** memory of facts and experiences that one can consciously know and "declare"
- **Effortful processing:** encoding that requires attention and conscious effort
    - Ex. reading
- **Automatic processing:** unconscious encoding of incidental information, such as space, time, and frequency, and of well-learned information, such as word meanings
    - Space: during a test, remembering where the info was on the page
    - Time: when you lose something, helps you go back and retrace
    - **Frequency**: unintentionally remember you've bumped into someone 3 times
- **Implicit memory:** retention of learned skills or classically conditioned associations independent of conscious recollection.
    - **Riding a bike**
- **Iconic memory (proposed by Sperling)**: a momentary sensory memory of visual stimuli; a photograph or picture-image memory lasting no more than a few tenths of a second
    - **Ex. a flash picture containing different letters/numbers**
- **Echoic memory:** a momentary sensory memory of auditory stimuli; if attention is elsewhere, sound of the words can still be recalled within **3 or 4 seconds**
- George Miller proposed we can store about 7 bits of information in short-term memory. Researchers confirmed that if nothing distracts us , we can recall about 7 digits or 6 letters or 5 words
- **Short-Term Memory Decay:** unless rehearsed, verbal info may be quickly forgotten
- In general, people are more efficient when they are focusing on a specific goal rather than when they're multitasking
- **Working memory capacity** reflects intelligence level (how much you can remember with distractions in between)

Effortful Processing Strategies

Chunking information: organizing items into familiar, manageable units helps us recall it more easily.

Mnemonics: memory aids, especially those that use vivid imagery and organizational devices

Spacing Effect: the tendency to retain better long-term information when our encoding is distributed over time rather than massed-study or practice

- Testing not only assesses learning, it improves learning

Testing Effect: enhanced memory after retrieving, rather than simple rereading information. Also sometimes referred to as a retrieval practice effect or test-enhanced learning.

Shallow Processing: encoding on a basic level based on the structure or appearance of words. Ex. how do you say this word? Or does this word rhyme with train?

Deep Processing: encoding semantically, based on the meaning of the words; tends to yield the best retention. Ex. how would you fit the word into this sentence?

Hippocampus: a neural center located in the limbic system that helps process **explicit** memories for storage (along with **frontal lobe**), helps with memory consolidation

Cerebellum: forms and stores **implicit** memories created by classical conditioning
Basal ganglia: facilitate formation of procedural memories for skills (implicit)

- **Infantile amnesia**: first three years of our conscious memory is blank

Flashbulb memory: a clear memory of an emotionally significant event or memory

- **Ex. 9/11**

Long-term potentiation (LTP): an increase in a cell's firing potential after brief, rapid stimulation. Believed to be a neural basis for learning and memory.

Memory Retrieval

- Best retrieval cues come from associations we form at the time we encode a memory - smells, tastes, and sights that an evoke our memory of the associated person or event
    - Ex. a song & an ex
- **Priming**: the activating, often unconsciously of particular associations in memory
- **Encoding Specificity Principle:** the idea that cues and contexts specific to a particular memory will be most effective in helping us recall it.
    - Ex. words heard underwater were best recalled underwater
- **Mood-congruent memory:** the tendency to recall experiences that are consistent with one's current good or bad mood
- **Serial position effect:** our tendency to recall best the first (primary effect) and last (recency effect) things we heard

Forgetting

- We forget to discard the clutter of useless or out-of-date information
- **Anterograde amnesia:** can recall past but can no longer form new memories
- **Retrograde amnesia: a**n inability to retrieve info from one's past

Encoding Failure

- Much of what we sense, we never notice, and what we fail to encode, we will never remember.
- Age affects coding efficiency
    - Slow coding efficiency in older adults helps explain age-related memory decline
- When it occurs, it means short term info has not been transferred to long term info

Storage Decay

- Even after encoding something well, we sometimes later forget it.
- **Forgetting curve**: retention is high for one day, then drops steeply immediately after, then levels off

Retrieval Failure

- Sometimes even stored info cannot be accessed, which leads to forgetting

Interference

- **Proactive interference**: the forward-acting
    - **Prior learning negatively affects recall of new info**
- **Retroactive interference**: the backward acting
    - **New info negatively affects recall of old info**

    - Info presented in the hour before sleep is protected from retroactive interference because the opportunity for interfering events is minimized.
- **Repression:** the basic defense mechanism that represses painful or unacceptable memories to protect our self-concept and minimize anxiety
- **Reconsolidation:** a process in which previously stored memories, when retrieved, are potentially altered before being stored again
- **Misinformation Effect:** when misleading information has corrupted one's memory of the event
    - Ex. lost in a shopping mall
- **Memory construction:** Is sensitive and can be altered based on words used (ex. Car bumped vs. Car smashed, how fast were they going, bump was slower than smashed)
- **False Memories:**
    - can result from digitally altered photos
- **Source Amnesia:** attributing to the wrong source an event we have experienced, heard about, read about, or imagined. It along with the misinformation effect, is at the heart of many false memories.
- **Deja Vu:** the eerie sense that "I've experienced this before." Cues from the current situation may unconsciously trigger retrieval of an earlier experience.
- False memories can be persistent!

Chapter 11: What Drives Us: Hunger, Sex, Friendship, and Achievement

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Motivation

Motivational Concepts

- Why do we do what we do?
- The forces that energize, activate and direct our brain
- 3 characteristics linked with motivation: activation, persistence, intensity
- Multiple theories attempting to explain human motivation (learning 5)

1. Instincts theory: inspired by Darwin and says that human behaviour is motivated by instincts
    - Instinct: genetic predisposition to respond to a specific stimulus in a specific way (all members of the species respond the same way)
    - It is innate, unlearned, and a fixed pattern of behaviour
    - While there's a genetic component, thousands of behaviours are proven by it
    - However, it fell out of favor because the logic is circular and can't really explain anything

2. Drive-Reduction Theory

- states biological needs must be met or else it will create a state of imbalance and homeostasis is affected, creating a state of tension which drives & pushes us to do

whatever it takes to satisfy needs. When needs are satisfied, homeostasis is restored and tension & drive go away until we need something again.

3. Incentives Theory

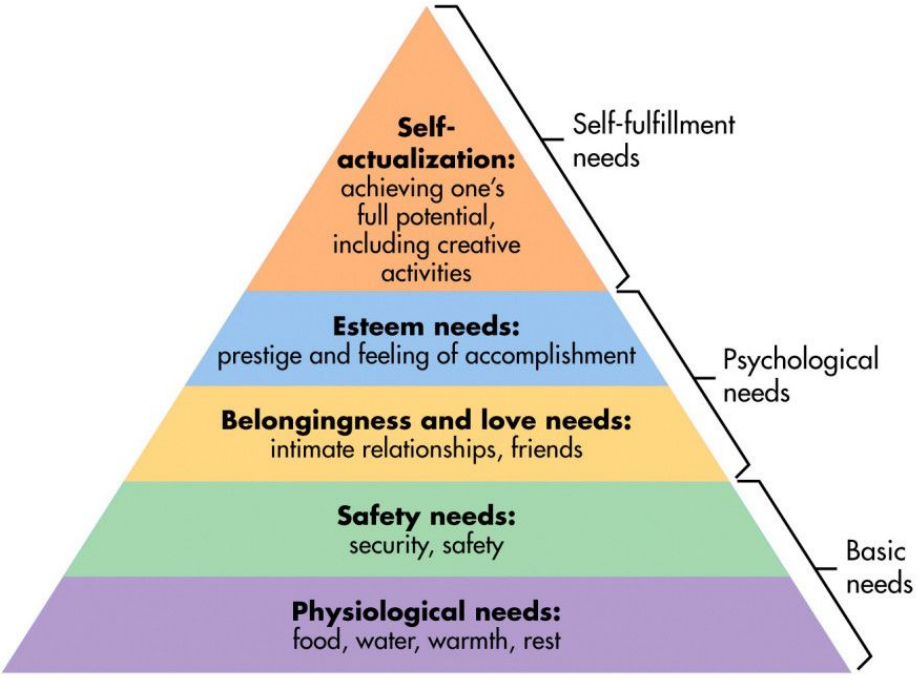
- In the external environment, there are incentives we're attracted to that we want to have (ex. Money, uni degrees, praise, etc.), and we'll work hard to get those.

4. Arousal Theory

- Humans & animals are motivated to maintain an optimal amount of arousal. When too low, we get bored & it's unpleasant & we do something to bring our arousal up. When too high, it's unpleasant and we take action to bing it down (too stressed, anxious, etc.)
- Finding the right amount of arousal
- **Yerkes-Dodson law:** the principle that performance increases with arousal only up to a point, beyond which performance decreases
- High arousal: most likely to seek intense music, novel foods, and risky behaviours and careers, these people can be called "sensation-seekers"

5. Hierarchy of Motives

- According to MASLOW, we have physio & psychological needs that must be met
- Ordered in a hierarchy where some are more important & must be satisfied first, then we move up to satisfy others



Hunger

Physiology

- Stomach: could be empty, full (could feel this without having a stomach)
- Hormones: play a role in hunger
    - Glucose levels low = hunger
    - Ghrelin up = hunger

        - Orexin up = hunger
        - PYY up = full
        - LLK up = full
        - Leptin (released by fat cells - more fat in body = more leptin in blood) up = full
- Brain:
    - Hypothalamus: stimulates latter part & test subjects eat a lot
        - Stimulates ventromedial part & test subjects stop eating; starve
- Set point weight:
    - Brain & body have an optimal weight range they prefer and will defend it (incr/decr metabolism)
- Settling Point Theory
    - Body weight will settle & remain same as long a there's a balance between als we consume & energy we expand
- Basal Metabolic Rate (BMR)
    - Amount of energy body needs to maintain basic bodily functions while at rest (ex. Breathing & heart beat)
    - Multiple factors influence BMR:
        - Exercise = BMR up
        - Good sleep = BMR up
        - Couch potato = BMR down
        - Low cal diet = BMR down

Psychology of Hunger

- Neophobia: afraid to try something new
- Obesity: >30 BMI
- Too Much fat: high risk for cancer, diabetes, shorter lifespan, etc.
- Has a genetic component
- Physiology of fat cells:
    - Once you gain them, they're never lost, just emptied during weight loss
    - Fat tissue is less metabolically active
    - **2-3 cals to maintain 1lb fat tissue**
    - **30 cals to maintain 1 lb muscle tissue**
- According to st point theory, some people are overweight because their set point is higher than others
- Low cal diet = lower BMR & more difficult to lose weight

Abundance of food (too much), **Ignorance, Unit bias** (tendency to consider a single unit of food has the right amount to eat, use big/small banana example.)

- You eat more when you eat with other, **social facilitation**
- **Food variety** also stimulates eating: buffets you eat more than sit down
- Technology: some researchers believe some people who are overweight eat to activate pleasure pathways because their pleasure pathways are sluggish

Sexual Motivation

- Sex is not like hunger, because it is not an actual *need*. (Without it, we may feel like dying, but we will not.) Yet sex motivates.
- The main male sex hormone is **testosterone**. The main female sex hormones are the **estrogens**, such as estradiol.

Sex hormones influence us at many points in the life span:

- During the prenatal period, they direct our development as males or females.
- During puberty, a sex hormone surge ushers us into adolescence.
- After puberty and well into the late adult years, sex hormones activate sexual behavior.
- **Havelock Ellis** was a very smart physician who studied human sexuality
    - Had orgasms asleep (wet dreams/nocturnal emissions)
    - Discovered women are as sexual as men
- **Kinsey** further studied human sexuality

Masters & Johnson

- Single people and those in relationships were sent to a lab
- Machines watching them when they had sex/solo sex

Physiology of Sex

- Sexual Response Cycle (discovered by Masters & Johnson experiment)
    - **1. Excitement:** Blood rushing to clitoris/penis
    - **2. Plateau**: Excitement peaks as breathing, pulse, blood pressure all increase.
    - **3. Orgasm:** Muscle contractions are released all over the body and are accompanied by further increase in breathing, pulse, blood pressure. Same **subcortical brain regions stimulated** in men & women shown by PET scans.
    - **4. Resolution:** Body gradually returns to its unaroused state as the genital muscles release their accumulated blood. **Refractory period** comes next during which an orgasm is not reachable. Much shorter for women than men and can possibly be restimulated and orgasm during that time period.

- Sexual Disorders (all listed have solutions)
    - Persistent
    - Cause distress to person/couple
        1. Premature ejaculation
            - End before it starts
            - Leaves partener dissatisfied
        2. Erectile dysfunction
            - Can’t have an erection or cannot sustain one
        3. Orgasmic disorder
            - Woman cannot reach orgasm no matter what

Paraphilias: sexual arousal from fantasies, behavriosus, or urges involving non human objects, the suffering of self/others ant nonconsenting persons.
AIDS: a life-threatening, seually transmitted infection caused by the human immunodeficienty virus (HI), which depletes the immune system , leaving the person vulnerable to infections.

Hormones and Sexual Behaviour

- Does menstrual cycle affect sexual desires and behaviours?
    - Cats & Dogs = yes
    - Women: around ovulation = increased sexual desire
- **Sexual desires are influenced by testosterone in both men and women!**
- Hypothalamus controls drives

Psychology of Sex

- 1. External stimuli
    - Ex. sexy movies/magazines, etc.
    - Both women and men are sexually aroused by external stimuli
    - Are there negative/adverse effects? Depends on how much porn & what type
        - People who watch a lot of porn are dissatisfied with partner because they are comparing
        - Rape acceptance
        - Diminished satisfaction
- 2. Imagined Stimuli (fantasies)
    - Both men and women have them and are aroused by them
- 3. Adolescent Sexuality (MT)
    - genes influence teen sexual behavior - by influencing pubertal development and hormone levels, and also by influencing teen exposure to environments that stimulate sexual activity
    - Teenage pregnancy
    - Other important factors:
        - *Minimal communication about birth control*
        - *Guilt related to sexual activity*
        - *Alcohol use*
        - *Mass media norms of unprotected promiscuity*
    - Today's American teens have a higher pregnancy rate—but a lower rate than their parents' generation
    - It is found that those who had later first sex reported greater relationship satisfaction in their marriages and partnerships
    - Lower pregnancy rates for:
        - Those who are religious
        - Higher scores on intelligence tests
        - Father presence

        - Participation in service learning programs
- 4. Sexual Orientation
    - What partner are we physically, emotionally attached to (homosexual, etc.)
    - **Erotic plasticity:** degree to which sexuality is influenced by environmental factors & degree to which sexual orientation is fixed or fluid
        - **Women have a higher erotic plasticity than men (more changeable)**
        - Environmental factors (education, culture, all girls prison, etc.)
        - Mother domineering: does not make you gay
        - Father is absent: does not make you gay
        - Someone from opp sex as you hurt you: does not make you gay
        - Hormones currently in blood: does not make you gay
        - Sexual abuse: does not make you gay
        - Modeling (parents): does not make you gay
        - **By default** (prison, etc.): does not make you gay, BUT may engage in homosexual behaviour

Biological Causes

- Genetic component to homosexuality
- Identical twins are more similar in sexual orientation than than fraternal twins
- By manipulating genes of fruit flies changes sexual orientation
- Recent research **links chromosome X, 13 & 14, to homosexuality**
- Exposure to abnormal levels of hormones in womb could affect sexual behaviour
- **Higher number of older brothers a man has = higher probability of homosexuality**

Brain

- Parts of hypothalamus in straight men is bigger than gay men
    - BUT, we don't know if they're born this way or if it's brain plasticity
- Cerebrum Asymmetry
    - Straight men & gay women, right hemisphere is bigger than left
    - Gay men & straight women, roughly the same size
    - Amygdala connection in straight men is more similar to gay women & vice versa
- **Cerebrum & Amygdala connections happen in womb or shortly after birth**
    - ANIMAL KINGDOM: >1500 species studied & homo beh. was found in all
        - Not uniquely human
        - More homosexuality, the more peaceful
    - SEXUAL PREJUDICE
        - Negative attitudes because of sexual orientation
        - Worldwide
    - SEX & HUMAN VALUES
        - Words we use to describe sexuality can reflect our personal values. Whether we label certain sexual behaviors as "perversions" or as an

"alternative sexual lifestyle" depends on our attitude toward the behaviors. Labels describe, but they also evaluate.
    - More sexually satisfied in a relationship

The Need to Belong

- Need to love & be loved
- Many advantages
- Adaptive & necessary for survival
- When this need is met, we are happier and more satisfied with life & healthier
- However, we are also more likely to be **addicted** which causes us to be less happy & healthy
- **Affiliation need:** the need to build relationships and to feel part of a group

Ostracism (exclusion)

- When we're ignored & treated like we're invisible (worse than bullying)
- Physical pain linked with **Anterior Cingulate Cortex**
- Heart pain activates the same area
- High emotional pain = higher activity in the area
- Because of this, we are able to take advil to lessen emotional pain

Social Media

- Helps us be more connected to existing friends but less connected to other people in our lives (ex. Classmates, neighbours)
- We share more of ourselves online because we aren't seeing facial expressions of other people
- Less satisfying than real life interactions
- **Narcissism:** excessive self-love and self-absorption

Drawbacks

- More time spent on social media, less satisfied we are with our own lives (ex. Travel pics) & more likely to be anxious and depressed
- Social skills go down
- Language skills go down
- Grades (on avg.) go down (users during class have grade averages of 14% lower)

Achievement Motivation

- The need to achieve and accomplish goals and master challenges/skills/seek excellence
- Different people have different needs
- People who have more achievement motivation do better & are happier
- **GRIT**: passion for long term goals (& perseverance)
    - Self discipline and grit outweigh high IQ and innate talent

Chapter 12: Emotions, Stress, and Health

Intro

Emotions are complex psychological processes

- 3 components:
- 1. **Physiological arousal** (ex. Heart beating fast when scared)
- 2**. Behavioural activation** (ex. Running away)
- 3. **Subjective experience** (ex. Being aware of your thoughts, feelings, emotions, an body)
- All emotions are adaptive & essential
    - Some emotions can be maladaptive (when they're over exaggerated, overwhelming, and dysfunctional)
- People all over the world..
    - **Valence:** how pleasant/unpleasant an emotion is
    - **Arousal:** how much physiological arousal accompanies the decision
        - When content, heart beats fast
        - When happier, heart beats faster

Theories of Emotions

1. **James-Lange Theory**
    - When exposed to a stimulus (ex. snake) we feel afraid
    - Subjective experience comes first
    - Behavioural activation and physiological arousal occur after
    - Because we're scared, we run away
2. **Cannon-Bard Theory**
    - When we're exposed to a snake, we feel afraid & heart beats fast & we run away
    - ALL happen at the **SAME TIME**
    - <u>Do not influence each other</u>
3. **Schacter's Theory (Arousal + Label = Emotion)**
    - 2 things must happen for us to feel emotion:
        - <u>1. Must have physiological arousal</u>
            - Similar across emotions
            - Emotion we feel depends on cognitive label we put on physical arousal
        - <u>2. Must have Cognitive Appraisal</u>
            - Something you have been wanting for a long time

Spillover Effect: Arousal from a soccer match can fuel nger, which can descend into rioting or other violent confrontations

Cognition & Emotions

- Do we think first and feel second?

1. **Cognitive Therapy**
    - If you're depressed, it's because of the way you think (expectations, belief, etc.)
    - If you want to change the way you feel, change the way you think first
2. **LeDoux**
    - Sometimes out emotions (especially simple likes, dislikes, and fears) take the **"low road",** a neural shortcut that bypasses the cortex. Following the low road, a fear-provoking stimulus would travel from the eye or **eye directly to the amygdala. This allows for us to feel the response before thinking about it.**
3. **Zajune**
    - Agrees with cognitive therapy, but he believes sometimes emotions are so fast that we **feel first and think second**
4. **Lazarus**
    - There are times where we feel first and think second, however, it only seems this way
    - The mere fact that we're feeling meaning that the brain already assessed unconsciously and evaluated the stimulus
    - **Agrees with James-Lange**
5. **Schachter-Singer**
    - Our experience of emotion depends on two factors: general arousal and a conscious cognitive label

Embodied Emotion

- The Autonomic Nervous System evaluates/regulates physiological arousal of what we feel
- **Sympathetic division** (fight or flight)
    - Body reduces/shuts own all other systems that could compete with that energy
    - Digestion, etc. slows down
- **Parasympathetic**
    - Calming, relaxing, helps body restore
- **Polygraphs**: measure emotion-linked changes in breathing, cardiovascular activity, and perspiration

Physiology of specific emotions

- Different in each emotion
- Anger & Afraid = fast heartbeat and high body temp
- Fear = low body temp
- High levels of activity in the left frontal lobe - linked to positive emotions
- High levels of activity in the right frontal lobe - linked to negative/depressing emotions
- Non verbal communication = essential for survival

- We are capable of over 7000 facial expression, they're innate and universal
- Only face muscles are attached to skin
- Culture plays a role in how much & when we express emotion
- Gender: men & women have no significant difference with what type of emotion they feel, nor the intensity. The difference is how they express them (socialization), females will likely show it more.
- Our brain is an amazing detector of subtle expressions
    - However, it's difficult to detect deceiving expressions (liars vs. truth tellers)
    - Distracting people, rather than encouraging them to think deeply, increases their lie-detection accuracy
    - Introverts excel at reading others' emotions
    - Extraverts are easier to read

Effects of Facial Expressions

Facial feedback effect: the tendency of facial muscle states to trigger corresponding feelings such as fear, anger or happiness

- **Amplify existing emotions**

Behavior feedback effect: the tendency of behavior to influence our own and others' thoughts

- Mimicking another person's facial expression allows us to **feel what they feel**

Experiencing Emotion

- **10 basic emotions** (Izard): joy, interest-excitement, surprise, sadness, anger, disgust, contempt, fear, shame, and guilt
    - Some also believe pride and love are

Anger

- When we face a threat or challenge, fear triggers flight but anger triggers fight - each at times an adaptive behaviour.
- Chronic hostility is linked to heart disease
- Boosts heart rate, causes perspiration, raises testosterone levels
- **Catharsis:** emotional release
    - The catharsis hypothesis maintains that "releasing" aggressive energy (through action or fantasy) relieves aggressive urges
    - Usually it makes us even angrier
- To reduce the level of physiological anger, WAIT
- Not always a bad thing

Feel-Good, Do-Good Phenomenon

- People's tendency to be helpful when already in a good mood

Positive Psychology

- The scientific study of human flourishing, with the goals of discovering and promoting strengths and virtues that help the individuals and communities to thrive

Subjective Well Being

- Self-perceived happiness or satisfaction with life

- Used along with measures of **objective well-being** (ex. money) to evaluate people's quality of life

Emotional Ups and Downs

- In the long run, tend to balance out
- By the next day, gloom always lifts

Wealth and Well Being

- Having enough money to buy your way out of hunger and to have a sense of control over your life does buy some happiness
- Money makes you happier when you're poor, as you get richer, there's less of an effect
- Economic growth in rich countries has provided no apparent boost to morale or social well-being

Two Psychological Phenomena: Adaptation and Comparison

Adaptation-level phenomenon: our tendency to form judgment (of **sounds, light, income**) relative to a neutral level defined by our **prior experience**

Relative deprivation: the perception that one is worse off relative to those of those with whom one **compares oneself**

What predicts happiness levels?

- High self esteem
- Being optimistic, outgoing, agreeable
- Have close friendships or a satisfying marriage
- Have work and leise that engage your skills
- Have an active religious faith
- Sleep well and exercise
- Not related to: age, gender, physical attractiveness

STRESS

- Process of appraising and responding to a threatening or challenging event called stressors
- Things that push out buttons:
    - **Catastrophe**s (toxic stress): large-scale unpredictable events such as floods and earthquakes
    - **Significant Life Changes** (ex. Changing schools)
    - **Daily Hassles** (ex. Annoying roommates)

Stress response system

- **General adaptation syndrome:** Selye's concept of the body's adaptive response to stress in three phases: **alarm, resistance, exhaustion (ARE)**
- Additional stress response via adrenal glands that secrete glucocorticoid stress hormones such as cortisol
- Prolonged stress can damage your body
- Best way to deal with stress: withdraw

- **Tend and befriend**: under stress, people (especially women) often provide support to others (tend) and bond with and seek support from others (befriend)
- **Health psychology**: a subfield of psychology that provides psychology's contribution to **behavioural medicine**
- **Psychoneuroimmunology**: the study of how **psychological, neural, and endocrine** processes together affect the **immune system** and resulting health.
- Surgical wounds heal slower in stressed people
- Stressed people are more vulnerable to colds
- Low stress may increase the effectiveness of vaccinations
- Stress can speed up the transition from HIV infection to AIDS
- Stress can influence cancer

Stress and Heart Disease

Coronary Heart Disease: the clogging of the vessels that nourish the heart muscle; the leading cause of death in many developed countries.
Type A Personality: Friedman and Rosenman's term for competitive, hard-driving, impatient, verbally aggressive, and anger-prone people
Type B Personality: Friedman and Rosenman's term for easygoing, relaxed people
Type A's are more prone to diseases

Health And Coping

- Aerobic exercises (sustained exercise that increases heart and lung fullness) and exercise help
- Relaxation and meditation help
- Meditation: strengthens connections among regions in the brain, activates brain regions associated with more reflective awarenesses, calms brain activation in emotional situations

Coping: alleviating stress
Problem-focused coping: alleviating stress directly - by changing the stressor or th way we interact with it
Emotion-focused coping: alleviating stress by avoiding or ignoring the stressor and tending to our emotional needs related to our stress reaction
Learned helplessness: the hopelessness and passive resignation an animal or human learns when unable to avoid repeated aversive events

- Some freedom and control is better than none

Internal vs. External Locus of Control

External Locus of Control: the perception that chance or outside forces beyond our personal control determine our fate

- Compared to parents generation, more young americans use this now

Internal Locus of Control: the perception that we control our own fate
Self-control: the ability to control impulses and delay short-term gratification for greater long -term rewards

- If developed in one area of life, it can spill over to others (positive)