PSY 1101 Class Notes- Midterm 1

Chapter 1- Thinking Critically With Psychology

I- The Need for Psychological Science

- Psychology is the scientific study of how we feel, think and behave
- Our thinking and attitudes operate on 2 levels- conscious and unconscious

A.1- Limits of Intuition

- Intuition can't be used to study the natural world as it is very misleading
- We need science

A.2- Limits of Common Sense

- Common sense does not generate new knowledge
    - Is the result of experience and acquired knowledge
- Sometimes what we call common sense makes no sense
- More easily describes what *has* happened, rather than what *will* happen
- Three factors illustrate why we can't rely solely on intuition and common sense
    - Hindsight bias
    - Overconfidence
    - Our tendency to perceive patterns in random events

Hindsight Bias

- The 'I knew it all along' phenomenon
- Once we know all the facts about something and how that something ended, we have the tendency to believe that we could have easily predicted the end
- When we don't know all the facts and conclusion, it isn't easy to predict
- Good ideas are like good inventions: once created, they seem obvious

A.3- Overconfidence

- Is the tendency to over exaggerate how accurate our beliefs, judgements and knowledge are
- We are more confident than we are accurate
- We are ignorant of our ignorance
- Think we know more than we do

A.4- Illusory Correlation

- It is our tendency to perceive a relationship between two variables when in reality, there is none or it is barely there

- This affects how we think, remember, pay attention, behave and react

A.5- Perceiving Order When There is None

- Humans are uncomfortable with randomness and uncertainty
- To deal with this, we look for patterns and order where there are none to calm our anxiety
- Curious fact of life- *random sequences often don't look random*
- In reality, random sequences occur more often than expected
- An event that happens to 1 in 1 billion people occurs 7 times a day, 2500 times a year

B.0- The Scientific Attitude

- Three main attitudes- curiosity, skepticism, and humility- make modern science possible
- To be a critical thinker, one must possess
    - **Curiosity**
        - Asks *does it work? Can the predictions be confirmed?*
    - **Open-mindedness**
    - **Skepticism**
        - Don't accept things at face value, use logic and evidence
        - Asks *what do you mean? How do you know?*
        - Skeptical testing can reveal which ideas best match the facts
    - **Awareness of….**
    - **Humility**
        - Accept that they are not the only smart ones
        - No matter how smart, we will fail
        - Science is not about power, ego or prestige
        - *"The rat is always right"*
    - **Cautiousness**
        - What we know today could change tomorrow

Critical Thinking

- Aka smart thinking
- Examines assumptions, appraises the source, discerns hidden values, evaluates evidence and assesses conclusions
- Helps clear coloured lenses of our biases
- Critical thinkers recognize multiple perspectives and expose themselves to sources that challenge their preconceived ideas

Lecture 1 HW- Study Tips

- Marty Lobdell- Study Less, Study Smart
    - 25-30 mins of effective studying, then 5 min break

- After full study session is complete, reward yourself
- Create a designated study area (preferably library)
- Understand the concepts. Facts can be looked up.
  - Can you put the concept in your own words?
- Recollect, don't recognize
- Sleep better to avoid wasting everything you learned
- Teach others what you learned to reinforce the information
- SQ3R- Survey, question, read, recite, review
  - Survey before reading by looking at diagrams, pictures and the summary and ask questions about what you see (eg; what is epithelial, what does osmosis mean)
- Use mnemonics to memorize

The Scientific Method

C.The Scientific Method

- What makes a field of research a science, is the method used to do research
- Any field that uses the scientific method (SM) is a science
- The SM is a standardized procedure that allows us to do research in a logical, rational and objective way
- **Observation**
  - Everything begins with observation
  - What starts as casual observation becomes systemic
- **Theory**
  - Helps us organize and summarize observations in a coherent way
  - It **attempts** to explain observations
  - By summarizing facts, a theory simplifies
  - By linking facts with deeper principles, a theory offers a useful summary
- **Hypothesis Testing**
  - Extract idea from theory and test it using rigorous scientific methodology
- **Operational**
  - To check biases, psychologists report their research with precise **operational definitions**
    - **Definition-** the line of scientific rules that must be followed when testifying hypothesis
  - The researcher must clearly state how he measured his variables
- **Replication**
  - We must repeat studies
  - When we repeat and obtain similar results, we become confident in the results

- **Generate or refine**
    - We use results to generate new theories and questions or refine existing theories and questions
- Then the process begins all over again

Types of Research Studies

- There are 3 main types of research studies
    - Descriptive, correlational and experimental research

A-Descriptive Research

- To observe and describe what we observed
- **A.1- Case study**
    - An in-depth investigation of an individual or a very small group of people
    - The researcher will gather any relevant information related to the case
    - *Advantages*
        - Most in-depth research that can be done
        - Sometimes an excellent first step for something complex and rare
        - Allows us to preserve and document information about rare cases that otherwise would be lost
        - Allows us to have a glimpse into human nature
    - *Disadvantages*
        - The sample is too small- can't generalize
        - Researcher bias- could filter data through own expectations and beliefs
- **A.2- Survey**
    - Can be descriptive or correlational
    - Asks people to report their behaviours or opinions
    - The researcher will ask a large sample of people questions that are of interest to him/her
    - We can't survey every single person in a population which is why we extract a sample and survey them. The results are then generalized to the rest of the population
    - *Advantages*
        - Very easy to do
        - Cheap
        - Can reach a large number of people
        - Include people who aren't usually included
        - Sometimes the only way to find something is to ask
    - *Disadvantages*
        - People lie intentionally and unintentionally

        - Very sensitive to word choice
            - If you change the words, you change the results
        - Very sensitive to characteristics of the person doing the survey

Representative Sample

- In order for results to be scientifically viable, we must use a representative sample
- Characteristics of the sample must closely match the characteristics of the population
- How to get a representative sample
    - **Random sampling**
        - Chance and only chance will determine who will be part of the sample
        - Everyone in the population has an equal chance of being included
- Large representative samples are better than small ones, but a small representative sample of 100 is better than an unrepresented sample of 500
    - Cannot compensate for an unrepresented sample by adding more people

A.3- Naturalistic Observation

- The researcher will leave the lab and go into the real world to do research there
- Does not explain behaviour, but instead *describes* it
- **#1 rule-** researcher must **never** interfere, only observe
- Is called a *small science*- science that can be done with pen and paper rather than fancy equipment or a big budget
    - New technologies (eg social media, facebook) are allowing researchers to track volunteers and their habits without interfering
- *Advantages*
    - Doesn't get more real than this- real world, real behaviour, real-time
    - Allows us to discover things we may never discover in a lab
- *Disadvantages*
    - Researcher bias
    - Even though the researcher doesn't interfere, the mere presence could change behaviour

B.- Correlational Research

- Allows us to observe, describe and **make predictions**
- Allows us to find out if there is a systematic and reliable relationship between two variables
- We ask three major questions when doing this type of research;
    - Do the variables covary (have a relationship)?
    - In what direction do they covary?

        - **Positive correlation-** there is a relationship between variables. When one changes, the other changes in the **same** direction.
        - **Negative correlation-** there is a relationship, but the variables change in **opposite** directions.
    - How strong or weak is the relationship?
        - In order to find out, we use a statistic called a **correlation coefficient (r)**
            - Helps us see the world more clearly by revealing to what extent two things relate
            - r gives us the answer to all three questions
        - Value of r varies from -1 to +1
        - r= 0 means there is no relationship
        - r= +1 means perfect correlation (every time one variable changes, the other changes too)
        - r= -1 means negative correlation
        - The closer r is to 0, the weaker the relationship
        - The closer r is to +1, the stronger the relationship
- **Scatterplots** can be very revealing when asking how strongly two variables are related
- *Advantages*
    - Excellent first step
    - Can be done before conducting an experiment to see if any relationship is present
    - Sometimes is the only research we can do to get information as it is sometimes unethical to do otherwise
    - Describes, observes and predicts
        - Having information about only one correlated variable will allow us to predict information about the other variable
- *Disadvantages*
    - With correlations, you absolutely **cannot** infer causality
        - Can't say that variable A caused a definite change in variable B, only that there is a relationship between the two

Regression Towards the Mean

- The illusion that uncontrollable events correlate with our actions is feb by a statistical phenomenon called **regression towards the mean**
- Average results are more typical than extreme results, thus after an unusual event, things tend to return towards their normal average
    - Extraordinary things happening tend to be followed by more ordinary ones
- When fluctuating behaviour returns to normal, there is no need to invent fancy explanations as to why it does so
    - Regression towards the mean is probably at work

C.- Experimental Research

- Observe , describe, predict and **infer causality**
- Cause and effect relationship
    - Is the only research that allows us to say that variable A is related to variable B
- Why can we infer causality?
    - The researcher is going to manipulate the variable of interest
    - Researcher will control all other variables that could affect results whether they are known or unknown
- **Independent variable (IV)**: a variable that influences, effects and changes another variable
    - Is the variable the researcher will control
- **Dependant variable (DV):** the variable that is being changed by the IV
    - Is the variable that the researcher will measure
- An experiment's purpose is not to recreate the exact behaviours of everyday life, but to test *theoretical principles*

C.2- Manipulate the Independent Variable

- In the experiment, the researcher will manipulate the IV he is interested in studying
- Researcher will create at least 2 levels/groups of the IV
    - **Experimental group**- subjects are exposed to IV
    - **Controlled group**- subjects are not exposed to IV
- At the end of study, the results of both groups will be compared to see if exposure to IV changed the DV

C.3- Control All Other Independent Variables

- The researcher will control all other IV's that could affect the DV and the results
    - These are IV's that are of no interest, but could affect the study
    - Can be known or unknown
- Why must IV's be controlled?
    - Must be done or else researcher will no be sure what caused the manipulation of the DV
- If those IV's are not controlled, they become **confounding variables** that confuse the results
    - Won't know what caused what
- Must control for unknown IV's by doing **random assignment**
    - Chance and only chance will determine which participant is going to be in the experimental group and which will be in the controlled group
        - Every participant has equal chance of being in either group

Placebo Effect

- When doing research to test the effectiveness of a drug or treatment, we must control for the placebo effect
    - **Placebo-** a fake treatment that has no therapeutic value whatsoever
    - **Placebo effect**- when we give a placebo to a participant unknowing to them and they believe that they are getting the actual treatment
        - They may get better due to this belief alone
        - Is scientifically proven
- If the results of the placebo and the actual drug are identical, it means that the drug has no effect

Blind Procedures

- Is another way to control experiment
- We keep subjects in the dark as to the main reason of the study
    - This is done to control **subject bias** because if they know what you are doing, it may affect the results

Double Blind Procedures

- Keep both subject and researcher interacting with them blind
- This controls both subject and researcher bias

Summary of Important Points

- Experiments aim to manipulate an IV, measure a DV, and control confounding variables
- An experiment has at least two different conditions (groups): an experimental group and a controlled group
- An experiment tests the effects of at least one IV on at least one DV
- Random assignment is used to control for unknown IV's

Statistical Reasoning

- Statistics are mathematical tools that help researchers describe data and make inferences from it
- Must be used in research
- There are two different types of statistics

A-Descriptive Statistics

- Allow researchers to organize, summarize and describe in an understandable way
- Examples: percentages, histograms, bar graphs, etc.
    - It is easy to make a graph to make the difference look big

        - The secret lies in the vertical axis (y-axis)
    - When viewing graphs, read the scale labels and note their range
- **NOTE**: figure 1.8 in textbook is on the exam

A.2- Measures of Central Tendency

- Are descriptive stats that allow researcher to have an idea about the *typical* score in a distribution of scores
- Is a single score that represents a whole set of scores
- Neatly summarize data
- There are three measures of central tendency
    - **The Mean**
        - Is the mathematical average
        - Takes into consideration every single score in a distribution of scores
        - *Con*- is sensitive to extreme scores in a distribution of scores
            - Such scores will artificially inflate or deflate the average, thus distorting it
                - Researchers usually remove them from data
    - **The Median**
        - Aka. the 50th percentile
        - If we were to average a distribution of scores from highest to lowest or vice versa, the median would be the score that falls in the middle of the distribution
            - 50% will fall above the median and 50% will fall below it
        - *Pro*- Not affected by extreme scores
        - *Con*- is only one number is missing a lot of information
    - **The Mode**
        - The most frequently occurring score in a distribution of scores
        - *Con*- most frequently occurring does not necessarily mean the most typical

A.3- Measures of Variability

- Scores in a distribution of scores will differ
- Measures of variability allow researchers to have an idea about the typical difference between the scores
- **The Range**
    - Take the highest and lowest score and subtract them from each other
    - Con- takes into consideration only 2 scores and misses a lot of information and could distort the typical difference
- **The Standard Deviation**
    - Much better measure of variability of the range

    - Takes into account every single score in a distribution of scores
    - Looks at difference between every score and mean and gives the average difference between the score and mean
    - Scores clustered around mean- standard deviation is smaller
    - Scores widespread around mean- standard deviation is larger
- **Normal Curve**
    - Large numbers of data often form a symmetrical, bell-shaped distribution
    - Most cases fall near the mean and fewer cases fall near the extreme
    - This bell shaped curve is so typical that it is called the normal curve

B- Inferential Statistics

- Allow researchers to make inferences from data
- Allow researchers to *generalize from sample to population*
- Allow researchers to determine if the results are statistically significant or not
    - Means that they are not likely to be due to chance, rather they are likely to reflect real relationships/differences between variables
    - Results are considered to be statistically significant when the probability that they are due to chance is very small
- **P-Value** (On Exam)
    - Is a statistic that will inform about the probability of results being due to chance
    - Ranges between 0 and 1
    - P value = 0.05 or less means that the results are statistically significant
        - Otherwise they are statistically insignificant

When Is An Observed Difference Reliable?

- When deciding when to generalize from a sample, three principles should be considered:
    - Representative samples are better than biased samples
    - Less-variable observations are more reliable than those that are more variable
    - More cases are better than fewer
- Generalization based on few unrepresentative cases are unreliable

Statistical Significance Summary

- When sample averages are reliable and when the difference between them is relatively large, we say that the difference has statistical significance
    - This means that the observed difference is probably not due to chance variation between the samples
- Statistical significance indicates the likelihood that a result will happen by chance
    - However, this does not say anything about the importance of the result

Psychology's Research Ethics

Studying and Protecting Animals

- Psychologists study animals to understand how different species function and also to learn about humans
- Animals and humans are very genetically similar and so animal experiments have lead to treatments for many human diseases
- There are two issues that emerge regarding the use of animals for experimentation:
    - Is it right to place the well being of humans above that of animals?
    - If we give human life first priority, what safeguards should protect the wellbeing of animals?
- Many ethics committees have guidelines to be followed when using animals for experimentation
    - British Psychological Society (BPS)
        - Animals must be housed in reasonably natural living conditions, with companions for social animals
    - American Psychological Association (APA)
        - Researchers must ensure the comfort, health and humane treatment of animals and minimize infection, illness and pain
- Animals themselves have benefitted from animal research

Studying and Protecting Humans

- Occasionally, researchers stress or deceive people, but only when it is believed essential to a justifiable end
- Some experiments won't work if participants know everything beforehand
- The ethics codes of the APA and BPS dictate researchers to:
    - Obtain a participant's **informed consent** before the experiment
    - Protect them from harm and discomfort
    - Fully **debrief** people (explain the research afterwards)

Values in Research

- Psychology is not value free
- Researchers' values influence their choice of topics
- Knowledge, like all power, can be used for good or evil
- Although psychology does have the power to decieve, its purpose is to enlighten

Chapter 2-The Biology of The Mind

Function and Structure of The Nervous System

- The nervous system (NS) consists of two divisions:
  - **Central Nervous System-** brain + spinal cord
  - **Peripheral Nervous System-** all the nerves in the body that are outside the CNS
- Our Ns is a communication network
  - **Receives** information from environment
  - **Organizes** and integrates the information
  - **Uses** the information in order to send out messages
- Is responsible for the **conscious** experience
  - Awareness of self and environment

Neurons

- Are the basic units of communication in the NS
- Main job is to receive and transmit information
- Cluster into work groups called **neural networks**
  - Each layer's cells connect with cells in the neural network's next layer
- Three major types of neurons:
  - **Sensory neurons**
    - Receive information from the environment and transmit to the CNS
    - Are *afferent*
    - Send information to interneurons
  - **Interneurons**
    - Only found in CNS
    - Communicate with other neurons
    - Organize and integrate information
    - Issue orders to other neurons
  - **Motor neurons**
    - Receive information from CNS and transmit it to muscles
    - Are *efferent*

Basic Structure of Neurons

- **Soma** (cell body)
  - Find DNA here
  - Manufactures everything the neuron needs to function
- **Dendrites**
  - Receive information from other neurons and conduct it towards the cell body
- **Axon**

    - Thin, tubelike structures
    - When a neuron decides to communicate with another neuron, it fires, produces electrical impulse also known as action potential
    - Carries action potential away from cell body all the way to the **terminal buttons** (axon terminal)
    - Terminal buttons release chemicals called **neurotransmitters**
- **Terminal buttons**
    - Found at the end of axon branches
- **Myelin Sheath**
    - Some axons are covered with myelin sheath
    - Is a white, fatty substance
    - **Insulates** axon and **speeds** up transmission
    - Healthy mielin is essential for healthy functioning
    - Synthesized until the age of 25
- **Synapse**
    - Place where neurons communicate
- **Synaptic Cleft/Gap**
    - Tiny space between two neurons at the synapse
- **Presynaptic Neuron**
    - Is the neuron that sends **out** messages
- **Post-synaptic Neuron**
    - Is the neuron that **receives** the message

Glial Cells or Glia

- Are present in the cerebral cortex
- Outnumber neurons
- Researchers thought that glial cells were the **nannies** of neurons
    - Provide neurons with nutrients, structural support, clean up after neuron and disposes of neuron after it dies
    - Also produce myelin sheath
- Today, researchers believe that they are more than just nannies
    - Involved in information processing, learning, memory, creativity and intelligence
- Play a vital role in the brain
- In complex animal brains, the proportion of neurons to glia increases

Communication of Neurons

- When a neuron decides to communicate, it fires
    - Produces an electrical impulse/action potential
- Action potential travels all the way down the axon and then releases neurotransmitters

    - Neurotransmitters relay messages to post-synaptic neurons
- Is an **electrochemical** process

Within a Neuron

- Our brains are 80% water
    - Contains dissolves chemicals such as:
        - Na+ ions
        - Cl- ions
        - K+ ions
- These ions are found both inside and outside a neural cell in different concentrations
    - Concentration will change depending on what is happening with the neuron
- **Neuron at rest**:
    - More negative ions inside the neurons (negatively charged)
    - More positive ions outside the neuron (positively charged)
    - When at rest, the electrochemical charge is **-70 mv** inside the neuron
        - In this case, the membrane is **polarized**
    - Even at rest, the neuron receives messages
    - Two types of messages:
        - **Inhibitory**
            - Instruct neuron not to fire
            - These messages cause the inside to become more negative (**hyperpolarized**)
        - **Excitatory**
            - Messages that instruct neurons to fire
            - Gates in the axon open and Na+ ions flood in
            - Cause inside to become less negative and the membrane is therefore **depolarized**
- A neuron fires when the inside is about **-50/-55 mv**
    - This is known as the **threshold of excitation**
        - If excitatory signals exceed the threshold, an action potential fires
- **Refractory period:** a resting pause after an AP where the neuron pumps the Na+ ions back outside

Action Potential

- Is an **all or nothing** phenomenon
    - No such thing as partial action potentials
- Everytime a neuron fires, it is the same strength from beginning to end
- Action potential travels down the axon in a domino like effect
    - Doesn't travel like an arrow

Between Neurons

- Presynaptic neuron fires, action potential travels down to the terminal buttons
- In terminal buttons, there are **synaptic vesicles** (little bags containing neurotransmitters)
- Synaptic vesicles attach to membrane, then burst open releasing neurotransmitters into synaptic gap
    - Cross gap and attach to receptor site in postsynaptic neuron
    - The neurotransmitter unlocks the channels on the postsynaptic neuron and charged ions flow in, either exciting or inhibiting the neuron

Deactivating Nerotransmitters

- After delivering its message, neurotransmitter must be deactivated
- Two ways this can occur
    - **Reuptake**
        - Reabsorbed into neuron and recycled
    - **Degradation**
        - Enzyme will break down neurotransmitter
- Neurotransmitter must be deactivated or else it will deliver message over and over again
    - This will either overexcite or overinhibit the NS

Neurotransmitters

- Are chemicals that neurons use to deliver messages
- Health levels of neurotransmitters are essential for health mental and physical health
- Problem is there is an imbalance
- **Dopamine**
    - Major neurotransmitter
    - Influences movement, learning, attention and emotion
    - Imbalanced
        - Schizophrenia (high levels), (low levels) depression, low motivation, parkinsons, no pleasure
- **Acetylcholine (ACh)**
    - Enables muscle action, learning and memory
    - Is the messenger at every junction between **motor** neurons and skeletal **muscles**
        - When ACh is released into muscle receptor cells, the muscle contracts
        - If it is blocked, paralysis occurs
    - Alzheimer's disease- ACh producing neurons deteriorate
- **Serotonin**
    - Affects mood, hunger, sleep and arousal
    - Undersupply = depression

- **Norepinephrine**
    - Controls alertness and arousal
    - Undersupply can depress mood
- **GABA**
    - Gamma-aminobutyric acid
    - Major inhibitory neurotransmitter
    - Undersupply is linked to seizures, tremors and insomnia
- **Glutamate**
    - Major excitatory neurotransmitter
    - Involved in memory
    - Oversupply can overstimulate brain producing migraines or seizures
- Table 2.1 and main text about neurotransmitters on EXAM

Drugs and The Brain

- When drugs reach the brain, they affect at the level of the **synapse**
    - Interfere with communication of neurons
- **Endorphins-** natural, opiate like neurotransmitters linked to pain control and pleasure
    - Eg: morphine
- Affect activity at synapse on three levels:
    - **Presynaptic neuron**
        - Can increase, decrease or inhibit release of NTs
    - **Synaptic cleft/gap**
        - Will interfere with degradation or reuptake
            - Enhance, decrease or block them
    - **Postsynaptic Neuron**
        - 3 ways
            - **Can lock and mimic**
                - Attach to receptor sites and behave like NT, delivering message to neurons
            - **Lock and block**
                - Will attach to receptor sites and block them.
                - Will not deliver messages and will stop NT from delivering message
            - **Locks, enhances or diminishes**
                - Drugs will attach to receptor sites in such a way that NTs can also attach
                - NT will deliver message and drug will either enhance or weaken it
- Two major types of drugs: (on exam)

    - **Agonists**
        - Enhances, facilitates and increases the activity of NT
    - **Antagonists**
        - Will weaken, diminish and block the activity of NT

The Brain

- Is 2% of body weight
- Consumes 20-25% of glucose in the body
- Brain is the fattest part of the body- 60% fat
- (above will not be on the test)

Tools of Discovery

- **Clinical Observation**
    - The oldest method and at one time, the only method
        - Still used today
    - Systematically observe people who have brain problems and will systematically describe and document what is observed
- **Brain Manipulation**
    - Researcher will intentionally interfere with the functioning of the brain
    - Will then systematically observe, document and describe the results of this manipulation
    - Ways to manipulate the brain:
        - Surgically
        - Chemically
        - Electrically
        - Magnetic field
        - Optogenetics
        - Sonogenetics
- **EEG**
    - Allows us to see the brain in action
    - Not invasive, safe
    - Put electrodes on scalp which will then pick up electrical activity of neurons
        - Will pick up brain waves

Neuroimaging Techniques

Name	Description
CT or CAT Scans	• Uses x-ray technology to take multiple **images** of the brain at different angles

	• Does not allow the viewing of brain function • Can see anatomy and structure
MRI	• Doesn't allow viewing of brain function • Can see anatomy and structure • Exposed to powerful magnetic field which causes tissue to release **electromagnetic signals** • Machine uses these signals to create detailed images of the brain
PET Scan	• The brain consumes glucose for energy ○ The more active an area of the brain is, the more glucose it will consume • Injected with **radioactive glucose** and the machine tracks it • The more active areas will show up in red and less active areas in blue • Allow us to see brain function
fMRI	• Shows brain function • Non invasive, believed to be safe • Exposed to powerful magnetic field and machine tracks **blood flow** to the brain • More active areas will have more blood flow • Produces colourful images

Lower Brain Structures

- **The Brainstem**
  - Oldest and innermost region
  - Starts where the spinal cord ends
  - Is a **relay** station
    - All information coming to or from the brain must go through it
    - Is believed that the analysis of information begins here
  - Is a **crossover** point
    - Information coming from the right side of the body crosses to the left side of the brain when it reaches the brain stem (and vice versa)
  - Considered to be the life center of the brain
  - Contains structures that control vital functions of the body
    - **Medulla**
      - Controls heartbeat, breathing, swallowing, vomiting, etc.
      - Will die if it is damaged

        - **Pons**
            - Sits right above the medulla
            - Helps coordinate movement and regulate sleep
        - **Reticular Formation (RF)**
            - Located between ears
            - Associated with arousal, wakefulness, sleep
            - Filters incoming stimuli
            - Some cases of coma can be caused by damage to the RF
- **Thalamus**
    - Sits on top of the brain stem
    - Is the brain's sensory control center
    - Is also a **relay** station
        - All information collected by senses (except smell) goes to the thalamus which conveys it to different brain areas
        - All information from higher brain areas goes to the thalamus which relays it to lower brain areas
        - Filters information, highlighting what is important
        - Regulates motivation, arousal and attention
- **Cerebellum**
    - Known as the little brain
    - Controls muscle tone, porture, balance, voluntary movements
    - Associated with learning and motor skills that become automatic (eg: writing)
    - Is **1/10th** of brain volume
        - Over half of the brain's neurons are located here
        - These neurons have 20x more connections than neurons in other parts of the brain
    - Researchers believe that it is involved in higher cognitive function
        - Evidence indicated that it could be linked to learning, creativity, certain aspects of language and memory
    - When we get drunk, the cerebellum also gets drunk

Limbic System

- Consists of multiple structures and is linked to multiple functions
    - Learning, memory, emotion, motivation, etc.
    - Contains the *amygdala, hippocampus* and the *hypothalamus*
- **Hippocampus**
    - Processes conscious **memories**
- **Amygdala**
    - Linked with **aggression** and **emotions**

        - Experience (particularly fear) , perception, formation of emotional memories and the fight or flight (stress) response
    - Can detect threatening stimuli in environment before they are consciously perceived
- **Hypothalamus**
    - Sits under the thalamus
    - Is known as the brain within the brain because it is so powerful
    - Regulates **homeostasis** and **pleasure**
    - It controls:
        - Drives (hunger, thirst, etc)
        - Maintains homeostasis
        - Pleasure centers
        - Endocrine system
        - Autonomic system
    - **Reward Deficiency Syndrome**
        - Is a theory that tells us the following:
        - Some people have sluggish/underperforming pleasure pathways due to low dopamine
        - According to theory, some people will seek drugs, shopping, gambling, food, etc. to pump up pleasure pathways

Cerebral Cortex

- Is the **youngest** part of the brain
- Most **complex** part of the brain
    - Humans have the most complex cerebral cortex
- Responsible for higher mental functioning
- Is the outer layer of the brain
- Contains billions of neurons and other cells (glia)
- Contain glial cells
- ⅓ of the cortex is visible only
    - The rest is hidden in grooves and folds
        - This allows it to fit into the size of the human skull

The Two Hemispheres

- Connected via the **corpus callosum**
    - Is a bundle of nerve fibers that the 2 hemispheres use to exchange information and communicate
- **The left hemisphere**
    - Receives information from the **right** side of the body
    - Controls the right side of the body

    - Responsible for **language**
        - Makes quick and literal interpretations of language
- **The right hemisphere**
    - Receives information from the **left** side of the body
    - Controls the left side of the body
    - Excels in making inferences
    - Helps modulate speech
    - Helps orchestrate self awareness
- Each hemisphere consists of 4 lobes:
    - Frontal, parietal, temporal and occipital
        - Each lobe consists of 2 areas: **Primary** and **association**
    - SEE Fig 2.23 in textbook

Primary Areas

- Primary areas are found in each lobe
- Are linked and associated with the processing of either motor or sensory information
- The primary areas are:
    - **Visual Cortex**
        - Located in the occipital lobes
        - Processes visual information
        - SEE Fig. 2.27 and 2.28.
    - **Auditory Cortex**
        - Located in temporal lobes
        - Processes auditory information
        - SEE Fig. 2.28
    - **Somatosensory Cortex**
        - Aka. sensory cortex
        - Located in parietal lobes
        - It receives information from the skin, muscles and joints
        - Processes information pertaining to touch, pain, temperature, etc.
        - The right part of the parietal cortex receives info from the left side of the body and the left part receives information from the right side
        - The more sensitive a body part is, the larger the somatosensory cortex area it has
        - SEE Fig. 2.24
    - **Motor Cortex**
        - Located in frontal lobes
        - Controls voluntary movements

        - The right part of the motor cortex services the left side of the body and the left part services the right part of the body
        - SEE Fig. 2.24
- 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 size of a body part has nothing to do with the size of the area the brain devotes to this part
    - The brain devotes more tissue to sensitive areas and areas that require precise control
        - Eg: fingers have greater representation in brain than upper arm

Association Areas

- SEE Fig. 2.29
- Found in each lobe and they are linked and associated with higher and more complex mental functioning
    - Are also involved in the processing of complex motor or sensory information
- These areas interpret, integrate and act on sensory information and link it with stored memories
- Some functions that have been linked to the association areas of the cerebral cortex are listed below;
    - **Frontal Lobes**
        - Attention, planning, abstract thinking, some aspects of memory, personality and language, impulse control, decision making and emotions
        - *Prefrontal cortex* enables judgement, planning and processing of new memories
        - Damage can alter personality and remove inhibition
    - **Temporal Lobes**
        - Some aspects of language, recognizing faces, music, some aspects of memory, god spot
    - **Parietal Lobes**
        - Nonverbal thinking, sense of space
    - **Occipital Lobes**
        - Processing of complex visual information
- Keep in mind however that the brain's lobes work in tandem (together) to produce complex human behaviours & mental processes
- Our mental experiences arise from coordinated brain activity

Brain Reorganization

- Researchers believe that once the human brain has matured, it remains the same/unchangeable until it has a disease, injury or it ages
    - They were very wrong

Brain Plasticity

- Researchers have discovered that the human brain is plastic
    - Brain changes with experience, even the old brain
- Plasticity means an area of the brain could increase or decrease in function based on experience
    - Is the brain's ability to modify itself after damage
    - A healthy area could take over an unhealthy area
    - An area of the brain could become bigger (more synapses) or get smaller as a result of experience
- **Neurogenesis**: the ability of the brain to produce new neurons, even in old age
- Brain damage effects can be traced to two main facts:
    - Severed brain and spinal cord neurons do not regenerate
    - Some brain functions seem pre assigned to specific areas
- ***Constraint induced therapy***- aims to rewire brains and improve dexterity in a brain damage victim

Functional Asymmetry

- There is functional asymmetry in the cortex
    - While the 2 hemispheres carry out similar functions, it seems that each has its own expertise
        - This does NOT mean that we have a left brain or right brain
- 2 hemispheres are working together as a team to produce complex functions, emotions, etc.
- We learn about functional asymmetry through observation, neuroimaging techniques and from split brain functions

Split Brain Functions

- Are individuals who suffered from epilepsy
- To relieve their seizures, doctors cut out their corpus callosum

Keep In Mind….

- We have a right and left visual field
    - Doesn't mean left/right eye
    - Refer to tb for further explanation

- Information that is flashed to the right visual field will go to the left hemisphere and vice versa
- In a **normal brain**, the information that is flashed to one hemisphere will be relayed to the other hemisphere
- In a **split brain** patient, information that is flashed to one hemisphere will NOT be relayed to the other hemisphere (it will not know about it)
- The **left** hemisphere controls **language** and the **right** side of the body
- The **right** hemisphere controls the **left** side of the body

The Spinal Cord (CNS)

- Is a highway for information
- All information that the body sends to the brain and back must go through the spinal cord
- Is linked and associated with **rhythmic movements**
    - Eg: walking, swimming, flying
- There are **pattern generators** in the spinal cord
    - Specialized cells controlled by the bain
    - When activated, they produce rhythmic movements
- **Spinal reflexes**
    - Reflexes are innate, unlearned behaviours
    - Controlled by spinal cord
    - A **spinal reflex pathway** consists of:
        - Single sensory neuron
        - Single motor neuron
            - Communicate through interneurons

Peripheral Nervous System (PNS)

- Connects body to CNS
- Main job is to convey information between the body and the CNS
- Consists of ALL the nerves in the body that are outside the CNS
- Has 2 main divisions:
    - **Somatic** and **automatic**

Somatic Nervous System

- Two main functions
    - **Sensory function**
        - Information collected by senses will be sent to the CNS via sensory neurons
    - **Motor function**

        - Motor information sent from CNS to skeletal muscles (muscles attached to bones) via motor neurons

Autonomic Nervous System

- Controls glands, organs and visceral muscles (muscles not attached to bones)
- There are 2 divisions
    - **Sympathetic nervous system**
        - Mobilizes the body's resources, energizes and arouses the body, prepares the body for fight or flight
        - Linked to the stress response
    - **Parasympathetic Nervous System**
        - Conserves the energy of the body
        - Calms, relaxes, and helps the body repair itself

The Endocrine System

- Refer to tb for the different glands
- Is a major communication network
- Consists of all the glands in the body
    - These glands release hormones into the bloodstream
- Hormones are chemical messengers that carry messages to the body, including the brain
- 3 major types of hormones:
    - One type is responsible for **homeostasis**
    - **Reproductive** hormones
    - **Stress** hormones
        - Short term stress hormones are good for us

NS and Endocrine System

- Both are communication networks
- Both produce molecules that act on receptors elsewhere
- The nervous system controls the endocrine system
- However, the nervous system including the brain is still influenced by the hormones produced by the endocrine system
    - There is constant interplay between them
- Some hormones are chemically identical to neurotransmitters
- Endocrine messages take much longer than neural messages to travel through the body
    - However, endocrine messages last longer than neural messages

Pituitary Gland

- Known as the ***master gland*** because it controls ALL other glands in the endocrine system
    - Is controlled by the **hypothalamus**

- Releases **growth hormone** that stimulates physical development
- Also releases **oxytocin** which enables contractions, breast milk flow and orgasms
    - Also promotes pair bonding, group cohesion and social trust
- Pituitary secretions also direct other endocrine glands to release hormones

Adrenal Gland

- A pair of endocrine glands located above the kidneys
- Secrete hormones **epinephrine** and **norepinephrine**
    - Increase heart rate, blood pressure, blood sugar and provide surge of energy
    - Also responsible for fight or flight response

Other Glands

- **Parathyroids-** regulate calcium levels in the blood
- **Thyroid gland**- affects metabolism
- **Testies and ovaries**- secrete sex hormones
- **Pancreas-** regulates blood sugar levels

Affect Behaviours

- Hormones influence and affect behaviour
- Learn different hormones from main text in tb (ON EXAM)
- Split brain patient practice questions on exam too

Chapter 6- Sensation and Perception

The Musts of Sensation

- In order for us to sense, 3 things must happen:
    - Must be able to **detect** physical energy
        - No detection = no sensation
        - Humans are limited to what we can detect
    - Physical energy that has been detected must be **transduced**
        - Means that it must be translated into a message that the brain can understand
        - Must be translated into an electrochemical message
    - This information must be **transmitted** to the brain for further processing

Transduction

- All senses:
    - *Receive* sensory stimulation
    - *Transform* stimulation into neural impulses

    - *Deliver* the neural information to our brain
- The process of converting one form of energy into another that our brain can use is called **transduction**

Sensory Receptors

- Highly specialized receptors found in sensory organs
- They detect, transduce and transmit information
- Sensation is a **bottom up process**
    - Starts with the basic elements and then builds up

Psychophysics

- Is the scientific study of the interaction between the physical characteristics of the world and our psychological experience of them

Absolute Threshold

- It is not enough for us to be able to detect physical energy
    - The energy must be strong enough to be detected
- The absolute threshold is the **minimum** amount of energy/stimulation that must be present in order for us to detect it **50%** of the time

Difference Threshold (JND)

- It is very important to detect changes in stimulation
    - Essential for survival
- **JND-** the minimum **difference** in stimuli in order for it to be detected 50% of the time
    - The difference threshold increases with the size of the stimulus

Webster's Law (ON MIDTERM)

- 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 percentage is different for every stimulus
- Thresholds vary from one person to the next and in the same person from one situation to the next

Signal Detection Theory

- Predicts when we will detect weak signals
- According to this theory, our ability to detect physical energy doesn't depend only on its strength
- There are other factors that could affect our ability to do so
    - Eg: knowledge, emotion, motivation, past experiences, being tired or not, etc.

Subliminal Persuasion (ON EXAM)

- Stimuli that cannot be detected 50% of the time are **subliminal-** below the absolute threshold
- An unnoticed image/word can reach the visual cortex and briefly **prime** your response to a later question
- **Subliminal persuasion** attempts to mask messages that we cannot consciously hear in order to unconsciously persuade us to do something
- This phenomenon is based on two assumptions:
    - We can unconsciously detect subliminal stimuli
    - Without our awareness, these stimuli have extraordinary suggestive powers
- Although subliminally presented stimuli *can* influence people, research discounts attempts at subliminal advertising and self improvement

Sensory Adaptation

- With repeated exposure to a stimulus that is unchanged and harmless, our senses reduce their response to it or ignore it completely because our nerve cells begin to fire less frequently
- Allows us to focus on changing stimuli
    - It can even influence how we perceive emotions
- Why does this happen?
    - We are bombarded with stimuli on a daily basis
    - If it is not dangerous, it is important to tune it out, otherwise our nervous system will be hyperstimulated and could crash
- Our attentional resources are very limited so we must ignore the insignificant things and focus on the more important stimuli
    - Is important for survival

Circumventing Sensory Information

- Refer to figure about eyes in textbook
- Body doesn't allow sensory adaptation to occur when experiencing intense pain
    - If we tune it out or adapt, we could be in serious trouble
- The body doesn’t allow the eyes to sensory adapt
    - Eyes are constantly making tiny movements that we are not aware of, otherwise stationary objects would disappear
        - This way, the stimulation on the eyes’ receptors continually changes

The Basics of Perception

- Sensory information will be sent to the brain which will process, analyze, organize, integrate and interpret the information in a meaningful way
- Perception is a **top down process**
    - This means that the brain will use past experiences, existing knowledge, beliefs, values, etc in order to analyze and interpret the information
- It is possible to have sensation, but not perception
    - **Prosopagnosia**
        - Eyes can see faces, but brain can't recognize the face
        - Sensation, but no perception
- It is also possible to have perception but no sensation
    - Hallucinations: seeing fire when there is none

Perceptual Set

- Is a mental predisposition to perceive life and its events in a specific way
    - It comes from all of our experiences, culture, parenting, peers, rejection, love, etc.
    - Through experience, we come to expect certain results
        - Those expectations may give us a perceptual set, a set of mental tendencies and assumptions that affects (**top-down)** what we perceive
- This is why some people will laugh at a joke and others will find it offensive

Context Effects

- The context we are in is very important
    - It influences how we perceive life and events
- Same thing, different way of perceiving out

States of Being

- Will influence how we perceive life and its events
- If we are tired, full of energy, sick, happy or sad, motivated or not
- Emotions and motivation colour our perceptions, including social perception

II-Vision

The Stimulus

- There must be light in order for us to see
- Light is a form of **electromagnetic radiation** and it travels in the form of a wave
- Is part of the electromagnetic spectrum
    - Called visible light because we can detect it
- We can only detect light waves ranging between **400-700 nm**
- Two physical characteristics of light waves that are of interest:

- **Wavelength**
  - Is the **distance** between the 2 peaks of a wave
  - Is a physical characteristic that will be translated into the psychological experience of colour or **hue**
    - Colour is a psychological experience created by our brains
  - **Long wave** - Red
  - **Medium wave**- Green
  - **Short wave**- Blue
    - All are 10^3 nanometers in wavelength
- **Amplitude**
  - Is the **height** of the wave
  - Translates into psychological experience of brightness or **intensity**

Focusing Light

- Light must enter the eye through the **cornea** which bends light to provide focus
- The light then passes through the **pupil**
- Surrounding the pupil and controlling its size is the **iris** which is a coloured muscle that dilates or constricts in response to light intensity
  - Iris also responds to cognitive and emotional states
- Behind the pupil is a **lens** that focuses incoming light rays into an image on the **retina** which is a multilayered tissue on the eyeball's inner surface
  - The lens focuses rays by changing its curvature and thickness in a process called **accommodation**
- The retina does not see a whole image, rather its receptor cells convert light particles into neural impulses and forward them to the brain where the information is perceived
- Refer to figure 6.14 (study structure of the eye)

Retina- Structure

- Starting from the innermost layer:
  - **Rods** and **cones** are connected to **bipolar cells** which are connected to **ganglion cells**
  - The axons of ganglion cells will branch up to form the **optic nerve** which will carry information to the thalamus and then to the visual cortex (in occipital lobe)
- **Blind spot**
  - Is the part of the eye where the optic nerve **exits** to get to the brain
  - No sensory receptors there, so when light hits this spot, nothing can be seen
- **Fovea**
  - Located at the **center** of the retina
  - Responsible for highest visual acuity

Rods and Cones

- Will detect light, transduce it and transmit information to the brain
- Known as **photoreceptors**
- Differ in many ways:
    - **Shape**
    - **Number**
        - Rods outnumber cones
    - **Function**
        - Rods are super sensitive to light (need little light to activate)
            - Used in the dark or at night
            - Allow us to see black, white and grey
            - Involved in **peripheral** vision (highly concentrated in periphery)
            - No rods in fovea
        - Cones need a lot of light to activate
            - Used during the daytime
            - Allow us to see colour and fine detail
            - Differ in location
            - Are highly concentrated in the **fovea**, less in periphery
    - **Connections to bipolar cells**
        - Cones have 1-1 connection with them
        - Rods have a several- 1 connection with them

	Rods	**Cones**
Number	120 million	6 million
Location in retina	Periphery	Center
Sensitivity in dim light	High	Low
Colour sensitivity	Low	High
Detail sensitivity	Low	High

Visual Information Processing

- In order of increasing complexity (least to most):
- **Retina**
    - Processing of visual information begins here

    - Ganglion cells start the processing of information
- **Visual Cortex**
    - Information reaches here after the retina
    - Has **feature detectors**
        - Highly specialized cells that respond only to very specific stimuli
        - They receive information from individual ganglion cells in the retina and pass specific information to other areas where teams of cells called *supercell clusters*, respond to more complex patterns
        - Eg: some only respond to a vertical lines, angles, etc.
- **Parietal and Temporal Lobes**
    - There **'where'** pathways
        - Are located in the parietal lobes
        - Allows us to locate an object in space and to track its movements
    - The **'what'** pathway
        - Located in the temporal lobes
        - Allows us to identify what is being looked at

Parallel and Spatial Processing

- We have a dual mind
    - A conscious and unconscious mind that processes information differently
- **Serial processing**
    - Done by the conscious mind
    - Information is processed one **single** step at a time
        - Step 1 must be finished before step 2 can start
- **Parallel Processing**
    - Much faster
    - Done by the unconscious mind
    - Brain will do **multiple** steps at one time
    - The brain will take a job and break it down into tasks
        - Each task will be handled by a different, separate group of neurons
            - Separately, but simultaneously
        - When finished, they share the information, the brain integrates it and we perceive something coherent and meaningful
    - To analyze a visual scene, the brain divides it into subdimensions (motion, depth, form, colour) and works on each aspect simultaneously

Colour Vision

- **Young-Helmholtz Theory**
    - Aka Trichromatic theory

- People already knew that we have primary light colors
  - By combining the three colours, we can create millions of other colours
  - Red, green, blue
- Based on this understanding, this theory proposes the following
  - There must be 3 different types of cones in the retina (Red, Blue, Green)
  - While each cone can respond to all colours, it is maximally responsive to one colour
    - Eg: red cone is maximally responsive to the colour red
- The brain is monitoring the 3 cones to see what types are being activated, in what combination and to what degree
  - Based on this, the brain will determine colour
  - All colours fully activated= white
  - All colours minimally activated= black

- **Opponent Process Theory**
  - Developed by Hering
    - He accepted the Trichromatic theory but believed that it was not sufficient by itself
  - One of the things that it couldn't explain was complementary afterimage
  - **Afterimage-** when we continue to see an object even though we are no longer looking at it
  - **Complementary afterimage**
    - If we stare at green and then look at a white sheet of paper, we will end up seeing red
  - According to this theory, we have 4 primary light colours; red, blue, green and yellow
  - Also according to this theory, in the visual system, we have 3 antagonist visual systems
    - Red-Green, Blue-Yellow and Black-White
    - The R-G system for example, is maximally responsive to red and green light
      - However, the neurons will respond in opposing ways to the red and green light
        - If they are excited by red, they will inhibit the green light
          - This will inform the brain
        - Eg: if neurons in the R-G system are excited, the brain knows that there is a red light
  - The brain will monitor all 3 systems to see what is being excited and inhibited in what combination and to what degree
    - Based on this, the brain will determine colour

- **The Bottom Line**
    - To date, both theories have been supported by modern research
    - In the retina, we do have 3 different cones that function in line with the trichromatic theory
    - Ganglion cells in the retina function in line with opponent process theory, but so do other neurons in the brain
    - These theories are complementary and outline the two stages of colour vision
        - The retina's receptors for red, green and blue respond to different colour stimuli
        - The receptors signals are then processed by the opponent process cells on their way to the visual cortex in the brain

Organization and Interpretation

- **Gestalt Psychology**
    - Doesn't exist anymore, but work continues to be valuable today
    - One main idea is that the brain organizes sensory information into a **Gestalt**
    - Gestalt means a form, a meaningful whole
        - We see the whole object, not bits and pieces
    - Another idea is that the whole may exceed the sum of its parts
- **The Perceiving Brain**
    - The brain does not perceive reality as it is
    - It actively constructs reality using experiences, knowledge, expectations, beliefs, etc.
    - If we have not experienced it, we won't see it

The following are all Gestalt rules:

Figure and Ground

- When looking at a visual scene, the brain will organize information into figure and ground
- Figure is the object that is being looked at and ground is the background
    - Figure and ground can constantly reverse
- Due to figure and ground, the same stimulus can be perceived in different ways
- Figure and ground is not a characteristic of the physical world
    - Is is a psychological experience of the brain

Grouping

- **Proximity**

    - Elements in a scene that are physically close to each other will be perceived as a single unit
- **Similarity**
    - Elements that are similar to each other will be perceived as a single unit
- **Continuity**
    - Elements in a scene that seem to follow in the same direction or that continue in a pattern will be perceived as a single unit
- **Connectedness**
    - Elements in a scene that are connected to each other will be perceived as a single unit
- **Closure**
    - If an element is missing in a scene, the brain will fill in the blanks

Depth Perception

- How close or how far an object is to us
- Allows us to see the world in 3D
- Is it innate or due to experience?
    - **Visual cliff experiment** (babies 6-14 months old)
    - Depth perception is partially innate
- Experience is an absolute must for proper development of depth perception
- The brain relies on 2 major clues to determine depth
    - Binocular depth cues
    - Monocular cues

Binocular Depth Cues

- The brain will use information from both eyes to determine depth
- 2 types of binocular cues:
- **Convergence**
    - The degree to which our eyes turn inward when we look at something
    - The more inward they turn, the closer an object is perceived to be
- **Retinal Disparity**
    - There is distance between our eyes
    - Because of this distance, even if we look at the same object, each eye will have a different view of it
    - The larger the retinal disparity, the closer an object is perceived to be

Monocular Cues

- We need information from only one eye to determine depth
- **Relative size**

    - If objects in a scene are known to be roughly the same size, then the one that appears to be larger will be perceived as closer
- **Relative Clarity**
    - The clearer and crisper an object is, the closer it is going to be perceived
- **Texture gradient**
    - The rougher a surface seems, the closer it will be perceived
- **Relative Height**
    - Objects higher in our visual field will appear to be further away than those lower in our field
- **Relative Motion (motion parallax)**
    - Perceiving depth while moving
    - When we are moving, objects that are close to us will appear to move fast and in opposite direction to us
    - Objects far away will appear to move slowly and in the same direction as us
- **Linear Perspective**
    - Two parallel lines that appear to intersect in the distance
    - They convey depth
    - Objects near the intersection will be perceived as further away
- **Light and Shadow**
    - Well lit objects will appear to be closer
    - When an object casts a shadow on another object, it will appear to be further away

Motion Perception

- When we look at an object, it will cast an image on our retina
- Researchers believe that the brain makes assumptions
    - If an image is getting larger, the brain assumes that it is moving closer to us
    - If an image on the retina is getting smaller, then the brain thinks the object is moving further away
- **Stroboscopic Movement**
    - The motion we see when we watch a movie
    - Nothing is actually moving on the screen
        - Movements are caused by still photographs that are being flashed really fast and the brain perceives movement
- **Phi phenomenon**
    - Adjacent lights that are turned on and off at a rapid succession which create the impression of a moving object
    - Brain creates movement due to this
    - Eg: moving christmas lights

Perceptual Constancy

- Allows us to have a coherent and stable perception of the world
- Is a **top-down** process
- It is our tendency to perceive that shape, colour and size of an object as remaining the same in spite of changes in physical stimulation, retinal images, lighting conditions, etc
- **Colour and Brightness Constancy**
    - Our experience of colour depends on the object's context
    - *Brightness constancy* also depends on context
    - The perception of constancy depends on *relative luminance*- the amount of light an object reflects relative to its surroundings
- We perceive objects, not in isolation, but in their environmental context

Relative Luminance

- Explains colour constancy and lightness constancy
- Means that when the brain is assessing how much light an object is reflecting, it does not do it in a vacuum
    - The brain will also consider how much light is reflected off other objects in the surroundings
- **Size- Distance Relation**
    - Size and distance are interconnected
        - When the brain is assessing size, it takes distance into consideration and vice versa

Perceptual Adaptation in Vision

- The ability of the brain to adapt, adjust and function properly in a world that has been artificially turned upside down or artificially shifted from left to right
    - Does so without and conscious effort
    - Eg: when you get a new pair of glasses, you have to wait a few days to adjust

Sensory Deprivation and Restored Vision

- If we were blind until adulthood, would we be able to perceive if we regained vision?
- Without experience, figure and ground, perception of colour will be okay
    - Motion perception will be somewhat okay
    - There will be serious problems with shape, depth and perception of faces without experience

Critical Period

- We have critical periods in our development

    - There are certain periods during our development where we must be exposed to certain experiences otherwise we won't properly develop
- Today, it is believed that the critical period for vision is 0-6 years