Lecture notes, all lectures

Introduction to Psychology: Foundations (University of Ottawa)

PSY1101: Course Outline

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8 Chapters + Prologue (12-15 PGS)

- CHAPTER 1: Thinking Critically With Psychological Science
- CHAPTER 2: The Biology Of Mind ("Everything Psychological is Biological")
- CHAPTER 6: Sensation & Perception
- CHAPTER 3: Consciousness & the 2 Track Mind
- CHAPTER 7: Learning
- CHAPTER 11: Motivation and Work
- CHAPTER 12: Emotions
- CHAPTER 8: Memory

Books: "Psychology" by Myers (10TH edition)

Evaluation and Exam Dates (4 components)

2 Midterms

- October 1 – chapters 1-2 &6, multiple choice and true or false – 25.5% of final mark
- November 13 – chapters 3 & 6, 7, multiple choice and true or false – 25.% of final mark

1 Final

- unknown – cumulative (all chapters + prologue equally weighted) – 45% of final mark

1 ISPR

- deadline = December 3 – participation in psychology research - 4% of final mark!

ALERT

- Absence from exams MUST be properly documented.
- Student card is mandatory!
- Must arrive on time! Otherwise, penalties will apply.

What is Psychology?

A *science* which studies cognitive, emotional and motivational processes and behaviors.

What is the scope of psychology?

Psychology is used for numerous purposes, not only psychological therapy.

Why do we need psychological science?

Limits of Intuition

- While intuition can be important and accurate, we cannot rely on it as it can also be wrong, misleading and lead us astray.

Limits of Common Sense

- We cannot rely on common sense as it does not generate new knowledge; it comes after an experience – not before!
- Common sense itself is the result of experience, learning and having acquired knowledge.
- **Hindsight bias** – "I knew it all along" phenomenon – we have a tendency to overestimate and over-exaggerate our abilities ("I told you so!").

Overconfidence

- We tend to overestimate how accurate our knowledge is.
- Tetlock: Psychologist who studies the accuracy of experts' statements (were they right or wrong?).

Illusory Correlation

- Our tendency to see a relationship between 2 variables or more where NO relationship exists!
- **Cognitive effects** – we give anything that supports our beliefs more attention and deny or ignore whatever may go against it. We remember whatever supports our beliefs and forget whatever doesn't.

Perceiving Order in Random Events

- As human beings, we are uncomfortable with uncertainty. We tend to look for explanations.

The Scientific Attitude

Curiosity and passion

- One needs to be perseverant in pursuing their interests and satisfying their curiosity.

Open mindedness

- A trait that needs to be cultivated!
- One cannot be rigid – they must be open to new experiences and ideas, particularly if they are fundamentally different that personal ideas.
- We need to be able to look at situations from different perspectives.

Skepticism

- One cannot be naïve and believe everything they're told.
- Evidence *must* be found and examined for oneself.

It is crucial for one to find the perfect balance between open mindedness and skepticism – being too open minded makes one naïve whilst being too skeptical makes one rigid!

Awareness of…

- We must strive to limit our biases from interfering with our objectivity.

Humility

- No matter how smart we may be, we must understand that others are smart too and may also have significant contributions to make.
- No matter how smart we are, we must understand that we are only human and will fail and make mistakes.
- We must remove the ego in order to further our studies – we are not researching for recognition or prestige, but for furthering our personal and others' understanding.

Cautiousness

- We never prove anything in science!

NEVER use the word proof. Data can either support or confirm research.

The Scientific Method

- Any field of study that follows the scientific method is a science!

Observation

- Everything in science starts with an observation!
- Observations may first be casual, but then *must* become systematic!

Theory

- A theory is not *fact* or *truth*.
- An attempt at explaining something.
- Used to organize, summarize and integrate our information.

Hypothesis Testing

- Taking an idea from a theory and testing it scientifically.
- Hypotheses are tentative and therefore require *rigorous* research.
- Variables must always be **operationally defined** – precisely stating how the variables are going to be measured. This is done in order to allow other researchers to conduct the same study.

EX. ✗ Optimism = seeing the glass half full.

✓ Optimism = scoring a 50 or higher on the Haddad optimism scale.

Replication

- Test and retest getting similar results.
- The more similar the results, the higher the scientific confidence and vice versa.

Generate and Refine

- Generate new questions and tweak the hypothesis.

Types of Research Studies

There are 3 main types of research studies.

Descriptive Research

The *purpose* is to observe and describe – collect information that is going to allow the researcher to answer what? When? Where? And how? (*not why!*)

CASE STUDY

- Researchers will study 1 person or a very *small* group of people – it is a very *in depth* study!
- Advantages – case studies allow us to document such information
  – having so much information allows us to look at different perspectives
  – case studies are very good starting points for very research.
  – only way to help those with rare disorders (✗ enough people for lab).
- Disadvantages – cannot generalize, as there is only 1 person to study!
  – Researcher bias – videotape to get an objective point of view.

SURVEY

- Can be used in both descriptive and correlational research.
- Type of study where researchers ask a large sample of people questions about attitudes, beliefs and opinions.
- It must have a representative sample (the sample must closely mirror, reflect and parallel the characteristics of the population of interest) in order for it to have scientific value!

EX. ✓ 45% of the population of choice are women.
✓about 45% of the sample should be women.

- How to get a representative sample? Random sampling! Chance must determine who is going to be in the sample/every person in the population must have an equal chance to participate.
- Although the researcher can choose the population, they cannot choose the sample! *If you don't do random sampling, data is completely distorted and you cannot generalize info!*
- Advantages – very easy to administer.
  – the largest kind of study to do.
  – includes people who may not be included in other studies (EX. Illiterate).
  – may sometimes be *only* way to get information (✗ observations, ✓ asking).
- Disadvantages – some people will lie in order to look good.

– may receive incorrect data as people may misjudge themselves

– wording of a question may affect responses.

– Person conducting survey may influence answers.

NATURALISTIC OBSERVATION

- Researcher is going to do research in the real world, the natural environment.
- Researcher *cannot* interfere with what is going on – has to just be an observer.
- Advantages – can sometimes be the only way to get information.
  – reality research!
  – may uncover patterns of behavior that one would have been oblivious to.
- Disadvantages – researcher bias! Videotape to get an objective documentation.
  – the presence of the researcher may influence the subjects' behavior.
  The researcher must blend in!

Correlational Research

- The *purpose* is to observe, describe and predict.
- Used to find out if there is a meaningful relationship between two variables.
- EX. Is there a relationship between class attendance and grades?

In order to find out if there is a relationship – we ask the 3 questions below.

1. Do they co-vary?
- If one variable changes, does the other change too?
- EX. If the class attendance changes, do the grades change too?
2. If they co-vary, in what direction? There are 2 types of correlations:

- Positive (both variables change in the same direction - ∧∧ or ∨∨) or…
- Negative (variables change in opposite directions ∧∨ or ∨∧).

3. To what extent?

- How strong is the relationship?

Correlation coefficient: r (says + or – and how strong it is)

-1 0 +1

Signs: determine if the relationship is positive (∧∧) or negative (∧∨).
Numbers: determine the strength of the relationship (the closer to -1 or +1, the stronger the relationship and the better the ability to predict / 0 = no relationship).

- Advantages – excellent first step.
  – great when no other option.
  – describes and predicts

EX. When there is a relationship between two variables, researchers can make predictions on one variable using data from the other.

– Correlational research helps us live better lives!

EX. correlation between seat belts and lives saved urges people to wear them.

- Disadvantages – when we do correlational research we *cannot* infer causality! Even if one causes the other, it is impossible to know which does what!

Experimental Research

- *Only* research that's going to allow you to talk about cause and effect – let's us conclude that variable A causes a change in variable B.

There are 2 reasons why it is the only one:

- Researcher is going to manipulate the independent variable.

- Researcher is going to control all other independent variables.

- Cause and effect relationship.
- **Independent variable** – a variable that causes a change in another variable.
- **Dependent variable** – the variable being changed, affected or influenced.
- **Confounding variable** – independent variables that the researcher is not studying, but could influence or affect the variables he is studying (*must* control confounding variables in order to get accurate results!).
- Manipulating the independent variable – we have to create at least 2 levels of the independent variable being studies. We must have at least 2 groups in the study: an experimental group (exposed to the independent variable) and a control group (not exposed to the independent variable).
- Control all other independent variables (confounding variables) – control all known independent variables and all unknown variables (random assignment! Only chance should determine what group the subject is going to end up in – every subject in the study has an equal chance of being in either the experimental group or control group).

EX. Known variables – If you're trying to study what lowers depression, researcher can request ✗ medication or therapy.

- The purpose of controlling confounding variables is to ensure that given results are due to own chosen independent variables and no external factors!
- Control **placebo effect** – a substance or treatment that is neutral, neither helps or harms us. Once we *believe* a treatment is effective and will help us, we are likely to get better even though the treatment may be fake!
- Blind and double-blind procedures – blind (keeping the subject as much in the dark as ethically possible in order to control subject bias) and double blind (both subject *and* some researchers are kept in the dark as the researcher may subconsciously gesture or mention something which may give away the experiment, controls researcher bias).

Statistical Reasoning

What are stats? Why do we have them?

Stats are *mathematical tools* used to describe and analyze our data.
There are 2 types of stats:

DESCRIPTIVE STATISTICS
The purpose of such stats is to help the researcher describe, summarize and organize his data in a clear and understandable fashion.

EX. class averages

- Measures of central tendency give the researcher an idea about the typical score in a set of distributional scores.

1. **Median** / **"50th percentile"** – middle number in a set of data or distribution of scores when the score are arranged in order.

Caution: focusing on only 1 score in data, we lose a lot of information!

2. **Mode** – number that occurs most frequently in a distribution of scores.

Caution: the most frequently occurring number is not necessarily the most typical!

3. **Mean** – average of a distribution of scores – the most useful of the measures of central tendency as it takes into consideration every single score.

Caution: the mean is supersensitive to extreme scores (very high/very low) as extreme scores distort the mean = not a good reflection of a typical score.

- Measures of variability are stats that give researchers an idea about the typical average difference between scores in a distribution of scores and their mean.

1. **Range** – subtract the highest and lowest scores from one another.

Caution: limitations – relies on only 2 scores!

2. **Standard deviation** – gives an idea of the typical average difference between my scores and the mean. One must take every single score 1 by 1 and calculate how much it differs from the mean, take the info, plug it into a specific formula and calculate the standard deviation = the average deviation from the mean and how clustered or spread out they are around the mean (more clustered = smaller standard deviation and vice versa).

INFERENTIAL STATISTICS

The purpose of inferential statistics is to allow us to make sense of data and draw conclusions and make inferences. It allows us to answer: Are my results statistically significant (reliable, real and meaningful) or due to chance (accidental, random and meaningless)?

- Results are considered statistically significant when the probability that they are due to chance must be very slim (we look for the P. value – probability that the results are due to chance – in the computer).
- The P. value ranges between 0 and 1

EX. P. = .6 = 60%

EX. P. = .07 = 7%

How small should the P. value be?

- Data is statistically significant when the P. value is 5% or less.

Frequently Asked Questions About Psychology

Study at home on own time - earn 2 points on major.

Function and Structure

Nervous System
/ \
Central Nervous System (brain and spinal cord) Peripheral Nervous System (anything outside the Central Nervous System)

- 2 divisions are extremely specialized, but they work together as a single integrated unit
- Communication unit (receives information/organizes, analyses and integrates it/uses it to send out messages to other muscles).
- Creates a conscious experience (awareness of ourselves and our environments).

Neurons

Basic function and structure of communication in the nervous system.

There are 3 types of neurons:

- *Sensory* – receives information from environment.
- *Motor* – carry out messages to muscles.
- *Interneurons* – found *only* in the Central Nervous System and has the most complex job of analyzing and organizing the information. There are billions of them, but they only communicate with other neurons.

Basic Structure

- "**soma**" – cell body – the control center of a neuron (produces everything a neuron needs in order to function).
- "**dendrites**" – receive messages from other neurons.
- "**axon**" – main function is carrying messages (action potential – electrical/nerve impulses) to neurons.
- "**axon branches**"
- "**terminal buttons/axon terminals**" – release neural transmissions.

- "**myelin sheath**" – a white, fatty-like substance which insulates some axons and speeds up the transmissions of the electrical impulses.
- "**synapse**" – where neurons meet to communicate.
- "**synapse cleft/gap**" – tiny gap between 2 neurons at the synapse.
- "**presynaptic neuron**" – the neuron sending out information.
- "**postsynaptic neuron**" – the neuron receiving information.

Neuron Composition

- brain = 80% water which contains dissolved chemicals like sodium ions, potassium ions and chloride ions - intracellular fluid = water inside a neuron / extracellular fluid = water outside a neuron. This water is found both inside and outside neurons, *however*, they are found in different concentrations which vary depending on what is going on with the neuron.
- There is a porous membrane around a neuron – selectively permeable (ions and other chemicals cannot go in and out as they please, they must follow certain rules and regulations.

Neuron at Rest

INSIDE	OUTSIDE
More potassium ions / more negatively charged ions overall (= negatively charged) / -70mv (electrical charge) = membrane is polarized.	More sodium ions / more positive ions overall (= positively charged).

Even at rest, a neuron receives messages from other neurons (messages change concentration of ions which can change the charge).

Neurons send 2 types of messages:

1. **Inhibitory** – "do not fire!" – changes concentration of ions = hyperpolarize (neuron becomes even more negative than at rest) = less likely to fire.
2. **Excitatory** – "fire!" – a number of sodium ions will diffuse = increase of positive ions inside = membrane will depolarize (neuron becomes less negative than at rest) = more likely to fire.

When does the neuron fire?

- When depolarization reaches about -50mv (electrical charge = threshold of excitation).

Caution: this number varies between sources, -50mv is the average.

- A large number of sodium ions enter the neuron, which makes it positively charged, which will bring it to +40mv (electrical charge).
- Potassium ions then start leaving the cell in huge numbers, which brings the cell to having more negative ions once again ("hyperpolarize") = more negative than at rest.
- The neuron then goes into a "refractory period" (neuron will *not* fire) – sodium-potassium pump = brings potassium back in and pumps the sodium back out.
- Finally, the neuron goes back to rest and the membrane has once again polarized.

Remember:

- Action potential is an all or nothing phenomenon which has the same strength all throughout (no matter how many times it's done it).
- Action potential travels down the axon in a domino-like effect.

Neurotransmitters

Communication Between Neurons

- **Neurotransmitters** – chemical muscles used by neurons to communicate with each other.
- **Synaptic vesicles** – little bags that contain the neurotransmitters.
- **Receptors** – structures found on the postsynaptic membrane (neurotransmitters attach to receptors to deliver messages – neurotransmitters are highly specialized, they each have their *own* receptor!).
- when the neuron has fired, the action potential travels down the axon until it reaches the terminal buttons.

- The synaptic vesicles attach to the terminal buttons and release the neurotransmitters into the synaptic gap – the neurotransmitters then attach to their receptor sites.

Fate of Neurotransmitters?

- **Reuptake** – once the neurotransmitters deliver the message, they pull back from the receptors and go back to the neuron that has released it to be repackaged, recycled and reused.
- **Degradation** – the neurotransmitter is diffused in the synaptic gap.

Why? If the neurotransmitters aren't reuptaken or degradated, they will deliver the same message over and over again, which over stimulates and exhausts the nervous system.

- In order for us to be physically and mentally healthy and to function, our levels of neurotransmitters have to be healthy and balanced.
    - Dopamine – at healthy levels, mood goes up and pleasure goes up / at unhealthy levels, mood goes down and motor problems arise (Parkinson's disease).

EX. Some people suffering from schizophrenia have it due to *too high* dopamine levels.

Check out Table 2.1 in textbook – on major!

How do Drugs and Other Chemicals Affect the Brain?

- All chemicals that affect the functioning of the brain at 1 particular place: the synapse.

Chemicals produce effects in 3 ways:

1. At presynaptic neuron – inhibit (block or reduce significantly) the release of neurotransmitters or facilitate it (allow the neuron to release more than normal).
2. At the cleft – interfere with reuptake (block / speed up or slow down) or degradation (block / speed up or slow down)
3. At postsynaptic neuron – lock onto receptors by mimicking neurotransmitters, lock and block (highjacks receptors = neurotransmitters have nowhere to go and will therefore not deliver the message) or lock and enhance or diminish receptors.

- Drugs can be either **agonists** – mimics, enhances and facilitates activity of neurotransmitters or **antagonists** – block or weaken transmissions.

Central Nervous System (CNS)

Brain

- Greeks were the first to explore organs and organisms and their function.

- They were fascinated by the heart as it was very active, but showed no interest in the brain as it seemed docile.
    - Most Greeks believed the heart was responsible for thoughts and actions.
    - Hypocrates was the only one who believed the brain was responsible for thinking and behaviors as opposed to the heart.

Tools of Discovery

1. *Clinical observation* – the oldest method – observing and watching a disease in order to see its progress/functions and influences on the body.
2. *Brain manipulations* – surgical (surgery on the brain), chemical (injecting a part of the brain with a drug and observing the effects), electrical (implant electrodes in the area of the brain the researcher is interested in and stimulate it with a weak electronic current), magnetic (expose particular area to powerful magnetic field to stimulate it and acquire information), optogenetics (genetically engineer neurons to respond to light and directing them to the brain area of interest).

EEG

- Used to see the brain in action. .
- One of the oldest technologies used to look at the brain (1929).
- Put electrodes on the skull (they work outside the brain to pick up brain activity – computer turns the data into brain waves).
- Electrodes are so sophisticated they can focus on only 1 neuron and get data from it.

Neuroimaging Techniques: CT / CAT Scan

- Sophisticated x-ray machine which takes lots of images, very fast, from multiple angles, and translates them into data.
- Shows the structure of the brain and damage that may have been done to it, not the brain in action!

MRI

- Considered not invasive and safe (to date).
- Brain is exposed to powerful magnetic field and therefore emits electromagnetic signals which a computer picks up and converts into an image of the brain.
- Does not show the brain in action.

PET Scans

- Invasive!
- Inject brain with radioactive material (particularly radioactive glucose).
- Brain is a glucose junkie, the more active a brain area is, the more glucose it is going to consume.
- Shows which areas are most active when using colored pictures (range: red → violet)

Functional MRI

- Tracking the activity of oxygenated blood – the more active an area of the brain is, the more oxygenated blood it requires.
- Allows us to see the brain in action.

TOUR OF THE BRAIN: Lower Brain Structures

Brain Stem

- The *oldest* structure of the brain (500 million years old).
- Connects the brain to the spinal cord.
- Relay station – all information coming through the brain has to go through the stem / cross-over point – all information coming in from the right side of the body crosses over to the left side of the brain and vice-versa.
- Life center of the brain – it controls vital brain processes.
- *Medulla* – part of the brain stem – controls heart beat, breathing, swallowing, etc. An injury to the medulla results in death.
- *Reticular formation* – regulates and controls arousal, awareness, consciousness and sleep.
- Injury to the brain stem can result in a coma.

Thalamus

- Sits on top of the brain stem, at the center.
- Relay-station – all senses except for smell go through the thalamus. The information gets further relayed into the higher portions of the brain. The brain also sends the thalamus motor information, which gets further relayed lower.
- Filters information – highlights some information while it deemphasizes other.
- Recent studies claim the thalamus is part of a system in the brain which directs attention and focus to stimuli that could be potentially important.
- Regulates awareness, attention and motivation.

Cerebellum

- Located on the back of the brain stem – nicknamed “little brain”.
- Controls balance, muscle tone, voluntary movement and is involved in the learning skills that can become habitual (writing, typing).
- Takes up only 1/10 of the brain in volume, but has over ½ of the brain’s neurons. The neurons located here have 20x more synapses than anywhere else.
- Gets really affected by alcohol – loses ability to coordinate movements.
- Injury to the cerebellum results in jerky movements / walking and standing could become very difficult or impossible, although the individual may not be technically paralyzed.
- Researchers are starting to believe that the cerebellum could be involved in higher mental processes – they have beginning evidence for it contributing to learning and memory.

Limbic System

- 250 million years old.
- Consists of a lot of different structures – linked and associated to learning, motivation, memory, etc. in particular.
- *Amygdala* – linked and associated with emotions (involved in producing emotions), particularly with fear and anger. Without it, we become passive and docile. It identifies and processes information about threatening stimuli, even when we may not be conscious of the threat.
- *Hypothalamus* – “below thalamus” – size of a peanut but is involved in numerous vital functions and therefore nicknamed “the brain within the brain”. Controls the drives essential for survival (food/water/rest/sex). It regulates homeostasis (maintaining the balance of the internal environment of the body), such as body temperature and blood sugar. It also controls the endocrine system (hormones) and the autonomic systems (nerves and relaxation). It is associated with the pleasure centers of the brain (reward deficiency syndrome – theoretical – belief that some people take drugs because their pleasure symptoms do not function properly and they, therefore, need the jolt.

Cerebral Cortex

- Very young (2 million years old).
- The outer part of the brain (only ⅓ of it is visible – the rest is hidden in the grooves and folds – nature’s way of saving space and giving us a smaller head.

- 2 hemispheres – billions of neurons and even more glial cells or glia (considered the nannies of the neurons – provide oxygen, nutrients, support and clean after their waste / the dead neurons). Researchers believe glial cells are more than just nannies and could be involved in higher mental processes.

EX. Einstein donated his brain to science. Researchers discovered that a part of his brain was larger than ours → that part contained more glial cells than normal!

- 2 hemispheres (left / right) are connected via the *corpus collusom* (a bundle of nerves that the hemispheres use to communicate). Each hemisphere has 4 lobes (frontal / parietal / temporal and occipital). Each lobe has 2 areas (primary / association).

1. *Primary Area* – 1 in every lobe – processes either sensory or motor information. P. auditory cortex = located in the temporal lobe and processes auditory information. P. visual cortex = located in the occipital lobe and processes visual information. P. motor cortex = located in the frontal lobes and processes motor information related to voluntary movements (right motor cortex controls left side of the body and vice versa). Every part of the body is represented in the motor cortex (adjacent body parts are serviced by areas in the motor cortex that are adjacent to one another), but the size of the body part has absolutely nothing to do with the size of the area that the brain is going to devote to it, but with the amount of action that body part engages in.
2. *Association Area* – our association areas are the largest of every animal, which is what gives us mental superiority and makes us adaptable and sociable. Such areas process complex and sensory information. Every lobe has their own association areas (*see handout).*

Brain Reorganization

- *Brain plasticity* – researchers strongly believed once the brain reached adult size it would not change at all except for what disease or injury would bring to it. They were *wrong*! Plasticity refers to the brain's ability to be changeable and malleable. There are 2 types of plasticity:

1. **Functional** – brain's ability to reorganize itself following damage or injury. It can shift the function from damaged areas to non-damaged areas in order to allow the body to regain function.
2. **Structural** – brain's ability to change as a result of experience. The brain will continue to change and develop until the end of our lives. Enriching experiences make the brain muscles bigger, thicker and stronger. The quality of the experience increases the quality of our brain.

- *Neurogenesis* – the ability of the brain to produce new neurons after birth, including adulthood and late adulthood. New neurons are constantly being produced in the hippocampus until death.

Our Divided Brains

- Functional asymmetry – applies *only* to association areas. Some areas in the left and right hemispheres have different functions, abilities, capabilities and tasks. The most important information we have about functional asymmetry came from *split-brain* people (people who suffered from severe epilepsy who's corpus collusom was chopped). This made it impossible for the patients' 2 hemispheres to communicate, which led to the patients returning to the doctors and telling them that although the procedure helped their epilepsy, they now felt like they had 2 minds and 2 personalities.

Keep in mind! – we have a right visual field and a left visual field (this does NOT mean right eye and left eye).

- The information sent to the right visual field goes to the left hemisphere and vice versa. In a normal brain, if we send information to one hemisphere, the other will know about it due to the corpus collusom, but in a split brain, when one hemisphere receives information, the other is left in the dark and knows nothing about it as the corpus collusom is cut.
- The left hemisphere controls language and the right body, whereas the right hemisphere controls the left body. If a split brain patient is receiving an image in the right visual field, the left hemisphere will pick it up and say what image they saw. If the see the image in the left visual field, the right hemisphere will pick it up and say they saw nothing, as the left hemisphere which is responsible for language will not know the right hemisphere saw the image. On the other hand, if the patient is told to pick up what they see with their left hand and the image appears in the left visual field, the right hemisphere picks it up and order the left body to pick up the item.

Spinal Cord

Relay station

- Every little bit of information the body sends to the brain will go through the spinal cord and vice versa.
- An injury to the spinal cord can be devastating, the area below the injury will lose sensation and become paralyzed as it's not receiving information anymore.

EX. Young men have the highest rate of spinal cord injuries.

Rhythmic Components

- Controls such behavior through pattern generators (neurons in the spinal cord).
- Such pattern generators are responsible for rhythmic behaviors.

EX. Chewing, walking, swimming.

Reflexes

- Most behaviors are controlled by the brain, but certain ones are controlled by the spinal cord (reflexes).
- **Reflexes** – automatic, unlearned, involuntary behaviors.

Why does the brain control everything except for reflexes?

- Survival reasons – reflexes have a much faster reaction time than do behaviors which wait on the brain's command.

Peripheral Nervous System (PNS)

- Connects the body to the central nervous system (CNS) and vice versa.
- Its main function is to carry information to the central nervous system (CNS) and vice versa.
- Consists of all the nerves in the body outside the central nervous system (CNS).
- Has two main divisions which both control the same organs, but control them in 1 of 2 ways: sympathetic and parasympathetic.

1. **Sympathetic** – arouses, energizes and mobilizes the body's resources so we can take action. It is responsible for the fight or flight response.
2. **Parasympathetic** – the complete opposite of the sympathetic division. It calms and relaxes the body as well as conserves energy. It helps the body recuperate.

The Endocrine System

- Communication network.
- Consists of a number of glands found throughout the body – the glands release hormones into the blood stream.
- **Hormones** – chemical messengers produced by the endocrine glands which are released into the blood stream. There are 3 types:

1. Homeostasis - maintaining the balance of the internal environment of the body.

EX. Insulin.

2. Reproductive.

EX. Testosterone, estrogen.

3. Stress – released by the body when faced with stressful situations to help us deal with the stress.

EX. Adrenaline.

Nervous System and the Endocrine System

- They are separate systems but are always interacting.
- The nervous system controls the endocrine system, but the endocrine system affects the brain via hormones.
- **Pituitary gland** – boss of all the glands but is controlled by the hypothalamus.

Why study hormones in psychology?

- They effect behaviors, emotions, motivations and cognition.
-

Basics of Sensation

What are the musts of sensation?

There are 3 things that must happen in order for us to sense something. Together, these 3 things are the definition of sensation. If even ONE is missing, there is NO sensation.

1. *Detection* – we must detect the stimulation. We only detect a small fraction of the energy in our worlds. Animals pick up different things and energies than we do.

EX. Dogs can sniff out explosives, whilst we cannot sense it ourselves.

2. *Transduction* – the stimulation detected is physical energy which must be translated into an electrochemical message in order for us to understand it.
3. *Transmission*.

Sensory Receptors

- Highly specialized cells which detect physical energy and stimulation.
- They detect, transduce and transmit information.
- Without them, sensation is impossible.

Bottom-up Processing

- Starting from scratch and building up.
- From basic → very complex.

Is it Possible to Have Sensation Without Perception?

- YES – senses could be perfect but the area of the brain responsible for interpreting the information could be damaged.

EX. Prosopagnosia – people who do not recognize familiar faces, including their own! They can see it, but they do not know that they have already seen the individual before.

Measuring the Senses

1. Psychophysics – study the relationship between the physical characteristics of stimuli and our psychological experience of them.
2. Absolute threshold – the minimum amount of stimuli that must be there for us to detect it 50% of the time (the physical stimulation has o be strong enough to detect).
3. Difference threshold (JND) – the minimum change in stimulation in order for us to be able to detect it 50% of the time (it is not enough for us to detect physical energy, we must be able to detect *changes* in stimuli).

EX. Modifying the water in the shower – we can detect the changes between extremely hot water and extremely cold water, and are able to adjust it to our preferences (survival trait).

** Study Webber's Law in the textbook**

Signal Detection Theory

- The threshold we talked about varies from one person to the next (it differs).
- Thresholds will also vary for the same person from time to time.
- Detecting a stimulation or sensation is not only based on the strength of the stimulation, but also requires us to make a judgment. Everything in our environment affects what we detect and how fast.
- Signal detection is important for everyday life.

EX. Detecting a tumor on an MRI.

Subluminal Stimulation

- ** Study in the textbook**

Sensory Adaptation

- if we're exposed to a stimulus constantly and the stimulus doesn't change and is not impacting us negatively, our sensory receptors will adapt and stop responding to the stimulus or respond very mildly.

EX. Adapting to the pressure of our clothes on our skin.

- We adapt to free up our attention resources (to pay attention to stimuli that is important or potentially dangerous).
- Nervous system would crash had it not adapted to our sensations – it would be too overwhelming for it to sense everything all the time.

Circumventing or Avoiding Sensory Adaptation

- There are instances where we do not adapt to particular senses, despite their being constant and not dangerous.

EX. Although we can adapt to mild pain, we cannot adapt to intense pain as it is our body's way of alerting us that the pain could be detrimental to our overall well being.

EX. Eyes don't adapt – if they adapted, objects would simply disappear from view. In order to avoid this, eyes are constantly flickering to stop the receptors from adapting to images.

Basics of Perception

- Our brain taking sensory information to analyze, organize and integrate it.
- The brain will interpret this information in a meaningful way.

Top-Down Process

- It does *not* start from scratch. Brain will use experience, knowledge, etc. to interpret the information.

Is it Possible to Have Perception Without Sensation?

- YES – when people hallucinate, they really feel the things they believe are crawling on them, despite there being nothing on them in reality.

Influences on Perception

1. Perceptual set – mental predisposition to interpret things in a particular way which comes from our personal experiences.

EX. Hearing the same joke – some people may laugh while others are offended.

2. Context effects – the context we are in determines how we interpret something.
3. States of being – physical health, mental health, mental state, emotions and motivations will influence and affect the way in which we interpret something.

Senses

Vision

- Most studied sense.
- Stimulus = there must be light. Without light, there is no vision.
- Light is a part of electromagnetic radiation and part of the electromagnetic spectrum (called visible light).
- Light is a form of physical energy and has physical characteristics. There are 2 characteristics which are most important to us:

1. **Wavelengths** – physical characteristic that is going to be translated into the psychological experience of colors and hues (long wave lengths = red/medium wavelengths = green/short wavelengths = blue).

Color is a psychological experience.

2. **Amplitude** – the height of the wave – physical characteristics translated into the psychological experience of brightness.

The Eye

- Focusing light – light has to go through the eye in order for us to be able to see (it goes through the cornea and continues through different eye structures until it reaches the retina).

See figure 6.13 in textbook

- Retina structure – a very complex multilayer structure which is as thin as a piece of paper. It contains:

    - *rods and cones* – sensory receptors which communicate information through bipolar cells which send information to ganglion cells.
    - the *optic nerve* – is made up of the axons of ganglion cells and carries sensory information to the brain.
    - the *blind spot* – where the optic nerve leaves the retina to go to the brain – blind as there are no receptors there.
    - the *fovea* – responsible for our clearest vision.
- Retina rods/cones – sensory receptors in the eye which detect, transduce and transmit information in the eye. They are called "photoreceptors" and they differ from one another in very many ways:
    - *Shape*.
    - *Number* – rods outnumber the cones.
    - *Function* – cones (not sensitive to light and therefore need a lot in order to become activated. They allow us to see color, black, white and grey) and rods (supersensitive to light and are therefore used at night when the lights are dimmer. They do not allow us to see color, simply black, white and grey and are involved in our peripheral vision).
    - *Location* – cones (phobia → as we move away from the phobia, the numbers of cones decrease) and rods (periphery, *none* in the phobia).
    - *Connection to bipolar cell* – cones (possible to have 1-1 connection) and rods (several rods are connected to 1 bipolar cells).

Information Processing

Visual information Processing

Done in order of increasing complexity.

- Retina – processing of visual information begins in the retina with the ganglion cells. The information then leaves the retina and goes to the visual cortex, where we have feature detectors (highly specialized cells). Eventually, the information goes to the parietal ("where" – information is processed in such a way that it tells us where the object is located in space, allows us to follow movement and direct actions) and temporal ("what" – information is processed in such a way that it tells us what the object is) lobes.

Serial Processing

- Done by the conscious brain.
- Processing information step by step.

EX. Computer.

Parallel Processing

- Done by the unconscious brain.
- Super fast processing – takes complex jobs and breaks them down into small pieces.
- Different neurons are assigned different jobs which they do separately, but simultaneously.
- Brain then takes the information and integrates it to give us the message,
- Brain puts this information together instantly.

Color Vision

Trichromatic Theory

- Young – Helmholtz Theory – although they never met one another, they had the same idea and so their findings were put together into a single theory.
- "trichromatic theory".
- Researchers concluded that we have 3 primary *light* colors (blue, red and green) and that we can use these 3 colors to create thousands of other *light* colors.
- Proposed that since we have 3 primary light colors, we must therefore have 3 different types of cones in the retina and each one can respond to a different number of light waves (maximally responsive to a very specific light length).

Learn the long/medium/short lengths in colors from the textbook.

- Brain watches to see what cones are being activated and to what degree.
- If all three cones are being equally, maximally activated = white, if there are all being equally, minimally activated = black, if they are somewhere in between, we see different colors depending on the activation.

Opponent Process Theory

- Proposed by Herring in the 19th century.
- He appreciated but criticized the trichromatic theory – didn't believe it had sufficient information to explain color – claimed that there is some visual phenomena that the trichromatic theory does not account for.

EX. Afterimages – continuing to perceive an image of an object even though the physical sensation of it has stopped (staring at a green dot for a period of time and looking at a blank piece of paper directly after will turn it to red, and vice versa).

- Claimed there to be 4 primary *light* colors (blue, red, green and yellow), which are used to create thousands of other *light* colors.

- In our visual system, we have 3 antagonistic or opposed color systems (red+green, blue+yellow, black+white).
    - In such systems, like red+green for example, cells in the visual system that respond to red and green colors respond to them in different, opposing ways. If the brain is excited by the color red, it's inhibited by green and vice versa).
- The brain is constantly watching the 3 systems – based on what's going on in the systems, the brain gets a different experience with the color.

Which theory is a better, more accurate color theory?

- Both theories have been supported by research and are therefore equally needed to explain color.
    - Trichromatic theory – evidence supporting cones found in the retina.
    - Opponent process theory – evidence supporting ganglion cells in the retina, neurons in the brain such as the thalamus.

Organization and Interpretation

- Gestalt psychology is not in existence anymore, but much of what we know about organizing visual sensory in the brain comes from them.
- Gestalt psychology has 2 main principles:

1. The brain organizes visual information in a gestalt (a form or a whole).
2. The whole may exceed the sum of its parts.

- The perceiving brain is not passive. It doesn't work like a video camera, it actively constructs reality using its former knowledge.

Form Perception

- *Figure and Ground* – applies to all senses.
    - The brain organizes the information into figures and grounds both spontaneously and automatically.
    - Figure = what you're paying attention to and focused on.
    - Ground = background.
    - Same stimulus can produce multiple different perceptions.
    - Figure and ground are not properties of the object, but psychological experiences created by the brain.
- *Grouping* – Gestalt Rules.

1. Proximity – objects in a visual scene that are physically close to one another will be perceived as a unit.

2. Similarity – objects in a visual scene that are similar to one another will be perceived as a unit.
3. Continuity – objects n a visual scene that seem to flow in some direction will be perceived as a unit.
4. Connectedness – elements in a visual scene that are connected to one another will be perceived as a unit.
5. Closure – unfinished image will result in a completed image, the brain fills in the gaps.

Depth Perception

- Ability to perceive how far or close an object is to the self.

Is depth perception innate or do we need experience?

  - Animals = innate – baby animals are born with depth perception for survival.
  - Humans = partly innate – some babies are born with it, few are not.
- Experience is a must if we are to develop depth perception properly.

- Brain takes 2 clues into consideration when regarding depth perception:

1. Binocular depth cues – we need information from both eyes. There are 2 kinds:
   - *Convergence* – the degree to which the muscles of the eyes rotate inwards to focus on an object (greater convergence = closer object and vice versa).
   - *Retinal disparity* – because of the distance between the 2 eyes, each eye has a different view of the world or the same object (greater retinal disparity = closer object and vice versa).
2. Monocular depth cues – we only need information from 1 eye.
   - *Relative Size* – objects we know are of similar size – objects that appear to be larger appear closer and vice versa.
   - *Interposition* – 1 object that is partially blocking another – the object doing the blocking appears closer and vice versa.
   - *Relative clarity* – the clearer, crisper and more detailed an object is, the closer it appears and vice versa.
   - *Texture gradient* – the coarser, rougher the texture of an object, the closer it appears and vice versa.
   - *Relative height* – the lower an object is in visual field, the closer it appears and vice versa.
   - *Relative motion (motion parallax)* – deals with depth perception while moving. Objects further in the distance will appear to be moving in the same direction and slower and vice versa.

FIXATION POINT – objects found before the fixation point move faster and in the opposite direction and vice versa.

- *Linear perspective* – 2 parallel lines that appear to be converging. Objects near the convergence line appear to be further and vice versa.
- *Light and shadow* – well lit objects appear to be closer and vice versa.
- *Motion perception* – brain makes basic assumptions – if the image of the object on the retina becomes larger and larger, the brain assumes the object is getting closer and vice versa.

EX. Stroboscopic movement – movement in movies and video games – there is 0 movement on the film or the screen, but still images are flashed at incredibly high speeds, giving us the impression of movements.

EX. Phi phenomenon – the lights of the signs with lights sometimes appear to be moving – they are in fact stationary lights which blink on and off at high speeds.

Perceptual Constancy

- Our tendency to perceive the objects as unchanging, despite particular changes in physical stimulation/despite changes in retinal image.
    - *Shape constancy* – Our tendency to perceive the objects as unchanging, despite particular changes in shape.
    - *Color constancy* – Our tendency to perceive the objects as unchanging, despite particular changes in color.
    - *Lightness constancy* – Our tendency to perceive the objects as unchanging, despite particular changes in light. Applies to white, black and grey surfaces.
    - *Relative luminance* – when the brain is analyzing being reflected off an object, it takes into consideration the surroundings, environment and context. According to the textbook, its the explanation for the color and lightness constancy.
    - *Size constancy* – Our tendency to perceive the objects as unchanging, despite particular changes in size.
- Size-distance relation – when the brain looks at size, it considers the distance and vice versa.

Study and understand the section in the textbook on illusions for the final exam!

Perceptual Interpretation

Sensory Deprivation and Restored Vision

If we are born bling and at a later point in life, get surgery and are able to see, would we have normal perception?

- Perception of figure and ground and color = OK
- Motion perception = so-so.
- Shape perception = most problematic.
- Perceiving faces = difficulties not with recognizing, but with perceiving the face as a whole (gestalt).
    - All of this data comes from human and animal babies.
- There is a critical period during development by which we must develop particular abilities – if we do not by that particular period, we do not develop properly.
- The critical period varies from ability to ability.

Perceptual Adaptation (in vision)

- Our ability to adapt and adjust to a visual world that has been displaced, shifted or turned upside down.
- Goggles which change our visual environment exist – which has proven this as fact.

----------MIDTERM----------

Hearing (Audition)

Stimulus

- We need physical stimulation in order to hear anything.
- The stimulus = sound waves which disturb air molecules.
- There are 3 characteristics in sound waves which are important to us:

1. *Frequency* – the distance between the peaks which is measured in Hz. Physical characteristic is translated into the psychological experience of pitch (low frequency = low pitch and vice versa).
2. *Amplitude* – height of the wave. Physical characteristic is translated into the psychological experience of loudness (high amplitude = high loudness and vice versa).
3. *Complexity* – sound waves that have multiple frequencies and multiple amplitudes. Physical characteristic is translated into the psychological experience of timbre (what differentiates our voice from others').

Outer Ear

- **Pinna** – funnels sound waves → the ear's auditory canal.

Middle Ear

- → **eardrum** – sound waves make the ear drum vibrate.
- → **ossicles** – vibrations cause ossicles (smallest bones in the entire body) to move.
- → **oval window** – movements of ossicles cause the oval window to vibrate.

Inner Ear

- → **cochlear fluid (cochlea)** – oval window vibrations causes waves in the cochlea fluid.
- → **basilar membrane** – waves in the cochlea fluid causes the basilar membrane to vibrate.
- → **hair cells (cilia)** – sensory receptors embedded in basilar membrane sway due to the vibrations = responsible for our hearing as they detect, transduce and transmit information. They send information to the brain via. Auditory nerve.
    - Detecting loudness – the louder a sound is, the higher the number of hair cells that fire and vice versa.

How do we perceive pitch?

- *Place theory* – frequency sound waves cause maximum activation at the beginning of the cochlea and low frequency waves cause the maximum activation at the end of the cochlea.
- *Frequency theory* – frequency of sound waves will control the rate of firing of hair cells. Frequency of sound waves is going to cause the brain cells to fire the number of action potential that is equal to the number of Hz in a wave (1Hz = 1 action potential).

HOWEVER

- Hair cells can only fire a maximum of 1000 action potential/second, yet we can detect sound waves of up to 20,000Hz.
- *Volley principle* – groups of hair cells combine. Each group will fire 1000 action potential/second, but not at the same time! They will fire it split seconds one after the other.

- Place theory = best theory to explain high sound wave perception.
- Frequency theory = best theory to explain low sound wave perception.
- Combination of both theories = explains perception of any waves in between.

Locating Sound

- Sound waves hit both ears, but not at the same time.
- Brain uses 2 clues to locate sound waves:

1. *Time of arrival* – ear closer to the sound source will receive the sound wave slightly before the other – brain will therefore know which side it's coming from.

2. *Loudness* – ear closer to the sound source will experience the sound as slightly louder.
- We tend to cock our heads in order to better hear when we are unsure of which ear the sound source hit first.

Hearing Loss and Deaf Culture

- There are 2 types of hearing loss.

1. *Sensorineural hearing loss* – damage to the structures that detect, transduce, transmit and analyze (DTTA) information.

Solution = cochlear implant.

2. *Conduction hearing loss* – damage to structures that are not involved in detecting, transducing, transmitting and analyzing (DTTA) information.

Solution = digital hearing aid (compressed sound – some aids amplify soft sounds and leave loud sounds alone, as it is often only the soft sounds people have trouble hearing).

- *Echolocation* – tongue clicking which aids the blind to "see the world" – echoes bounce off objects and return with a sound that often distinguishes objects and materials.

Touch

- Skin = largest sensory organ.
- Cutaneous senses (skin is responsible for numerous senses, not only those of touch).
- Identified 4 different sensory receptors in skin.

1. Temperature (warm/cold).
2. Pressure.
3. Pain.
4. Itch.

- We mix and match these 4 basic sensations in order to feel other sensations (different receptors are associated with different combinations).

Study the different combinations from the textbook.

- Touch is super important for physical and psychological health.
- Touching releases human growth hormones which allow us to stay youthful and energetic.

EX. Premature babies require constant touching in order for them to develop properly and quickly.

Pain

- Unpleasant sensory and physical experience.
- We have pain receptors all over our bodies (nociceptors).

- Pain is essential for survival.

Gate-control theory

- pain is very complex – experience does not depend solely on tissue damage.
- Lots of factors affect pain (mental, emotional, social and cultural).
- Theory states we have a neurological gate in our spinal cords (open gate = we feel pain / closed gate = we don't feel pain). Lots of factors influence and effect the gate.
    - Small nerve fibers – open gate as they mostly carry information concerning pain.
    - Large nerve fibers – close gate as they mostly carry information concerning things other than pain.
- Role of the brain - brain also affects the gate by opening and closing it.
    - Simulation induced analgesia – if a particular area in the brain is stimulated, we feel 0 pain.
    - Belief induced analgesia – power of the mind overcomes physical pain.

EX. Hook-swinging in India.

    - Stress induced analgesia – when we are stressed (often during fight or flight situations), we don't have time to feel pain.
- Emotions affect pain (positive emotions = less pain and vice versa).
- To really feel pain, we must focus on it. Distractions minimize physical pain or make it disappear for the time being altogether.
- Culture affects pain.

Look at pain examples in the textbook.

Smell (Olfaction)

- Physical stimulation = chemical molecules (odor molecules).
- We release odor molecules in the air – these molecules enter the brain until the reach the olfactory receptors (sensory receptors), which are found in the olfactory epithelium.
- → receptors send their information to the olfactory bulb.
- → olfactory bulb then send information to the different parts of the brain.
- We have millions of olfactory receptors.
- Textbook states that, to date, researchers have identified 1000 different types of receptors, but we can detect 10,000 odors through the combination of activated receptors.
- Olfactory receptors regenerate every few weeks.
- Aging, smoking and alcohol severely negatively affects our olfactory receptors.
- Strong connection between smell, emotion and memories (smelt information is sent to the limbic system, which is associated with emotions and memory).

- **Anosmia** – loss of sense of smell.
- **Specific anosmia** – losing a particular scent.

Taste (Gustation)

- **Taste** – chemical sense.
- Stimulus is molecules of the food we eat which come into contact with out gustatory cells (sensory receptors) when they dissolve.
- Gustatory cells are found in the taste buds, taste buds are found in the papillae.
- 4 basic taste sensations – sweet, salty, sour, bitter (SSSB).
    - 5th was found – *umami* – meat, cheese, fish and mushroom.
    - Combinations of all 5 sense allow us to taste a large variety of flavors.
- Gustatory cells regenerate (by 20 years old, we lose half and they stop regenerating).

- Sensory interaction – senses are independent of each other but they influence one another.

EX. Taste and smell – smelling something can either enhance or lessen the experience of taste.

Study the McGurk effect in the textbook

Body Position and Movement

Kinesthesis

- offers information on the location, position, orientation, movement and contraction of muscles of body parts.
- Sensory receptors are found in muscles, joints, tendons and ligaments.

Vestibular Senses

- Tracks movement and position of the head and body as a whole.
- Responsible for sense of equilibrium and balance.
- Sensory receptors are found in the inner ear in 2 parts (both hair cells):

1. Semicular canal.

2. Vesticular sacs.

Extrasensory Perception (ESP)

- **Telepathy** – communication using thoughts only!
- **Clairvoyance** – ability to perceive events that happened in the past or in the present.
- **Precognition** – perceiving events that are going to happen in the future.
- **Psychokinesis** – using minds to control objects or events.
- **Parapsychology** – the study of the paranormal (ESP).

Is there extrasensory perception? – answer to date.

- No scientific evidence that ESP exists.
- To scientifically conclude there is ESP – we need reproducible phenomena.
- Be open/skeptical all possibilities.

- About consciousness and different states of consciousness.
- **Consciousness** – awareness about ourselves and our environments.
    - Most information is processed unconsciously.
- **Dual processing** – information being processed both consciously and unconsciously.

EX. Blindsight – brain damagedß people – they are consciously blind (cannot see) but they behave as if they have sight (they can see but they are unaware of it).

Selective Attention

- Our ability to direct our attention and focus it on 1 stimulus, therefore disregarding everything else.
- **Change blindness** – failing to perceive changes in the environment between time 1 and time 2.

Earn a point – read pgs. 92-109 for the second midterm – at least 10 questions on it

Read pgs. 85-92 – study notes ONLY – nothing from the textbook on the midterm

Hypnosis

- There are 2 stages in hypnosis:

1. *Induction* – when you're being hypnotized.
2. *Suggestions* – when suggestions are made about changes in behavior, mood, perceptions and so on while under hypnosis.

- **Posthypnotic suggestion** – suggestions made during hypnosis that the person will carry out at a later time.
- **Posthypnotic amnesia** – suggestion during hypnosis that they are going to forget some facts after the session is over.

Fact or Fiction? – 12 questions asked and answered based on scientific research

1. *Can anyone be hypnotized?*
    - The majority of us are moderately hypnotized. Few are entirely unhypnotizeable and few are extremely hypnotizeable.
    - Hypnotizeability (suggestionability) = stable phenomenon.

- Genetic – CMOT gene is associated with hypnotizeability.
- Has nothing to do with gullibility, imagination or mental illness.
- Related to the ability to get absorbed into something.

2. *Does the hypnotist control minds?*
    - NO – 0 control of the mind – subject retains full control over their own mind.
3. *Is it a sleep-like state?*
    - NO – people who are hypnotized are aware.
    - Brain areas associated with awareness are fully activated.
4. *Do we lose awareness of our surroundings?*
    - NO.
5. *Are the behaviors during hypnosis unique to it?*
    - NO – anything can happen.
6. *Can hypnosis make you stronger or more talented?*
    - NO – person under hypnosis remains the same.
7. *Can hypnosis be used to make criminal acts against personal values?*
    - NO – nobody can make you commit an immoral act, it's done by choice (legitimate context and authority figure = we tend to comply to requests).
8. *Can hypnosis induce age regression?*
    - NO – although subjects may believe it, they are not regressed – brains remain adult-like.
9. *Does hypnosis enhance memory?*
    - NO – does not enhance memory, but you can implant false memories.
    - Memories retrieved under hypnosis are a mixture of fact and fiction.
10. *Is hypnotic-analgesia (pain killers) effective?*
    - YES – hypnosis helps the elimination of pain (for highly hypnotizeable people, it was more effective than morphine).
    - Also works for moderately hypnotizeable people.

- Rainville et-al. – PET scan – subjects put hands in extremely hot water (SC/ACC = pain brain areas).
  Alert = SC^/ACC^
  Hypnotic induction/no suggestion = SC^/ACC^
  Hypnotic induction/suggestion = SC^/ACCv

11. *Can hypnosis be therapeutic?*
    - Strong evidence suggests hypnosis helps with asthma/warts/chemotherapy/stuttering and nightmares.
    - Hypnosis psychotherapy – obesity/insomnia/anxiety/hypertension significantly enhance the results of psychotherapy, but hypnosis by itself does NOT do anything.
    - No evidence that it helps with addictions (smoking/drugs/alcohol).
12. *Does one have to be relaxed in order to be hypnotized?*
    - NO.

The Nature of Hypnosis

- There are 2 theories devised to understand the nature of hypnosis:

1. *Dissociation Theory*
    - Hilgard – hypnosis is an altered state of consciousness (different than what happens in a normal state of consciousness).
    - Mind splits into 2 stems of mental activity (normal consciousness/hypnotized stream dissociated from normal consciousness).
2. *Sociocognitive Theory*
    - Nothing special about hypnosis → it's just as normal, everyday consciousness.
    - Reflects everyday life happenings.
    - Expectations/beliefs/motivations/assumptions/social influence – we comply to become "good hypnosis subjects".

Imaging/Faking?

- NO – under hypnosis – we display different levels of neural activity.
- McMaster University – 8 subjects were made to listen to a tape for which their brain activation was recorded.

✓ Hearing
✗ Imagination
✓ Hypnosis

Drugs and Consciousness

- Psychoactive drugs influence and affect the functioning of the brain (medical drugs, caffeine, street drugs).
- **Addiction** – person feels driven, pushed and compelled to use the drug in spite of negative consequences. It is a disease that is the *result* of drug abuse, it does *not* precede it.

Tolerance

- **Tolerance** – abusing drugs + time = more and more of the need for the drug in order to achieve the desired effect.

Neuroadaptation

- The reason we develop tolerance.
- The brain actively changes itself, both physically and functionally, in order to keep up with the drug.

EX. The brain will shut down dopamine receptors when on drugs.

- Body organs also adapt to drug taking.

EX. Liver may deal with alcohol consumption more aggressively to minimize its effects to the brain.

Withdrawal

- Person who stops taking drugs will experience intense, severe, unpleasant physical sensations as well as intense cravings for the drug.

Why does withdrawal take place? – 2 reasons

- Dependence – both physical and psychological factors.
    - *Physical* – brain needs the drugs in order to function *normally*.
    - *Psychological* – become psychologically dependent – drugs become a crutch, a coping mechanism.

- Expectations make a difference on how the drugs affect us (applies to all drugs).
- Drugs produce their influence at the level of the synapses **refer to chapter 2*.*
- All street drugs involve dopamine – reward pathways.

Heaven to Hell

- Heaven only occurs at the *beginning*. Intense pleasure and carelessness.
- There is a hell to every drug that involves all kinds of negative impacts on the self, both physically and psychologically.

Depressants

- A drug that is going to depress the activity of the Nervous System (reduce, decrease and slow down the activity of the Nervous System.

Alcohol

- Alcohol is a depressant no matter the dose (large doses vs. small doses is irrelevant)!
- Depresses the entire Nervous System, including the frontal lobes – which control our impulses (therefore we are less inhibited when we drink).
- *Low doses* – relaxing, decreased tension, decreased inhibition BUT impairs concentration, slows down reflexes, impairs reaction time, reduces coordination and impairs judgment.
- *Medium doses* – all of the above but further impairs judgment, develop slurred speech and drowsiness.
- *High doses* – all of the above, vomiting, breathing difficulty, unconsciousness, coma and death.
- *Other effects* – memory, reduces self-awareness, shrinks brain (neurotoxin → kills neurons!), fetal alcohol syndrome (FAS) – increased mental retardation and disability if a woman drinks while pregnant, sexuality (provokes desire but takes away performance), organ damage, neurotransmitters (GABA agonist, glutamate antagonist, dopamine + endorphin agonist), entire brain (cortex, cerebellum, brain stem affected on the night one drinks).
- Adolescents' brains (under 25) – brain is much more vulnerable to alcohol – effects are much more dramatic.
- *Lethal additive effect!*

Barbiturates and Tranquilizers

- "downers" – EX. Xanax.

- Depressants.
- GABA antagonists.
- *Lethal additive effect!*

Opiates

- Narcotics

EX. Opium, heroin, morphine, oxycontin.

- Intense euphoria, contentment, peacefulness, warmth and releases pain BUT produces effects by imitating endorphins (attach to endorphin receptors in the brain, GABA antagonists, dopamine agonists).
- May kill if overdosed.
- Number 2 cause of accidental death.
- *Lethal additive effect!*

Stimulants

- Psychoactive drugs which stimulate the Nervous System (increase, speed up and enhance the activity of the Nervous System) – increased alertness, increased breathing, increased energy and increased heart rate.

EX. Caffeine, amphetamine ("speed").

Smoking

- 30% of all cancer death due to smoking.
- 85% of all people who have been living with cancer had been smoking.
- If the smoking rate keeps going up at the same rate it has been, 1 billion people will die by the 21st century.
- U.S. spends on average $50 billion yearly for smoking related medical issues.
    - 2x the rate of death of car accidents, HIV, homicide, all drugs put together, etc.
- strong association between smoking and mental illness.
- Second-hand smoking = worse than expected.
- During pregnancy – higher concentration of chemicals in the womb than in the rest of the woman's body altogether = devastating results on the baby's physical and mental state.

- Nicotine damages DNA in sperms = harms child.
- *Smoking altogether damages DNA*.
- 1 cigarette = 12 mins. of life.
    - Men lose on average 13 years.
    - Women lose on average 16 years.
- Stopping to smoke increases life expectancy more than any other preventive measure.
- Neurotransmitters affected: acetylcholine, norepinephrine, dopamine and a few others.
- Dual effect on brain:
    - Sluggish → smoke → perk up.
    - Anxious → smoke → relax.
- Side effects could be mouth disease, impotence in men, tumors.
- Pediatric disease – most who start, do so as teens – if someone hasn't started to smoke in their adolescence, they have a close to 0% chance they ever will.
- Smoking is extremely addictive (intense withdrawal symptoms and cravings).

Cocaine

- One of the most addictive drugs.
- Intense euphoria, energy and confidence (because it blocks the reuptake of serotonin, norepinephrine and dopamine) <u>BUT</u> 15-30 mins of intense high followed by a crash, continued use results in chronic permanent depression, formication (feeling of bugs crawling on skin – pick at own skin until it bleeds), engage in stereotyped behavior (senseless, repeated behavior), psychotic episodes, lose touch with reality, violent and aggressive reactions due to paranoia, convulsions and death (even an extremely small dose or doing cocaine for the very first time could result in lethal consequences as cocaine interferes with the heart).

Meth

- Areas most loss – emotion rewards (limbic systems).
- Near death experiences.
- Similar things during cardiac arrest.
- Experience the feelings of death, leaving their bodies, experiencing a tunnel of light, seeing dead relatives, seeing dead religious figures, and the sensation of bliss.
- After life experiences *or* biological and physiological experiences of the brain losing oxygen.

- More likely experiences of the brain dying – more of a biological and physiological matter.
- All symptoms not related to near death experiences.

MDMA

- "Ecstasy", "Molly" – synthetic drugs.
- Created to repress appetite.
- 1970 – used in therapy to get people to reveal their emotions/feelings.
- Both a stimulant and a hallucinogen.
- Intense euphoria, pleasure, energy, increases connectedness, social inhibitions decrease. BUT increase body temperature (may resort to heat stroke), paranoia, nausea, confusion, vomiting, convulsions, cardiac arrest and death.
- Interferes with the functioning of the heart.
- Long term effects – sleep disturbances, cognitive impairment, weaker immune system, higher risk for Parkinson's disease, depression, hostility, etc.
- Neurotransmitters that are effected – dopamine, norepinephrine, biggest effect on serotonin.
    - Serotonin depletion – crash longer than the high = depression and irritability.
    - Serotonin is effected in two ways by drugs
    1. Increases the release of serotonin.
    2. Blocks the reuptake.
- Continued use – serious damage to serotonin producing neurons.
- 20-60% reduction in healthy neuron producing serotonin.
- Higher use of drugs increases damage.

EX. monkeys taking 2 doses of ecstasy per day for four days – displayed *incredible* serotonin loss. Seven years later, monkeys still had not fully recovered from serotonin loss.

Hallucinogens

- Psychedelics.
- Produce the most powerful changes in consciousness.

- Profound distortions in perception.
- Mind manifesting, mind expanding effects.
- Affects mood and emotions.

LSD

- Synthetic.
- Derived from a fungus that grows on grain.
- Initially used for medical purposes (1938).
- Something as small as a grain or salt can produce the effects of LSD.
- Negative Effects – Physical (increased heart rate and blood pressure, etc.), emotional (experience many emotions at the same time OR swing rapidly from one emotion to another), distorted perceptions (depth, color, shape, size, etc.), distorted sensations (taste sounds and hear colors), distorted thinking (delusions, false beliefs, etc.), near death experiences(seeing a bright light, walking into the light, meeting dead loved ones, or dead religious figures) unpredictable trips (either good or terribly bad).

How does LSD produce its effects?

- Assumed to be linked to serotonin.

Marijuana (Natural)

Earn a Point – in book, questions will be asked about this on the 2nd midterm

- If you are a teenager (brain has not finished developing yet) increases your risks of schizophrenia by several folds.
- Adults who smoke marijuana display significant brain shrinkage in at least two areas.

Influences on Drug Use

- Genetic factor – genes make you vulnerable to the drugs you take and are therefore more likely to become addicted.
- People are not genetically addicted to drugs, but they can be genetically vulnerable to them, which increases risks of addiction.
- Protein in the brain called CREB.
    - Lower levels of CREB → higher levels of anxiety.
    - Effect of relaxation in alcohol is effective for those with lower levels of CREB (self-medicate).

- NPY – chemical in the brain.
    - Lower NPY → higher levels of anxiety.
    - Negative correlation between NPY and alcohol.
- CYP2A6 – people who have this are less likely to smoke – the nicotine in cigarettes causes vomiting, nausea, etc.

Things That Make a Difference

- Type of Drug – cocaine is more addictive for example.
- Age – teenagers are more vulnerable and have higher risks of becoming addicts.
- Gender – men are more likely to become drug addicts.
- Psychosocial factors – major transitions make us vulnerable.

EX. Break ups, divorces, unemployment, a loved ones death, etc.

- Stress – increases vulnerability.
- Culture – increases vulnerability *but* can also decrease vulnerability.

EX. Certain religions prohibit drug use and alcohol consumption.

- Community – sense of belonging decreases vulnerability, also possible activities, connectedness and community involvement decreases vulnerability.
- Mental illness – high levels of anxiety increases vulnerability.
- Loneliness – increases vulnerability.
- Peers – increase vulnerability.

EX. Friends or co-workers that do drugs may influence you.

- Family – children from healthy families are less likely to do drugs as opposed to children from unstable families who have parents or siblings that do drugs.

EX. Unstable conditions such as neglect, childhood abuse, sexual and physical abuse, etc.

How do we prevent this?

- Maximize protective factors.

- Nurture self-esteem of children.

EX. Treat them with respect and dignity, convey how precious ad valuable their life is.

- Cultivate a sense of purpose in their lives so that they see value in what they are doing.
- Healthy pleasurable activities.
- Reward pathways in the brain have to remain healthy and strong.
- Collect joy and pleasure in your life.
- Managing emotions in healthy ways.

EX. Learn to generate emotions in a reasonable manner.

- Peers – engaged in life with a sense of purpose.
- Family bonds – trust, love, assure that they confide in you, make them feel safe, establish reasonable boundaries.
- Education – inform children on the effects of drugs.

Explanations

- Experiencing the feeling of death is not unique to near death experiences – it is similar to cottar syndrome (illness some people get, in which they truly believe that they are dead and recover over time).
- Out of body experiences is not unique to near death experiences – occurs sometimes right before sleep, or in the morning.
- Sensory deprivation facilitates out of body experiences.
- Parietotemporal junction in the brain – when stimulated people experience leaving their bodies.
- Drugs – certain drugs such as LSD cause out of body experiences.
- Seeing ghosts or religious figures – people with brain diseases report seeing dead people, not a near death experience.
- Brain stimulation – if a certain part is stimulated you will sense a presence.
- Positive emotions/bliss – drugs can cause this effect.

EX. Ketamine – same effects as near death experiences.

- Could be related to serotonin.

EX. Man getting attacked by tiger in the jungle barely experiences pain, feels extremely relaxed (possibly the brains way of giving mercy to suffering people – releases serotonin).

- Tunnel of light – artificially create the experience of light when the eye or brain are deprived of oxygen.
- When certain areas of the visual cortex are stimulated, people experience viewing bright lights.
-

Learning – a process that is going to lead to a relatively permanent change in emotions thinking, processes etc.

- Occurs because of experience (we are shaped by our experiences).
- Genes + experience = who we are.

Adaptability and Flexibility

- Learning could be a force of *both* good or evil.
- What the world gets is a reflection of who we are and what we have learned.
- Hope – everything learned can be unlearned!
- There are 3 major ways in which we learn (see below).

- **Conditioning** – learning to form associations.
- There are 2 types of conditioning (classical and operant).

1. Classical Conditioning (C.C.)

- **Classical conditioning** – we learn to associate 2 events or 2 stimuli.
- Learning that one event signals the arrival of another.
- Allows us to take action and make preparations for what is to come.

Pavlov's Experiments

- He discovered classical conditioning.
- One of the biggest names in psychology but *not a psychologist* (he's a medical researcher!).

- He noticed that dogs started salivating before he even gave them food (therefore termed the dogs: *psychic secretions*).
- He realized that the dogs began associating his footsteps with food.
- He was intrigued → started to study learning as opposed to his previous task, the digestive system.

- **Unconditioned** – unlearned.
- Food (unconditioned stimulus U.S.) →→→ salivation (unconditioned response U.R.)
- Bell (neutral stimulus N.S.) – alone ≠ salivation!

Bell + food = salivation.
Bell alone (over time) = salivation.

- **Conditioned** – learned.
- The bell *became* a conditioned stimulus (C.S.) and the salivation *became* a conditional response (C.R.).

Higher-Order Conditioning

- The use of a bell (C.S.) to turn a red triangle (N.S.) for example, into a conditioned stimulus (C.S.)

Triangle + bell + food = salivation.
Triangle alone (over time) = salivation.

Everything explained up to this point is the definition of ***acquisition****.*

- Few factors that affect classical conditioning.
    - *Frequency* (repetition) – the more the behavior is repeated, the better/more accurate the outcome or results.

- *Timing* – the food (U.S.) must immediately follow the sound of the bell (N.S.) in order for the association to be made.
- *Order of presentation* – always bell first (C.S.), then the food (U.S.).

Extinction and Spontaneous Recovery

- **Extinction** – weakens or makes the C.S. disappear (dogs no longer salivate at the sound of the bell).

Bell + food = salivation.
Bell alone = salivation.
Bell alone and no food (over long period of time) ≠ salivation.

- **Spontaneous recovery** – after extinction, out of the blue, the subjects will randomly react to the N.S. which had once been the C.S. (the dogs will randomly salivate at the sound of the bell).
- Extinction suppresses the salivation, does *not* exterminate it.

- **Generalization** – the subject will salivate to all stimuli that resemble the C.S. (the dog will not only salivate at the sound of the bell, but at all sounds that are similar to it).
- Can be adaptive or maladaptive (trigger hate, prejudice, mistrust).

- **Discrimination** – the subject will react solely to the C.S. (dog will salivate at the sound of the bell and *only* the sound of the bell).

Updating Pavlov's Understanding

- Cognitive processes – most of Pavlov's ideas stood the test of time, but 2 didn't!

1. He strongly believed that classical conditioning will happen regardless of what the dog is thinking.
    - Rescorta stated that mental processes are crucial to the success of classical conditioning – animals don't learn passively!
    - Even dogs assess and evaluate the events in their lives and only learn associations that allow them to have good predictions!
2. Biological constraints – Pavlov believed one can conditioning anything as long as the rules of conditioning are followed.

- Garcia and Koeling – classical conditioning works a lot of the time but you cannot conditioning everything!
- Nature puts limits – we're biologically prepared to make certain associations!

Taste + radiation = throw up.
Light + radiation = throw up.
Sound + radiation = throw up.

The rat associated the taste with throwing up, although he should've associated taste, light and sound, because we automatically associate nausea with something bad that we ate.

Pavlov's Legacy

- Discovered classical conditioning due to the dogs he was studying.
- Showed us that you can take something psychological that is very complex and study it objectively.
- Influenced John Watson.
    - Before him, the goal of psychology was to study consciousness through introspection.
    - Watson disagreed and stated that psychology should never study consciousness as the research methods are subjective.
    - Argued that we can only study observable behavior to predict and control it.
    - Imported Pavlov's research methods to study psychology.
    - Started the school of behaviorism (dominated psychology from 1920s-1960s).
    - Behaviorism doesn't dominate psychology anymore, but it is still a field of study.

Study and understand the classical conditioning examples in the textbook for the second midterm!

2. Operant Conditioning (O.C.)

Skinner's Experiments

- Huge name in operant conditioning.
- Skinner was a writer but gave it up in order to study human behavior.
- Was a behaviorist.
- Coined the term **operant conditioning** – we learn to associate a behavior with its consequences.

- In C.C. – the stimulus comes first and the behavior follows.
    - The behavior is automatic – called *respondent behavior*.

- In O.C. – behavior comes first and then it is followed by a consequence (consequence = stimulus).
    - Behavior is voluntary.

Law of Effect

- Behavior is controlled by its consequences!
- Behavior produces a desired consequence → behavior is strengthened and more likely to repeat!
- Behavior produces an undesired or unpleasant consequence → behavior is weakened and less likely to repeat!

Principles of Reinforcement

- **Reinforcer** – consequence that is going to strengthen a behavior.
- There are 2 kinds of reinforcers.
    1. **Positive reinforcer** – behavior leads to a desired stimulus being added or presented.
    2. **Negative reinforcer** – behavior leads to the removal of an unpleasant stimulus.

- **Primary reinforcer** – reinforcer that is naturally rewarding as it satisfies physiological needs.

EX. Water, food, warmth, sex.

- **Secondary (conditioned) reinforcer** – a reinforcer that we learn to value and appreciate through experience – not naturally rewarding.
- **Immediate reinforcer** – consequence follows immediately after the behavior.
- **Delayed reinforcer** – consequence doesn't happen right away, we have to wait for it.

Schedules of Reinforcement

- Consists of 2 main types.

1. *Continuous* – every time the desired response occurs, it is reinforced.
    - the best way to teach a new behavior.
2. *Intermittent (partial)* – sometimes the desired behavior is reinforced, other times it's not.
    - The best way to make a behavior resistant to extinction.
    - Consists of 2 main types.

    Ratio (based on the number of responses)

    1. Fixed
    - Decide immediately that a specific number of responses must occur before the behavior is rewarded.
    - Produces very high level of responses.
    - After being reinforced, there is little rest before starting to respond again.

    2. Variable
    - The number of responses that must take place in order for the behavior to be reinforced is unpredictable and varies.
    - Produces high level of responding with no rest.

    Variable (time based)

    1. Fixed
    - A very specific amount of time has to go by before the behavior is rewarded, but the behavior must be occurring throughout the entire time!
    - Produces high rate of responding around the time of the reward.

2. Variable
   - Amount of time that has to go by before the response is rewarded is unpredictable and varies.
   - Produces steady but low levels of responding.

Punishment

- A behavior produces a consequence that weakens the behavior, making it less likely to occur.
- Consists of 2 main types.

1. *Positive punishment*
   - The behavior leads to the presentation and addition of an aversive, unpleasant consequence.

   EX. Spanking, washing mouth out with soap.
2. *Negative punishment*
   - Behavior is going to lead to a pleasant, desirable stimulus being removed.

   EX. Taking away video games, grounding.

Side Effects of Punishment

- The side effects refer only to punishment that is harsh, unpredictable, unreasonable, disrespectful and hurtful.

1. *Suppression* (bad behavior is not eliminated, it's just disregarded and buried inside).
2. *Aggression* (learn that aggression is the way to solve problems – men who are abusive to their family have often been abused as children).
3. *Fear and avoidance* (children should trust, respect and feel safe with their parents, not afraid).
4. *Helplessness* (feeling that they are not in control of their own lives, results in giving up).
5. *Does not guide one towards more desirable behavior.*

Shaping Behavior

- Reinforcing successively closer approximation of a behavior until the correct behavior is displayed.

EX. A dog will not learn to surf just by simply being put on a surf board. First, the surf board must be placed in front of the dog – as soon as the dog sniffs the board, he must be rewarded with his favorite treat. The treats must then stop until the dog puts one paw on the surf board, at which point they must be rewarded their favorite treat again. The pattern continues until the dog puts two paws on, gets on, gets in the water, and so on. Eventually, the dog will learn how to surf – his behavior was shaped.

Updating Skinner

- Cognitive processes – most of Skinner's ideas stood the test of time, but some didn't!

1. He believed we do not need to look at cognition in order to look at learning.
    - Expectations, assumptions, memory and all other aspects of cognition are very important, even to operant cognition.
        - **Latent learning** – a cognitive process – learning that takes place without reinforcement or punishment and that remains hidden until there is the need to use it.
        - **Cognitive map** – a mental map of a layout that we acquire without even realizing.
        - **Intrinsic motivation** – animals and humans can both engage in behavior just because they derive pleasure from it and enjoy it.
        - **Extrinsic motivation** – behavior done out of requirement or out of the results they hope to obtain.
        - **Insight** – learning that takes place without trial and error or reinforcement. It's a sudden realization of a solution (an *a-ha* moment).
2. Biological predispositions – Skinner believed that you can teach anyone Operational Conditioning as long as the rules are followed.
    - Operant conditioning works a lot of the time but not with everything!
    - Nature puts limits.

    EX. A chicken was taught to play baseball, but never made it to second base. As soon as the ball was hit, the chicken would chase the ball as opposed to running the opposite way to second base – chickens are always going to follow whatever is moving in the grass – survival habit.

Skinner's Legacy

Read about the applications of Operational Conditioning in the textbook for the second midterm!

3. Learning By Observation

- An indirect form of learning – we observe our environments to learn what is being rewarded/punished and adjust our behaviors accordingly.
- Our brains seem to be wired for observational learning.

EX. Babies mimic adults as soon as they're born.

- Bandura – owe observational learning to him.
- *Mirror neurons*
    - Discovered in chimpanzees by accident in the 90s.
    - When the chimpanzee is doing an activity, they activate.
    - When the chimpanzee is watching another organism doing the activity, they activate.
    - When the chimpanzee watches or hears someone else doing the activity being done, they activate.
    - The role of such neurons is unclear, based on our most up to date research.
    - Found in a number of different areas of the chimpanzees' brains, including the motor cortex.
    - No direct evidence to show us that they exist in humans as we cannot study the human brain when the person is alive the same way we do that of a chimpanzee – ethical conflict.

Advantages

- Why do we have to make mistakes ourselves if we can learn from others'?
- We can use it as a force for good.

Disadvantages

- Children could learn negative things through observation.

EX. Violence.

- Aggression – is real life violence affected by the media?
    - Yes – based on 100s of studies conducted.
    - NIMH – there is a cause and effect relationship between violence in the media and violence in real life.

How?

1. Imitation – people, especially children, imitate whatever they see.
2. *Desensitization* – desensitizes towards violence – we're more tolerant of violence towards others and feel less empathy for victims of real life violence.

- **Motivation** – anything that is going to activate or energize direct behavior (the *why* of behavior – why do we do the things we do?).

Theories of Motivation

Instincts Theory

- Inspired by Darwin and the theory of evolution.
- **Instincts** – unlearned, automatic behaviors which we are born with. Inherited predispositions to behave in a specific way when a specific stimulus is present.
- Some of our behavior could be instinctive, but not all!
- Theory fell out because not everything is instinctive – theory didn't have much explanatory power.
- Although instincts do not necessarily motivate behavior, genes do!

Drives and Incentives

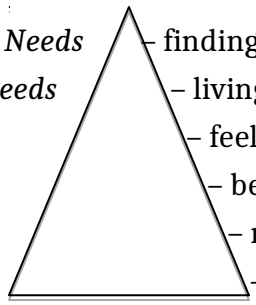
- **Drives** – biological needs (food, water, sex) which must be met.
    - When such needs aren't met, we develop a state of tension within us.
    - We are therefore motivated to do certain behaviors in order to reduce the state of tension.
- **Incentives** – external stimuli in our environments that pull us in (money, prestige, praise).
- Drives and incentives explain a lot, but not *all* behaviors.
- Some behaviors are just done for the enjoyment we derive from them, not from set rewards.

Optimal Arousal

- We're motivated to do something to change our level of arousal.
- Both humans and animals are motivated to reach an optimal level of arousal.
    - Too much arousal or too little arousal → unpleasant.

Hierarchy of Motives

- Developed by Maslow.
- He acknowledged the existence of both physiological and psychological needs.
- Organized motivations in a hierarchy – some needs take precedence over others and must therefor be met first!



6. *Self-Transcendence Needs* – finding meaning and purpose outside of oneself, service.
5. *Self-Actualization Needs* – living up to our potential and dreams.
4. *Self-Esteem Needs* – feeling valuable, worthwhile, competent and capable.
3. *Love Needs* – belongingness, feeling loved and being able to love.
2. *Safety Needs* – need to feel safe and secure.
1. *Physiological Needs* – food, water, shelter, sex.

- Maslow's hierarchy was still criticized as there is more to motivation that physical and physiological needs.

Hunger

The Physiology of Hunger

- Is there a correlation between an empty stomach and hunger pains? YES.
- Can we still feel hungry even when the stomach is full? YES.
- If the stomach is removed, can we still feel hunger? YES.
- The stomach plays a role in terms of hunger, but there is much more to it than the stomach alone.

Body Chemistry and the Brain

- Hunger promoting hormones.
    - Glucose – ↓ levels
    - Ghrelin – ↑ levels – discovered by the Japanese, crucial to hunger.
    - Orexin – ↑ levels – produced by the hypothalamus.
    - Leptin – ↓ levels – released by fat cells as an attempt to keep homeostasis (brain constantly monitors our leptin levels: + fat = + fat being used and vice versa).
- Hunger suppressing hormones.
    - PYY – ↑ levels – released by the digestive tract.
    - CCK – ↑ levels – released by the digestive tract.
    - Leptin – ↑ levels – released by fat cells as an attempt to keep homeostasis (brain constantly monitors our leptin levels: + fat = + fat being used and vice versa).
- Hypothalamus.
    - Lateral part – ↑ hunger.
    - Ventromedial part – ↓ hunger.
- Set-point weight.
    - *Theoretical* approach to why the body gains or loses weight.
    - Body has an optimal weight it prefers.
    - The body will do anything to keep itself at its optimal weight.
    - Most researchers do *not* support this theory, offered an alternative theory built on this one (settling-point weight).
- Settling-point weight.
    - Weight is going to settle at a particular weight – the point where there is a balance between the calories we consume and the calories we spend.
    - Different people have different settling-point weights / the same person may have different settling-point weights at different points in their lives.
- Basal metabolic rate (BMR)
    - **BMR** – the amount of calories the body is going to consume when at rest.
    - We eat food because the body needs it for energy.
    - 1/3 of the calories we eat go towards activities we perform physically.

- The remainder of calories we consume are used to maintain basic bodily processes (heart beat, circulation, brain activity, etc.).
- Main things affecting our BMR (increasing it) is good sleep, healthy levels of calories and regular exercising.

The Psychology of Hunger

What factors increase hunger and therefore increase weight?

- Familial and societal pressures – eating out just because as opposed to being hungry.
- Stress – promotes overeating.
- Emotional pressures (sadness and loneliness) – promotes overeating for closure.
- Drugs – *munchies* after using marijuana.
- Happiness – high spirits can promote overeating.
- Growing up – body requires more food and energy in order to keep up with growth.
- Culture – the culture in which we grow up shapes our different perceptions of food.

Obesity

- A form of eating disorder.
- 68% of the U.S. population is overweight or obese.
- 58% of the Canadian population is overweight or obese.
- Obesity is a worldwide issue – 1 ½ billion people are overweight or obese.
- 10% (1/10) of U.S. children under 5 years of age are obese.
- Obesity rates have doubled in the past 10 years.
- We need healthy levels of fat in order for the body and brain to function properly.
    - Too much or too little fat becomes problematic.
- Fat cells used to be called *dumb cells* by researchers.
    - Researchers now have a newfound respect for fat cells.

- Fat cells are actually very active and crucial to the functioning of the body and brain.

EX. We can harvest stem cells from adult fat cells and use them to save animals.

Why do we get Obese?

- Genetic component, but genes aren't everything – proper eating and exercise equates to a healthy body regardless of genes.
- Physiology of fat cells – "forever yours" – when we lose weight, fat cells empty out but the cells themselves remain (we never lose fat cells).
- Fat tissue is metabolically less active.
- When the set-point weight is higher than average.
- Low calorie diet (never eat below 1200 calories daily for women and 1600 calories for men)
- Not enough sleep results in more fat as it disturbs our biochemistry and lowers our metabolisms.
- Stress results to overeating which results in being overweight or obese.
- Ignorance – not keeping track of calories or what one's eating results in losing track of how much weight is gained or lost – when one realizes, it might be too late.
- **Unit bias** – tendency to consider a unit of something as being an appropriate or optimal amount of food.
- Technology – our generation does not move anymore!

EX. The great grandparents of today's generation were so active due to less technology that their activity equated to 26 miles a day.

Weight Loss?

- Good sleep, regular exercise and a healthy diet are all that is needed for a healthy body.

Sexual Motivation

The Study of Sexual Behavior – Pioneers of Sexuality

- Havelock Ellis – was experiencing **nocturnal emissions** – a phenomenon which both men and women experience in which one gets aroused while sleeping. He dedicated his life to researching sexuality after being misled by the medical books of his time which he consulted regarding his condition.

- Kinsey – 1940s – a biology professor that got fed up with being unable to answer sexuality related questions regarding human kind. He surveyed 80,000 people on their sexual preferences – first survey to ever be taken regarding sexuality.
- Masters and Johnson – wanted to know the physiology part of sex (what happens in the body during sex?).

The Physiology of Sex

- *Sexual Response Cycle – *Study the section in great detail from the textbook**
- **Sexual Disorders** – sexual problems that are persistent and consistent which causes distress in the individual and/or in their relationship.
    1. **Premature ejaculation** – men – ejaculate as soon as or shortly after penetration.
    2. **Erectile dysfunction** – men – cannot have or sustain an erection.
    3. **Orgasmic disorder** – women – cannot or have serious difficulties achieving an orgasm no matter the method used.
    - Sexual disorders are mostly found in older men or younger women.
    - All such disorders are treatable and should be addressed as a healthy sexual life is important (better mental state, physical health and longer lives).

Hormones and Sexual Behavior

- *Menstrual cycle* –fluctuation of estrogen during menstrual cycle affect sexual behavior?
    - Female animals – estrogen levels control and direct sexual behavior (when animals are in heat, they are very sexually motivated, when they are not, they have absolutely no interest in sexual behavior.
    - Female humans – estrogen levels have somewhat of an effect on sexual behavior, but it does not control or direct it. Sexual desire can occur at any time during the menstrual cycle.
- *Testosterone* – both men and women have this hormone, men just have significantly more of it. When testosterone levels are down, sexual desire is down and vice versa.
- *Hypothalamus* – plays a role in sexual desires, appetites, etc.

The Psychology of Sex

- *External Stimuli* – both men and women are aroused by sexual images and sounds. EX. Porn, sexual images, sexy lingerie.
    - Could be a part of a healthy sexual life.

    - Becomes a problem when we view too much – individuals may become dissatisfied with both the physical appearance (comparing their natural partners to airbrushed images of perfection in magazines) and the performance (comparing their natural partners endurance and sound effects to the edited films in which they see excessive endurance and enjoyment) of their partners.
    - Unhealthy porn can result in a negative perception of sexual behavior (violent, aggressive disrespectful porn, particularly towards women).
- *Imagined Stimuli* – sexual fantasies which both men and women can have and be aroused by.
    - Rape fantasies are a *complete myth*.
- Adolescent sexuality – **Do not study this in the textbook, study instructions are coming**

Orgasms are better for your brain than crossword puzzles, research suggests.

Sexual Orientation

- who we are attracted to both physically and emotionally.
  Heterosexual – being attracted to members of the opposite sex.
  Homosexual – being attracted to members of the same sex.
  Bisexual – being attracted to members of both the opposite and same sex.
- The prevalence in homosexuality varies from 1%-21% – further research.
- Homosexuality is found worldwide.
- **Erotic Plasticity** – the extent to which sexuality is affected by external factors (education, religion, etc.) or the extent to which sexual orientation is fluid or rigid.
    - Women have higher erotic plasticity than men (they are more affected by external factors).
    - Sexual orientation is more fixed or rigid in men than it is in women – they tend to stick with their orientation from birth until death.
- Environmental causes of homosexuality?
    - Dominant or absentee mother – NO.
    - Absentee, weak or hostile father – NO.
    - Fear of or hatred for the opposite sex – NO.
    - Hormones *currently* in their blood – NO.
    - Sexual abuse – NO.
    - Modeling behavior (homosexual parents) – NO.
    - By default (homosexual sex in prison) – NO.

- Biological causes of homosexuality?
    - There seems to be a genetic component to homosexuality.
      EX. Heterosexual male fruit flies were injected with a particular gene → they started behaving sexually with other male fruit flies.
- Prenatal hormones causing homosexuality?
    - Abnormalities in prenatal hormones could rewire the brain and change sexual orientation.
- Fraternal birth order explaining homosexuality?
    - Men with older brothers have a higher probability of homosexuality and vice versa.
    - The more older brothers a man has, the higher the probability of their being or become homosexuals.
- Brain affecting homosexuality?
    - Hypothalamus – certain areas of the hypothalamus were x2 as large in heterosexual men than in homosexual men and x2 as large in heterosexual men than in heterosexual women.
    - Cerebrum asymmetry – found in the brains of straight men and gay women (the right hemisphere was larger than the left) whereas in straight women and gay men, the hemispheres are roughly the same.
    - Amygdala asymmetry – found in the brains of straight men and gay women whereas in straight women and gay men, they are roughly the same.

  Cerebrum asymmetry and amygdala asymmetry take place in the womb, before birth.

Sexual Prejudice

- **Sexual prejudice** – negative attitudes and discrimination against people because of their sexual orientation.
- Homosexual men and women have much higher rates of suicide and depression than do heterosexuals because of their constant victimization.
- Sex and human values – we can never be 100% objective, we are highly influenced by our personal views and values.

The Need to Belong

- The need to have strong and enduring relationships – the need to love and be loved.
- We are born with both the need and the ability to form strong emotional bonds.

Advantages

- We feel accepted, loved and honored by those around us just for being ourselves.
- We're happier.
- We become busy with living as opposed to pleasing those around us by setting goals and following our dreams.

Disadvantages

- Not as motivated in life.
- We become miserable, sad, depressed, more likely to get diseases and more likely to die earlier.
- We keep ourselves reserved.
- We are afraid to follow our goals and dreams as we do not want to be rejected or judged.
- We stay with people who treat us poorly because we are afraid of being alone.
- We lose our voice.

Why do people kill themselves?

- **Ostracism** in the brain – feelings of rejection and heartache by others.
- *Anterior cingulate cortex* – activates when we are either in physical pain or feeling the pain of ostracism.
    - When the *ventral pentothal* activates, it dampens the activity of the ACC.

Motivation at Work

- Jobs meet a lot of our needs – our main source of money which is then used to satisfy the needs.
- Jobs give us a sense of identity.
- Jobs give us a sense of competence.
    - Important for psychological well being – dopamine increases → pleasure.
- We derive meaning and purpose.
    - Every job has value because it offers some kind of service.

- Our need to belong is met if we are surrounded by respectful and appreciative staff, like colleagues and bosses.

Different Types of Work

- **Job** – work you do to make money.
- **Career** – long term commitment to an occupation with the intention of moving up in ranking, prestige and salary.
- **Calling** – work done to bring pleasure and joy – considered our lives purpose.

Flow

- Concept of flow was developed by Csikzentmalyi.
- Being in the *zone* – so into what you're doing that you lose your sense of time, space and self.
- In this state, we are more productive and creative – working hard but are very relaxed.
- Such people report higher levels of satisfaction in life.

Grit

- People who have long term goals but have extreme perseverance with what they want – they do not let anything come between themselves and their aspirations.
- Extremely successful people despite their IQ levels.
- Overall happier in life.
- High degree of achievement motivation – they enjoy mastering excellence and challenging goals.

Industrial Organizational Psychology

- Psychology in the workplace.
- There are two components: a research component and an applied component.
- Comprises of 3 subfields: personnel psychology, organizational psychology and human factor psychology.

Personnel Psychology

- Hire the right person for the right job.
- Involved in evaluation and approval of employees.

1. *Harnessing Strength*
    - Do job analysis and figure out every single task that is part of the job.
    - For every task, they figure out the skills needed to carry out that task properly in order to develop full profiles.
2. *Interviews Prediction of Performance*
    - Prediction of performance based on interviews depends on the type of interview.
    - **Unstructured interview** – the interviewer is the only one controlling what is being asked (**interviewer illusion** – belief that gut feelings will guide them when hiring people) = poor predictor of performance on the job.
    - **Structured interview** – developed specifically for the job and is based on knowledge (simulated work situations, information on past performance, multiple interviews, administrative tests, developing job specific interviews). Every person interviewing for that job will be asked the same questions in the same order = good predictor of performance on the job and enhances reliability and validity.
3. *Performance Approval*
    - Bias in the way employers appraise their employees.
    - **Halo errors** – something about an individual that has nothing to do with the job but appeals to their boss, biasing them and influencing their opinion of their overall employee ability.
    - **Horn errors** – something about an individual that has nothing to do with the job but does not appeal to their boss, biasing them and influencing their opinion of their overall employee ability.
    - **Leniency** or **severity errors** – tendency of an employer to judge an employee's ability either too lightly or too harshly.
    - **Recency errors** – evaluating overall employee performance based on what happened most recently as opposed to how they perform consistently.
    - To reduce bias, people often use the **360° feedback** – evaluation comes from all places (self, bosses, colleagues, lower employees, etc. in order to get a more accurate evaluation and avoid individuals' biases.

Organizational Psychology

- The focus is on employee satisfaction – keeping employees happy, engaged, productive, and motivated.
- Focuses largely on leadership.

1. *Employee Satisfaction*
    - Employees who are satisfied are more productive, creative, loyal and less likely to steal or take days off, making them overall greater workers = greater organizational success.
    - Although the organization benefits from satisfied employees, the employees benefit individually as well – they report higher levels of overall happiness with their lives.
2. *Managing Well*
    - Harnessing job-relevant strengths – a good manager will disregard weaknesses and prioritize and cultivate employees' strengths and skills.
    - Setting specific and challenging goals keep individuals motivated – goals must be just *a little bit* above skill level, not too much, in order to avoid feelings of frustration, helplessness and incompetence.
    - **Implementation intention** – knowing when, where and how you're going to meet your goal = more likely to take action and actually accomplish goals.
    - Progress report – periodically check on progress with set goals to know if you are moving at a desired pace.
3. *Choosing Appropriate Leadership Style*
    - It is important to know what leadership style to use for what situation.
    - **Task leadership** – *very* directed, full control, makes decisions and employees are expected to execute without questioning directions.
    - **Social leadership** – democratic style, involves their employees in the decision making (feedback, gives them a voice – fantastic approach for boosting the organization's morale), good at building teams and resolving conflicts.
    - **Transformational leadership** – transform their organizations, have a clear vision as to where they want to go, rally employees around their vision so that the employees eventually adopt the vision and become excited to work towards making it happen. Woman are more effective transformational leaders than men – why there are more women running successful small organizations than men.

Human Factor Psychology

- Uses psychology knowledge in order to create environments and machines that work best with human perceptual abilities – *user friendly* machines.

- Involved in investigating the human error behind transportation accidents.
-

Emotions

November 11/18/20, 2013.

Do not study stress from the chapter in the textbook, solely emotions are covered in course

- Emotions make life interesting and worth living.
- **Emotions** – complex psychological processes which have 3 components.
  1. *Physiological arousal* – what goes on in the body while experiencing an emotion.
  2. *Subjective experience* – being aware of what you're thinking and feeling.
  3. *Behavioral activation* – how we behave and act when feeling a particular emotion.

How are the 3 components of emotions interrelated? Is there a relationship?

- Emotions, whether positive or negative, can be adaptive – essential for survival.
- Emotions, whether positive or negative, can be maladaptive – so strong that they can hijack or overwhelm us.

- Emotions are classified in 2 dimensions for most cultures.
  - **Valence** – degree of pleasantness or unpleasantness of an emotion.
  - **Arousal** – degree of activation in the body because of the emotion.

Theories of Emotion

The James-Lange Theory

- Ideas separate, don't work together.
- Common sense.

EX. Our common sense tells us to be afraid of snakes, out heart beats faster and we run away.

Canon-Bard Theory

- Disagrees with the James-Lange Theory.
- The 3 components of emotion are entirely independent from one another.

EX. When we see a snake, all 3 components of emotions (physiological arousal, subjective experience and behavioral activation) happen simultaneously.

Shaofer and Sinquer's Theory

- The 2-factor theory of emotion.
- 2 factors must occur for us to experience emotion .

1. Physiological arousal – similar to the James-Lange theory.
2. Cognitive label – a tag we put on the physiological arousal – different than James-Lange theory.

- Emotions are similar with physiological arousal.
- *Spillover effect* – physiological arousal from a situation will transfer (spill over) to the second situation and enhance the second emotional experience.

Cognition and Emotions

What comes first – thinking or feeling?

- Lazarus – we think before we feel. If we feel emotions, it's because of how we evaluate and interpret a particular event.
- *Cognitive theory* – based on the idea that if we feel a particular emotion, such as depression, it is because of our dysfunctional thoughts – this theory replaces them with positive thoughts.
- Zajonc – focused on feeling emotions first and thinking second.

- *Brain abnormalities* – once a mood sets in, it affects our thoughts. There is mutual influence between thoughts and feelings.
- The ability to feeling emotions is essential to making decisions.

Embodied Emotions

Emotions and the ANS

Read on ANS from Chapter 2 from the Textbook

- We feel our emotions in our bodies.
- ANS – closely related to feelings and emotions.
- ANS – 2 divisions – sympathetic (fight or flight) and parasympathetic (relaxed).

Physiology of Specific Emotions

- Left frontal lobe → happy.
- Right frontal love → sad.

Lying in the Brain

- Polygraphs are not allowed in court – must be careful with them.
- Under *controlled conditions* in the lab: when people are lying, 2 particular areas light up in the brain more than normally.
    1. Anterior Cingulate Cortex.
    2.
- This technology is still not ready to be used in real life.
    - Research is still in infancy.
    - Lying is complex.
    - There is still a lot to be learned about the brain and the effects such technology can have on it.
- We already know how to trick the fMRI.

Expressed Emotions

- Nonverbal communications – face expressions are the most important parts.

- Nature intended for us to communicate with facial expressions.
- We are capable of over 7,000 facial expressions.
- Facial expressions are innate and universal.
    - We are particularly good at detecting anger – we can detect it better and faster.
    - We are bad at detecting deceit.

Tone of Voice

- Culture plays a large role in the tone of voice we use.
    - How much and when we express our emotions is determined by the culture which we are born into.
- *Gender* – both men and women around the world believe that women are more emotional – however, there is no significant difference between gender and emotions (but we see the behaviors and expressions differently).
- Effects of facial expressions.

Experienced Emotions

Fear

- Adaptive – essential for survival!
- Dysfunctional – we can freeze up, stop ourselves from pursuing our goals.
- Deadly – attacking other people comes from prejudice, which is rooted in fear and hatred/dropping dead from fear.
- Learned – we have a biological predisposition to learn certain fears more than others.
- Genetic component to fear – anxiety runs in families/certain genes are much more sensitive than others to threatening stimuli.
- *Amygdala* – activates when we see frightening stimuli/look at someone who is afraid/when we anticipate a threat (whether we're conscious of the threat or not).

Anger

- Adaptive – healthy anger gives us more information for us to better develop.

- Maladaptive – the problem is what we do with our anger? – using it as a means of destruction and death.
- *Catharsis hypothesis* – "let it out"
    - If we release our anger in a socially acceptable manner through action or fiction, it is going to make us less angry, aggressive and violent.
    - MYTH – according to research – immediately after we may feel better, *but* in the long run, it in fact makes us angrier, more aggressive, more violent and more vengeful.

Solution to dealing with anger?

1. Step outside of the situation.
2. Find a way to calm the body – the nervous system.
3. Consider that our reactions are based on *us* and *our* experienced most of the time. Find and solve our own issues found in situations that trigger anger in us in order to reduce anger in the future. We use anger to cover hurt and fear, find the root cause.
4. What needs to be changed? Is what you're asking reasonable?
5. Resume the conversation in an *assertive* not *aggressive* way. Be respectful.
6. Forgive, let the anger go.

What makes us angry?

- Personal.

Happiness

- Psych used to focus on dysfunction and negative behaviors until positive psychology was created.
- **Positive psychology** – the study of positive and healthy human functions.

1. Subjective well being
    - A combination of how happy we are + how satisfied we are with our life.
    - High levels of subjective well-being = positive outcomes.
    - Low levels of psychological well-being = negative outcomes.

2. Feel-good, do-good phenomenon
    - When we're happy and satisfied with our lives, we are more likely to focus out attention on others and do good in the world.
3. Adaptation-level principle
    - Our past experiences become the standards by which we judge new situations and stimuli in our lives.
4. Relative deprivation principle
    - If we compare ourselves to people doing better than us, we may end up feeling deprived.
    - This is an unhealthy way to deal with others' success because there will always be someone better than us in something.

Does money make us happy?

- Money has its value and importance up to a point – once our basic needs are met, money brings us no happiness.
- People who value money, fame, social standing and prestige in life = low level of satisfaction in life.
- People who value love, compassion and personal growth = happy.
-

Studying Memory

- **Memory** – complex mental processes that includes 3 processes.
    1. encoding (acquiring information)
    2. storage (retaining information)
    3. retrieval (extracting information)
- Adaptive – essential for survival.
- Maladaptive – when memories of our past events continue to intrude into the present and interfere with our ability to function properly.

Measuring Memory

Recall

- Memory test.
- Participants are asked to remember something.
- Participants are left on their own to remember it.

Recognition

- Memory test.
- Participants were asked to remember something.
- Participants were given several pieces of information, 1+ of which is the correct answer.

Relearning

- Memory test.
- Participants were tested to see how long it takes to relearn something already learned.

Encoding

- **Encoding** – building information.
- There are 2 major ways to encode information.

1. Effortless (Automatic) Processing

- Acquiring information as we go about our daily lives in an effortless manner.

2. Effortful Processing

- Putting time, energy and effort into remembering something.
    - **Chunking** – organizing information into manageable units or chunks.
      EX. Phone numbers, acronyms.
    - **Mnemonic devices** – strategies, tricks and techniques we use to help enhance our memory.
    - **Spacing effect** – best for long term memory retrieval – study and restudy the information but the study sessions have a time distance in-between them.
    - **Testing effect** – be tested and retested on the same information.
    - **Self-reference effect** – relate information to personal experience, relatable information tends to be more easily remembered.
    - **Visual imagery processing** – associating something with a visual image.
    - **Organizational processing** – take the time to organize information.
      EX. Hierarchies, categories.
- **Shallow processing** – applies to verbal information – when we process either how words physically look or how they sound. It is a terrible way to retain information!
- **Deep processing** – "semantic processing" – applies to verbal information – when we focus on the meaning of the information.

Storage

- **Storage** – saving information.
- according to 1 theoretical model of memory, there are 3 stages of memory.

1. Sensory Memory

- the senses are collecting information all the time and hold on to that information for a very brief period of time.
- Every sense has a sensory memory – there are 2 most studied senses.
    - *Iconic* – visual sensory memory (1/4 seconds – ½ seconds maximum).
    - *Echoic* – auditory sensory memory (4 seconds to 5 seconds maximum).

2. Short-Term Memory

- "working memory"
- Any information from sensory memory that we focus on moves to short-term or working memory.
- Capacity = 7 items (give or take +/- 2).
- Duration = lasts a maximum of 20 seconds (most researchers believe even that is too much and believe no more than 5 seconds).
- Peterson & Peterson – held a study in which they gave students a list of 3 consonants they were asked to remember after they counted backwards from 100 in intervals of 3. They did this to avoid the rehearsal or constant repetition of the consonants. In most cases, by 18 seconds, nothing was remembered.

3. Long-Term Memory

- Holding information for a long time – possibly a lifetime.
- Capacity = researchers believe it could be limitless.
- **Long term potentiation** – through learning, neurons will physically, functionally and structurally change.
    - Could explain the relation between learning and memory.
    - Through learning and memory, we release more neurotransmitters.
    - Existing synapses will get strengthened and enhanced / new synapses and connections will be made.
    - Increases firing potential of a neuron.
- Based on research, there are 2 main types of long-term memory.

1. **Explicit** – conscious memory – memories that influence and intentionally retrieve the memories.

2. **Implicit** – unconscious memory – memories that influence and affect us even though we are not conscious of them. We know they exist because they affect our behaviors.

EX. Procedural memory – memories of skills we have acquired that have become automatic and affect our behaviors without us thinking about them (writing/walking/tying shoelaces).

Memory Location

- Karl Lashley – spent years researching the location of memory.
    - He taught rats to run a maze.
    - He took a different piece of the brain cortex out for each of the rats and made them run the maze one at a time.
    - Regardless of what brain regions were extracted, the rats always managed to find their way through the maze.
    - Concluded that memory does not exist in a particular area of the brain.
- There are multiple brain areas involved in memory, which work together to produce it.
    - *Amygdala* – emotional memories.
    - *Cerebellum* – memories formed from classical conditioning.
    - *Frontal lobes* – explicit memory.
    - *Hippocampus* – *newly* formed explicit memories.
    - *Basal ganglia* – procedural implicit memory.

Stress and Memory

- Whether stress affects memory or not depends on whether the stress is acute or chronic.

Acute Stress

- Immediate stress.

EX. The stress felt when we see a snake – it disappears as soon as the snake is gone.

- Can lead to the formation of new memories.
- When stress is too high, it could interfere with the retrieval of old information.

EX. **Flashbulb memories** – very vivid memories of events that have a strong emotional component to us (graduation, wedding day, funerals).

Chronic Stress

- Stress felt day-in and day-out.
- Stress hormones, *cortisol*, that are chronic are toxic to us – they kill neurons in the hippocampus.

EX. Abused children have a much smaller hippocampus than other children due to the chronic stress they feel during their upbringing.

H.M. - Henry Molaison

- 1 of the main reasons we have neural science today.
- Made a massive contribution to the study of memory.
- Suffered from severe epilepsy – the doctors removed his entire hippocampus – from age 20+, he was unable to form any new explicit memories.
- Allowed doctors and researchers to study him and his brain – became a subject of research in attempt to better others' lives – which he did.

Retrieval

- Successfully getting information out of storage.
- Retrieving long term memory and placing it into short term memory.

Factors Influencing Retrieval

- Priming – process where we're exposed to a specific stimulus which can activate information in storage that is associated with stimulus.
    - *Activation* – easier and faster to retrieve information.
- Context effects – retrieval of information – enhanced and facilitated when we retrieve information in the same context we were in when we encoded the information.

Moods and Memories

1. State Dependent Memory

- Retrieval is facilitated and enhanced when we are in the same mood during retrieval as when encoded.

2. Mood Congruent Memory

- Mood we are in will influence and affect the type of memories we retrieve.

Serial Position Effect

- When we're given a list of items and asked to remember it, we tend to remember better the items at the beginning and end.
    - Tested *shortly* after looking at the list – blurt out last items on the list and remember them well – "*recency effect*".
    - Asked to remember after a delay – better memory for items at the beginning of the list – *"primary effect"*.

Forgetting

- 3 types of amnesia

1. Anterograde Amnesia

- Cannot form new memories.
- Remember parts before the event that gave us amnesia.

EX. H.M.

2. Retrograde Amnesia

- Cannot remember anything from the past.

3. Infantile Amnesia

- No ability to reliably recall the first 3 years of our own lives.
- Conscious memories – only traced back to 3.5 years.

- Babies *have* memory but are not mature enough to remember everything.

How fast do we forget?

- Much of what we forget occurs soon after learning, then the forgetfulness levels off (|__).

Why do we forget?

- There are 5 theories for why we forget.

1. *Motivated Forgetting*

- Information is unpleasant and uncomfortable so we're motivated to forget.
- Consciously – "suppression" – we decide not to think.
- Unconsciously – "repression" – brain buries the information.

2. *Decay Theory*

- We don't remember – synapses and connections responsible for the memory have weakened.

3. *Retrieval Failure*

- Information is there but we can't get it out – "tip of the tongue" sensation.

4. *Interference Theory*

- Pieces of information in the memory compete with each other – problematic for information to be retrieved.
- There are two types of interference forgetting.
    - *Retroactive interference* – "backward acting" – new information is interacting with old information.
    - *Proactive interference* – "forward acting" – old information is interfering with the retrieval of new information.

5. *Encoding Failure*

- Cannot remember because we did not acquire the information in the first place.

Memory Construction

- Human memory *cannot* function like a video recorder and get the exact reality.
- Constructive – we construct our memory unconsciously by adding, deleting and editing elements.
- Memory – shaped and affected by previous experiences, new information, expectations, beliefs, values, imagination, etc.

Elizabeth Lothes

- *Misinformation effect* – memory distortion phenomenon – if after being exposed to an event, we're given new information of the event, we distort and reshape our own memory of the event.
- *Imagination effect* – we use our imaginations to envision an event occurred, we may end up believing the event actually happened (false memories).
- *Schema* – we use our knowledge of places and events and generalize it to everything.
- *Source amnesia* – we know information but we cannot remember where the information came from, so we misassociate the source of the information.

Discerning True and False Memories

read the examples in the textbook the night before the exam

Children's Eyewitness Recall

- **read the examples in the textbook the night before the exam**

Repressed or Constructed Memories of Abuse

- **read the examples in the textbook the night before the exam**

Exam Preparation

Chapter 1: Thinking Critically With Psychological Science

Intro	NOTES	Descriptive Researcher	NOTES + TB DEFS.
Limits of Intuition	NOTES	Correlational Research	NOTES
Limits of Common Sense	NOTES + TB	Experimental Research	NOTES + TB
Overconfidence	NOTES + TB	Statistical Research	NOTES
Illusory Correlation	NOTES	Descriptive Statistics	NOTES
Perceiving Order in Random Events	NOTES	Inferential Statistics	NOTES + TB
Scientific Attitude	NOTES	Frequently Asked ?s	TB
Scientific Method	NOTES + TB		

Chapter 2: The Biology Of Mind

NS Function/Structure	NOTES
Neurons	NOTES
• Communication Within	NOTES + TB
• Communication Between	NOTES
Neurotransmitters	NOTES
Drugs/Chemicals in Brain	NOTES
Brain – Intro	NOTES
• Tools of Discovery	NOTES + TB DEFS.
• Tour of the Brain	NOTES
• Cortex	NOTES + TB
Spinal Cord	NOTES
PNS	NOTES + TB
Endocrine System	NOTES + TB

Chapter 6: Sensation and Perception

Basics Perception/Sensation	NOTES + TB DEFS + EAP	Body Position	NOTES
Vision	NOTES + TB	Movement	NOTES
Visual Interpretation	NOTES + TB	Other senses	NOTES + TB + TABLE 6.3
Audition	NOTES	ESP	NOTES
Taste	NOTES		

Chapter 3: Consciousness and the Two-Track Mind

Intro	EAP	• Stimulants	NOTES + TB
Sleep	TB (*master it)*	• Hallucinogens	NOTES + TB
Hypnosis	NOTES	• Influence on Drug Use	NOTES
Drugs – intro	NOTES	Near-Death Experiences	NOTES
• Depressants	NOTES		

Chapter 7: Learning

Intro	NOTES
Observational Learning	NOTES
Everything else	NOTES + TB

Know Technical Terms!

Chapter 11: Motivation and Work

Need to Belong	NOTES
Motivation at Work	NOTES
Adolescent Sexuality	TB – READ ONCE
Everything else	NOTES + TB or just TB

Chapter 12: Emotions

Experienced Emotion	NOTES
Everything Else	NOTES + TB

Chapter 8: Memory

Storage	NOTES
Forgetting	NOTES
Everything else	NOTES + TB or just TB

Prologue

Introduction	SKIP
Objective 1	Study TB
Objective 2	Study TB
Objective 3	Study TB
TABLE 1	Study TB
Objective 4	Read TB
Objective 5	Read TB