

PSY100 TopHat Notes. Chapter 1. to Chapter 10.

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1 What is Psychology?

1.1 What is Psychology?


1.1.1 Early Work in Psychology

Psychology is often considered to be a union of *philosophy* and *physiology*. **Wihelm Wundt** is given the honour of formally founding experimental psychology. 1879, Leipzig, Germany.

1.1.2 Mind, Body, and Behaviour

Definition of psychology as a whole: the *scientific* study of both *behaviour* and *mind*.

The world *psychology* comes from these early traditions and has its roots in Greek, literally meaning *the study of the psyche, or soul*.

 **Question 1.05**

Which of the following is not an example of "behavior" as defined by psychologists?

- ☐ **A** Electrical impulses in the brain
- ☐ **B** The speed at which a rat navigates a maze
- ☐ **C** A person's response to a question
- ☒ **D** The subjective emotions someone feels

Empiricism is the view that knowledge arises directly from what we *observe* and *experience*.

But much of what psychology is interested in is inherently *unobservable*.

The concept of **mind** is *entirely* unobservable for all intents and purposes.

Dualism (also called *mid-body dualism*) is the philosophical position that the mind and the body are separate entities.

Ren Descartes: mind is inherently immaterial.

Also, *reflex*: the body acting without conscious action, that is, without the *mind*.

While all animal behaviour was unconscious reflex, evidence of human consciousness was evidence for a *mind*, and thus a *soul*. (*I think, therefore I am*)

A modern conception of mind is that it is the *sum of all brain activity*.

Example Steven Pinker: *the mind is what the brain does, the mind is the activity of the brain.*


The mind is the activity of brain (Steven Pinker)

1.2 What do Psychologists Do?

Three primary areas :

1. Basic research
2. Application
3. Clinical work

1.2.1 Basic Research in Psychology

 **Question 1.12**

Which of these is basic research?

- ☐ **A** Searching for a cure for depression
- ☒ **B** Attempting to understand the causes of depression
- ☐ **C** Looking for a better anti-depressant drug
- ☐ **D** Testing out a new therapy to combat depression

Psychologists who do basic research is psychology attempt to understand the *fundamental principles* that govern *behaviour* and *mind*.

Most conducted with perfectly *healthy* people, and not clinical populations.

Fields of Basic Research

1. **Abnormal:** How and why *unusual* and *maladaptive* patterns develop.
2. **Behavioural genetics:** Individual differences and *genetic factors*.
3. **Behavioural neuroscience:** Behavioural patterns and physical *components* or *activities* in the brain.
4. **Cognitive** *mental process* and how people organize and process information.
5. **Comparative Study** *non-human* animal behaviours (but not always).

6. **Developmental** Focus on *change* across the *lifespan*.
7. **Personality** Focus on differences in *characteristic* and *traits*, and how those differences influence behaviours.
8. **Social** Study the influence by other people (*society*).

1.2.2 Applied Psychology

Goal The goal is to change *behaviour* to solve some *practical problem*. Such as resolving mental health issues, improving workplace efficiency, or improving educational outcomes.

Sometimes an opposite approach is taken, which is altering the environment instead of the behaviour. E.g. improving the design of a keyboard used by helicopter pilots so that text entry is faster and has fewer errors. (*Francis & Rash, 2005*)



Question 1.23

Basic research is to _____ as applied research is to _____.

☐ **A** Causes; problems

☐ **B** Problems; solutions

☒ **C** Causes; solutions

☐ **D** Solutions; causes

Primary areas

- **Applied research** is done to discover a new or more efficiency *method* to solve some specific problem.
- **Applied practiced** refers to the *actual application* of techniques to the problems themselves.
- **Translational research** is to translate basic findings into practical solutions. Translational research is applied research, but it's *necessarily* based on an attempt to apply discoveries from basic research to practical problems.

Question 1.16

Which is the best description of translational research?

☒ **A** Using basic research findings to guide research on applied solutions

☐ **B** Tackling only the problem without regard to its underlying mechanisms

☐ **C** Researching only the fundamental causes of a psychological problem

☐ **D** Cycling between applied research and applied practice

Question 1.24

Translational research can be thought of as the bridge between what and what?

☐ **A** Applied research and applied practice

☒ **B** Basic research and applied practice

☐ **C** Basic research and clinical research

☐ **D** Applied research and clinical practice

Fields of Applied Psychology

1. Consumer behaviour
2. Educational
3. Forensic & legal
4. Human factors
5. Health
6. Industrial & organizational
7. Political
8. School

1.2.3 Clinical Psychology

Types of Clinician

1. **Clinical psychologists:** focus on *distress* or *dysfunction* that is *psychological in origin*
2. **Psychiatrists:** Same focus as clinical psychologists, however, they generally use *pharmacotherapy* as primary treatment.
3. **Counselling psychologists:** Focus *less severe* situations.

1.3 What Is the History of Psychology?

1.3.1 Influential Themes in the History of Psychology

Nature-nurture debate

- **Empiricist** Mind begins as a *blank slate* and who we are is shaped entirely by the *experiences* we have.
- **Nativism** Some forms of knowledge are *innate*. To logical extreme, called **biological determinism**.

Natural Selection :

1. Variations in phenotypes.
2. Heritability.
3. Struggle for existence.
4. Variations in survival and reproduction.

Phrenology The shape of the skull was the result of the size of brain structures beneath it.
Has been disproved.

1.3.2 Studying Psychology as a Science

Wilhelm Wundt established the first psychological in 1879 at *University of Leipzig* in *Germany*.
Father of modern psychology

Structuralism John Dalton.

Introspection was a method developed by *Wundt* to understand the components of mental processes by relying on trained participants' *self-reports* of their thoughts, feelings and mental images.
Wundt: psychology should focus on *decomposing* immediate conscious experience into its *basic elements* and understanding how those elements combine to create experience.

Systematic introspection attempted to standardize the way conscious experiences were reported, to make *inter-personal comparison* efficient.

Functionalism William James.
Father of American Psychology
Studying these pieces without an understanding of their function would provide little to no actual insight into the workings of the mind.
Early functionalists were heavily influenced by **Darwin's evolutionary theory**.

Behaviourism B.F. Skinner.

Skinner is best known for his work on **operant conditioning** in particular, the study of how behaviour can be modified using a system of rewards and punishments (1953).

Cognitive Revolution Steven Pinker, he explained that the computer was instrumental in reshaping understanding of the mind.

Humanism

1.3.3 Development of Psychology in the Clinic

Psychoanalysis *Sigmund Freud*

According to Freud's system of psychoanalysis, the critical component to solving mental health issues was the process of analyzing the contents of the **unconscious mind** so that relevant thoughts and feelings could be brought up to the level of consciousness.

Humanists and Positive Psychology

Humanistic psychology proposes that people have *free will* and the *capacity* to realize their own potential.

Positive psychology is a branch of psychology focused not on what can go wrong with human functioning (as in the case with much of clinical psychology) but instead on studying how humans flourish and how positive outcomes can be achieved. (*Seligman & Csikszentmihalyi, 2000*).

**Question 1.50**

Order the movements in the scientific study of psychology chronologically.

1	C Structuralism
2	D Functionalism
3	A Behaviorism
4	B The Cognitive Revolution

1.4 How Do Psychologists Think Today?

1.4.1 Ultimate and Proximate Explanations

Levels of explanation

- **Ultimate**

Ultimate explanations attempt to address the reason *why* a psychological phenomenon occurs by appealing to its *role* in the *process of evolution*.

- **Proximate**

Proximate explanations attempt to describe an *immediate cause* of a psychological phenomenon.

- **Functional explanations**

Functional explanations are *proximate explanations* that seek to identify a *specific problem* as the cause of a psychological phenomenon.

– **Process-oriented explanations**

Process-oriented explanations are proximate explanations that focus on how a *specific mental or physical process* explains a psychological phenomenon.

Question 1.52

Match each explanation with its proper level.

Premise		Response
1 Ultimate explanation	→	C Language exists because it was adaptive for humans to be able to communicate with one another over the course of evolutionary history.
2 Functional explanation	→	A Language can be used to explain how people deceive one another to gain an advantage in a trade.
3 Process-oriented explanation	→	B Language is produced and understood by portions of the temporal lobe of the brain.


1.4.2 Evolutionary Influences

Evolutionary psychology it strives to explain how mental processes and behaviour have developed over the course of *evolutionary history*.

1.4.3 Cultural Influences

Psychologists refer to culture as the shared set of beliefs, attitudes, behaviours, and customs belonging to a specific group or community of people.

Intersectional approaches to issue in psychology emphasize the examination of how multiple social identities intersect at the level of the individual person, influencing the ways in which they experience the world.

 **Question 1.54**

Early work on cultural influences on psychological processes focused on which of the following?

- ☒ **A** Discovering underlying “universals” cross-culturally
- ☐ **B** Comparing and contrasting Eastern and Western cultures to discover how they are fundamentally different from each other
- ☐ **C** Investigating intersections of different identities
- ☐ **D** Describing the effects of cultural expectations on gender roles

1.4.4 Biological Influences

It provides us with insight into *process-oriented explanations*, specifically concerning the biological process that are linked to behaviour.

1.4.5 Cognitive Influences

Computer-related metaphors in their models of information processing, relating the mental states and processes of the mind to analogs in computer systems.

2 Methods

2.1 How Do We Know?

Rationalism the view that **reason** and **logical argument**, but *not* experience, is most important for how we acquire knowledge.

Empirical evidence refers to data that has been collected (or the knowledge that has been gained) by scientific observation.

Assessing data quality:

- **Reliability** refers to the extent to which a measure is stable and consistent over time. e.g. Inter-observer agreement.
- **Validity** refers to the extent to which the collected data address the research hypothesis in the way intended.
- **Accuracy** refers to the extent to which an experimental measure is free from error. (*Random error vs. systematic error*).

2.2 Psychology as a Science: The Scientific Method

Scientific method is a common approach in which researchers methodologically answer questions.

Steps

1. **Identify** the problem.
 - Identify the problem of interest, which may be based on *observation, previous research, established theory* or *intuition*.
2. Gather **information**.
 - Review *scientific literature* and examine *existing theories of behaviour*.
3. Generate a **hypothesis**.
 - An *educated prediction* about the outcome of the experiment.
4. Design and conduct **experiments**.
 - Develops an experiment to *test the hypothesis* and *collect data*.
5. Analyze data and formulate **conclusion**.
 - Determine whether the data support that hypothesis.
6. **Restart** the process.(To step 3)
 - Replicate the *same* experiment.
 - Replication with *extension*.
 - Move to an entirely new research topic.
 - programmatic research.

2.3 Descriptive Methods

Descriptive methods are any means to *capture, report, record*, or otherwise *describe* a **group**.

2.4 Naturalistic Observation

Naturalistic observation (is best described as) observation of behaviour as it happens, *without* an attempt to manipulate or control the conditions of the observation in an animal's *natural environment*. Like **field experiments**.

Ecologically valid Naturalistic observation allows us to better understand behaviour exactly as it happens in the real world.

Hawthorne effect Animals reactively change their behaviour once they become aware they are being observed.

2.5 Participant Observation

Participant observation is a research method in which a research becomes *part of* the group under investigation.

e.g. Investigation conducted by David Rosenhan (1973), his pseudopatients discharged from the hospital after the diagnosis of Schizophrenia in remission.

2.6 laboratory Observation

Systematic observations are made within a laboratory setting rather than in the *real world*.

2.7 Case Studies

A case study is an in-depth analysis of a *unique* circumstance or *individual*. The challenge of case studies is to *generalize* findings from a unique case.



Question 2.15

When is a case study the most useful?



A When studying behavior change



B When research requires a substantial sample to be worthwhile or effective



C When a participant has a rare condition



D When you are studying yourself

2.8 Surveys

Surveys are an efficient way to quickly collect information and gather an understanding of the current state of people's opinions or attitudes.

- **Population**
- **Sample**
 - **Sampling error or bias** is any pooled selection of students that differs from the entire population in meaningful ways.

Wording effects The sentences used in survey may influence the response.

Response bias

- **Acquiescent response bias** refers to a tendency for participants to indiscriminately *agree* with most, if not all items on a survey regardless of their actual opinion.
- **Socially desirable bias** Participants response in specific ways that would be seen as *acceptable by others*.
- **Better than average effect/ illusory superiority**
- **Response/Return rate**
- **Volunteer bias** the small few who were willing and ready to talk about the content of the survey were likely overrepresented in the survey.

2.9 Correlation

2.9.1 What is Correlation?

Researchers often conduct *observations*, *case studies*, and *surveys* with the purpose of identifying *relationships* that exist between two or more variables.

Scatterplot: represent the relationship between two variables.

2.9.2 Direction of Correlation

- **Positively correlated:** variables change in the *same* direction.
- **Negatively correlated:** variables change in the *opposite* direction.
- **Zero correlation:** no apparent relationship between variables.

2.9.3 Strength of Correlation

$$\rho \in (-1, 1)$$

- $\rho = -1$: strictly negative relationship.
- $\rho = 1$: strictly positive relationship.

2.9.4 Correlations Can Be Misleading

*Correlations are **not** causation.*

Confounding variable : other variables that may influence one or both variables that we are measuring, thereby influencing the *correlation coefficient*.

Third variable ...

2.10 Experimental Methods

2.10.1 The Hypothesis

The experiment is used to directly link ideas in within a *cause and effect relationship*.

Hypothesis is a prediction about what will happen in research.

Characteristics of hypothesis

- It should be *consistent* with prior observations or an existing theory.
- It should be kept as simple as possible.
- It should be *specific*.
- It should be *testable(measurable)*.
- The hypothesis should be *falsifiable*.

Examples of psychological theories

- **Intergroup Contact Theory (e.g. Pettigrew, 1998)** Under certain circumstances, positive intergroup contact can reduce prejudice toward the out group.
- **Social Comparison Theory (e.g. Festinger, 1954)** When more objective measures are unavailable, people will evaluate their own abilities/qualities by comparing themselves to similar other.
- **Social Learning Theory(Bandura,1977)** People can learn by observing others, in the absence of explicit behavioural reproduction or reinforcement.

Operational definition is how a research decides to measure a variable.

Experimental hypothesis is what we expect to find if our hypothesis was correct.

2.10.2 Experimental Variables

Variables

- **Independent Variable(IV)** is the variable that the experimenter will manipulate, and it must contain **at least two levels**.
- **The dependent variable(DV)**, or called *outcome* measure are the variable(s) the experimenter counts or measure.
- **Extraneous variables/Confounding variables** are any variables that are not the focus of study, but that may influence the outcome of research if not controlled.

2.10.3 Sample Selection

Sampling methods *to create groups that are fair.*

- **Simple random sample** is a type of sampling where every individual in the population has an equal chance of participating.
- **Stratified random sample** A *stratification* divides the population first by *subgroups*, and then random samples are taken in *proportion* to the population of interest.
- **Non-random sample** not all individuals are equally likely to participate.
 - **Convenience sample:** a group of individuals that are only selected because a *pre-existing* condition, convenience, and easy access to participation.

2.10.4 Experimental and Control Groups

Placebo effect A needle is more effective than a capsule, a capsule is more effective than a blue pill, and a blue pill is more effective than a white pill.

2.10.5 Internal Validity/External Validity

- **Internal validity:** the degree to which results may be attributable to the independent variable rather than some other effect of our experiment.
- **External validity:** the degree to which a result can be *beyond* the scope of the experiment.
- **Generalization** is the *external validity* of how the results from an experiment can apply to other settings, other people, and other time period.

2.10.6 Type of research & subsequent claims

- **Descriptive research** involves observing and classifying behaviour.
 - Observations case studies.
 - May result in claims regarding the *frequency* of some behaviour.
 - In psychology, descriptive studies are often the *first step* in a line of research, or done as part of a larger research project.
- **Correlational research** may lead to claims regarding the *association* between two variables.
- **Experimental research** may lead to claims regarding the causal relationship between two variables. *The only research type that can do this.*

**Question 2.32**

How well the experimenter can generalize to the population of interest is called _____.

- ☐ **A** Reliability
- ☐ **B** Scientific Method
- ☒ **C** External validity
- ☐ **D** Internal validity
- ☐ **E** The Hawthorne effect

**Question 2.34**

Complete this sentence. Ideally, if a study concluded that eating ice cream caused violence, it would have to:

- ☐ **A** Assign participants to groups of high and low violence and compare their ice cream eating habits.
- ☐ **B** Measure how ice cream consumption and rates of violence varies over a period of time.
- ☐ **C** Show a correlation between ice cream consumption and violent behavior in participants.
- ☒ **D** Randomly assign participants to groups eating more and less ice cream and compare rates of violence.

**Question 2.36**

What is a measure of central tendency?

- ☐ **A** Multiple values to describe the how a group of data is clustered around a central value
- ☐ **B** A way of summary some data with a series of numbers
- ☐ **C** Multiple values that describe the distribution of data
- ☒ **D** A single point to describe the center of data

2.11 Making Sense of the Data

2.11.1 describing Data: Central Tendency

Descriptive statistics : Information like the *mean*, *median*, and *mode*, and the *frequency* of certain demographics.

- Mean
- Median
- Mode

Inferential statistics : make inferences about the *causal relationship* between the IV and DV.

Statistical significance If the probability of an event is less than **5%**, it is typically called a **statistically significant event** that is unlikely to happen by chance alone.

Statistical hypothesis testing A set of procedures used to make judgments about whether any observed differences between our experiment conditions are due to chance variation, or whether they reflect true differences in the groups being compared.

2.11.2 Describing data: Spread of Data

Measures

- Standard deviation.
- Variance.

2.12 Summary

Model psychology research is defined by *empirical approaches* and the *scientific method*.

Descriptive and correlational research methods : observe and explore patterns in behaviours.

Experiments : *test hypothesis* and understand *causal relationships* between variables.

Inferential statistics : provide guidelines to make decisions in research.

3 Biology & Neuroscience

3.1 The Conduit

Frame of reference something that we already know that we compare new concepts to.

Neurons cells that transmit electrical impulses.

Glial cells provide supporting functions.

3.1.1 Nervous system: Is It an environmental or Genetic Product?

Epigenetic factors are *environmental influences* that change the expression of genetic material.

”Junk” DNA : DNA that does *not* encode proteins.

3.2 The Building Blocks: Cells of the Nervous System

3.2.1 The Neuron Receives and Sends Messages

Neuronal membrane the *lipid(fat) bilayer* containing the contents of cell, contributes to neuron’s ability to *conduct electrical activity*.

Neuroplasticity the structure of neurons can change in response to the environment though a process called neuroplasticity.

Refers to the ability of neurons and their networks to change.

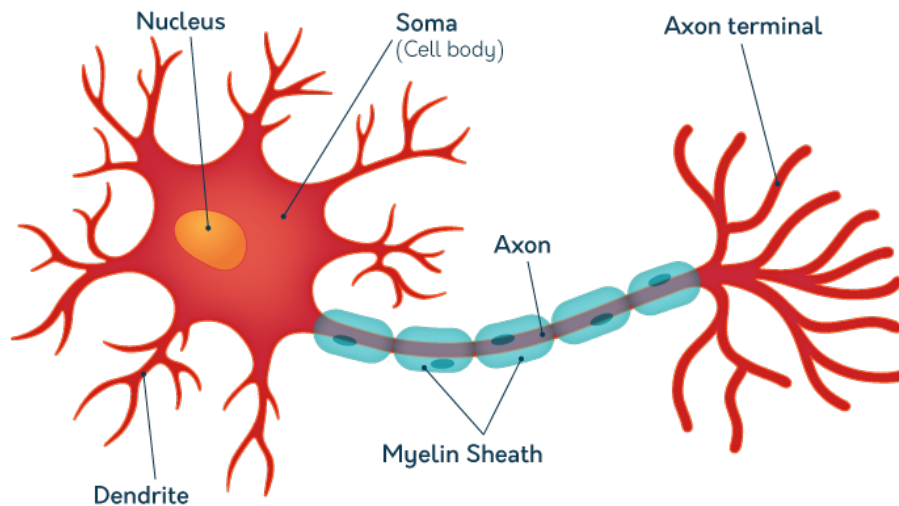


Figure 1: Basic Structure of the Neuron

Dendrites *Receive* Messages

Like branches of a tree that spread out to communicate with other neurons. Have protein called **receptors** that are embedded in the membrane. **receptors** are built to bind with molecules called **neurotransmitters**, which are *chemicals* that help to communicate information in the nervous system.

The Soma and Axon Work Together to *Send* Messages

Process of *firing* and sending a message.

1. An *electrical impulse* from the **dendrite** passes through the **soma**.
2. Leaves the cell body at the **axon hillock**(the beginning of the axon).
3. Electrical impulse makes its way down the **axon**.
 - The travelling down process involves *fluctuations in the amounts of positively axon negatively charged ions inside and outside the neuron*.

axon terminals ↔ **terminal buttons** ↔ **synaptic knobs**.

Myelin: *protein and fatty substance*. This substance acts like the *insulation* wrapped around the axon. It keeps the electrical impulse flowing down the axon. There are breaks in the myelin called **Nodes of Ranvier**, where channels are exposed to allow ions to flow in and out of the axon. This causes the *charge* to actually leap down the axon, *speeding up* the process.

3.2.2 Glial Cells

Glial cells perform vital roles in the nervous system, such as providing *structural support* for neurons, *bringing nutrients*, *removing waste and dead neurons*, and *speeding up electrical impulses*.

3.3 The Power Cell: How Neurons Control the Flow of Electrical Activity

Permeable everything is allowed in and out.

Neuronal cell membranes are only **semi-permeable**. Through **leaky channels**, they passively allow *potassium* to escape, but keep negative ions and positive sodium ions out.

Diffusion is the process by which particles passively move from high to low concentration.

Active transport is used to keep even more potassium outside the cell. Active transport is a process requiring energy where particles are transported *against* the natural flow of diffusion.

Resting potential (*about -70 millivolts*) caused by *imbalance* in ion concentrations.

Structure of channels in the membrane provide:

- **Specificity:** Each kind of channel is made to attract a specific ion.
- **Timing:** Channels could be activated at different times.
- **Influx:** Admitted.
- **Efflux:** Ejected.

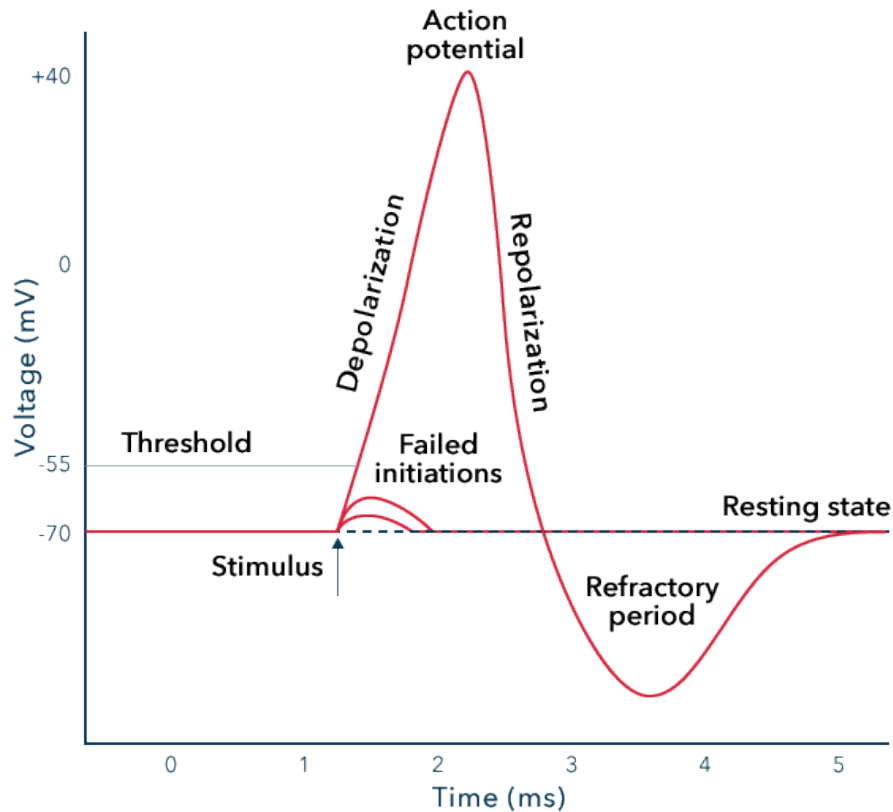


Figure 2: Increase and decrease in voltage inside the neuron corresponds with the movement of positive ions.

Threshold is the amount of voltage change *required* to activate a voltage-gated channel.

Propagation is the process by which electrical impulses get sent to the end of a neuron.

Process:

1. **Resting potential:** *all* voltage-gated Na^+ channels and *most* voltage-gated K^+ channels are closed. The Na^+/K^+ transporter pumps K^+ ions into the cell and Na^+ ions out.
2. **Depolarization:** some Na^+ channels open, allowing Na^+ ions to enter the cell. The membrane starts to depolarize.
3. **Hyper-polarization:** at the peak action potential, Na^+ channels close while K^+ channel open. K^+ leaves the cell, and the membrane eventually

becomes hyper-polarized.

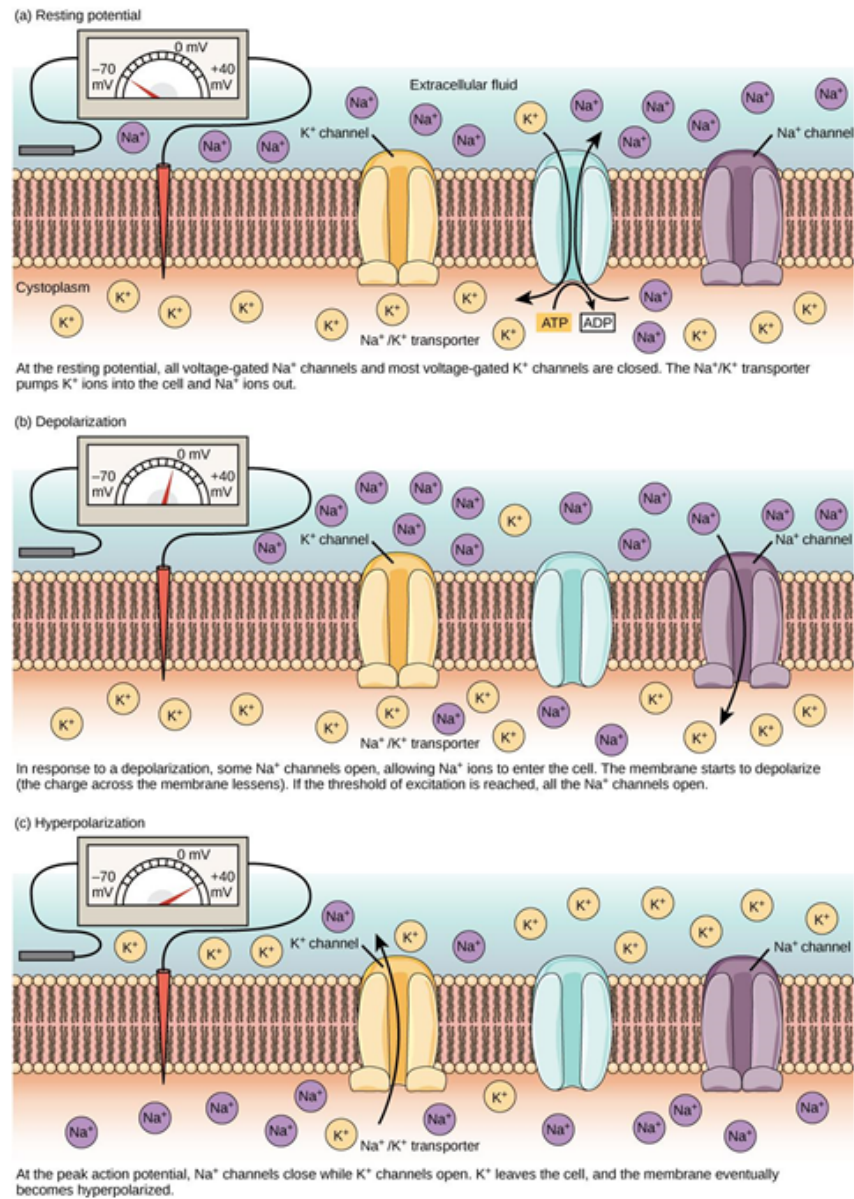


Figure 3: Corresponding event inside of the molecule when voltage changes.

3.3.1 How Neurotransmitters and Receptors Work

Some neurotransmitters are:

- **Excitatory:** They increase the probability of the neuron becoming electrically active.
- **Inhibitory:** They decrease the probability that the neuron is activated.

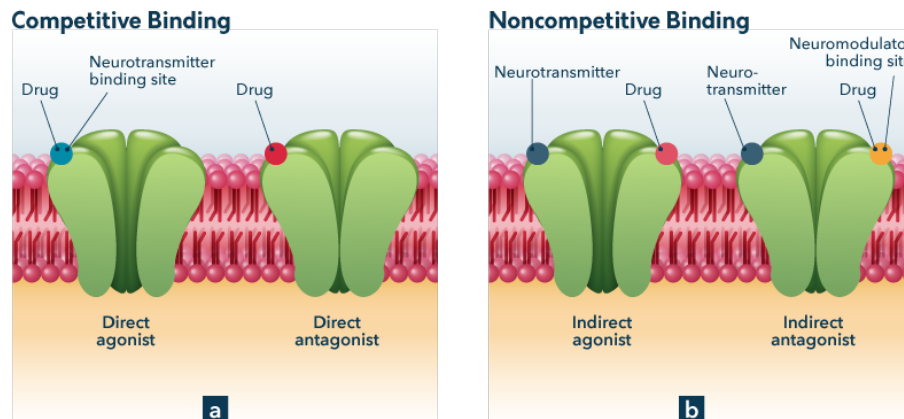


Figure 4: Competitive binding and noncompetitive binding drugs.

Brain and Drugs

- **Agonists** *mimic* the action of an endogenous(naturally produced by the body) neurotransmitter.
- **Antagonists** *prevent* the action of the endogenous neurotransmitter.

Agonists or antagonists can be

- **Competitive(Direct):** they will compete with the *same* binding site on the receptor as the neurotransmitter.
- **Noncompetitive(Indirect):** they bind at *different* sites.

Some drugs are called **partial agonists/antagonists**: they bind to and activate the receptor with *less power* than the endogenous neurotransmitter.

Neurotransmitter	Excitatory/ Inhibitory	Function	Associated Drugs
Glutamate	Excitatory	Learning and movement	PCP (causes hallucinations), Ketamine (anesthetic)
GABA	Inhibitory	Learning, anxiety regulation through inhibition of neurons	Valium (used to treat anxiety), Flumazenil (used to reverse anesthesia)
Acetylcholine	Excitatory	Learning, muscle action	Botox (Botulinum toxin, inhibits release of Acetylcholine)
Dopamine	Excitatory/ Inhibitory	Learning, Reward/Pleasure	Cocaine (prevents reuptake of dopamine, produces euphoria)
Serotonin	Excitatory	Elevation / depression of mood	Prozac (prevents reuptake of serotonin, used to treat depression)
Norepinephrine	Excitatory	Elevation / depression of mood	Doxepin (used for treating anxiety and depression)
Enkephalins/ Endorphins	Excitatory/ Inhibitory	Regulation of pain responses	Opiates (Morphine, Heroin)

Figure 5: Different types of neurotransmitters.

Steps in the process of triggering an action potential:

1. Binding of a neurotransmitter to a receptor.
2. Influx of positive ions into the cell body.
3. Opening of voltage gated sodium channels on the cell body.
4. Opening of potassium channels.

4 Development

4.1 Introduction

Social development

- Parent-infant interactions.
- Sibling relationships.
- Peer interactions.

The primary difficulty associated with studying infants and young children is that they cannot talk about what they know about the world and their relationships with others.

Still face paradigm is used by scientists to evaluate infants' emerging understanding of social relationships. The key point is that infants try to engage mothers and experience distress when their mothers are emotionally unresponsive.

Longitudinal research studies development in the **same people over time**, and this design can provide unique information about **developmental processes**.

Cross-sectional research, in which children of **various ages** are tested in the **same study**, and is useful for examining **age-related change** but not development within the same person over time.

4.2 Prenatal Development

4.3 Cognitive Development

1. Motor development.
2. Language development.
3. Cognitive development.
4. Social development.

5 Sensation & Perception

5.1 Introduction

Sensations are **features of the environment**, like the electromagnetic wavelengths of light or changes in air pressure, creating sound, that we use to create an understanding of the world.

These sensations are **transduced**(translated) by sensory system into electrochemical language of the brain. The brain takes a given message and combines it with previous experience to create a **perception**.

5.1.1 Top-down and Bottom-up processing

Bottom-up processing is the neural processing that starts with the *physical message* or *sensations*. This is the early level analysis that prepares the info for use.

Top-down processing occurs when we *combine* this early neural organization with our *understanding of the world* to interpret and organize that information into something that has value.

5.1.2 The Principles of Gestalt

Gestalt psychologists believe that we are born with *specific predisposed* ways of organizing information so that it has utility.

The principle of figure-ground We see letters as separate from the page, one flavour stands out from the rest of the bite.

The laws of Gestalt

- **The principle of proximity** states that objects that are *close* to one another will be grouped together.
- **The principle of similarity** states that objects that are *physically similar* to one another will be grouped together.
- **The principle of closure** states that people tend to perceive whole objects even when part of that information missing.
- **The principle of good continuation** states that if lines cross or are interrupted, people tend to still see continuously flowing lines.
- **The principle of common fate** states that objects that are moving together will be grouped together.

5.2 Vision: From Light to Sight

5.2.1 The Eye

20% of the cortex plays a role in the interpretation of visual info. *Wandell, Dumoulin, & Brewer, 2007.*

Visible spectrum electromagnetic waves with wavelength from **400 to 700 nanometers**.

Process the eye actively adjusts its behaviour in order to maximize the quality of light that hits the sensory cells in the **retina**.

1. **Cornea** Outmost, transparent, and protective layer of eye.
2. **Pupil** A hole in the front of the eye that expands and contracts depending on the environment, controlled by the relaxation or tension in a band of muscles attaching to the **iris**.
3. **Iris**

4. **Lens** a flexible piece of tissue helps refract light and bring image into focus against the sensory cells in the retina. This process is called **accommodation** and is determined by the distance between the lens and object.
 - **Nearsighted** have lenses that bring light into focus before reaching the retina.
 - **Farsighted** lens refracts light so that it focuses behind the retina.
5. **Retina** with **rods** and **cones** transduce (electromagnetic) energy into *neural language*. This is a **chemically based** process. Directly behind the pupil, there is **fovea**, a *cluster of cones*.
 - **Cones** transmit information about *fine detail*, the **visual acuity** process.
 - **Rods** are sensitive at *lower levels of light* and are the primary cells used for **night vision**. Respond only to the amount of light, but do not communicate information about the quality of that light.

Dark adaptation occurs as rods and cones adapt to changes in light.

5.2.2 The Retina

After the rods and cones react to light, they send their messages to **bipolar cells**. Bipolar cells summate the firing of several photoreceptors and send a different kind of message to a **ganglion cell**. Message finally leave the eye and enter brain via the *optic nerve*.

Blind spot the spot on the retina where there are no photoreceptors.

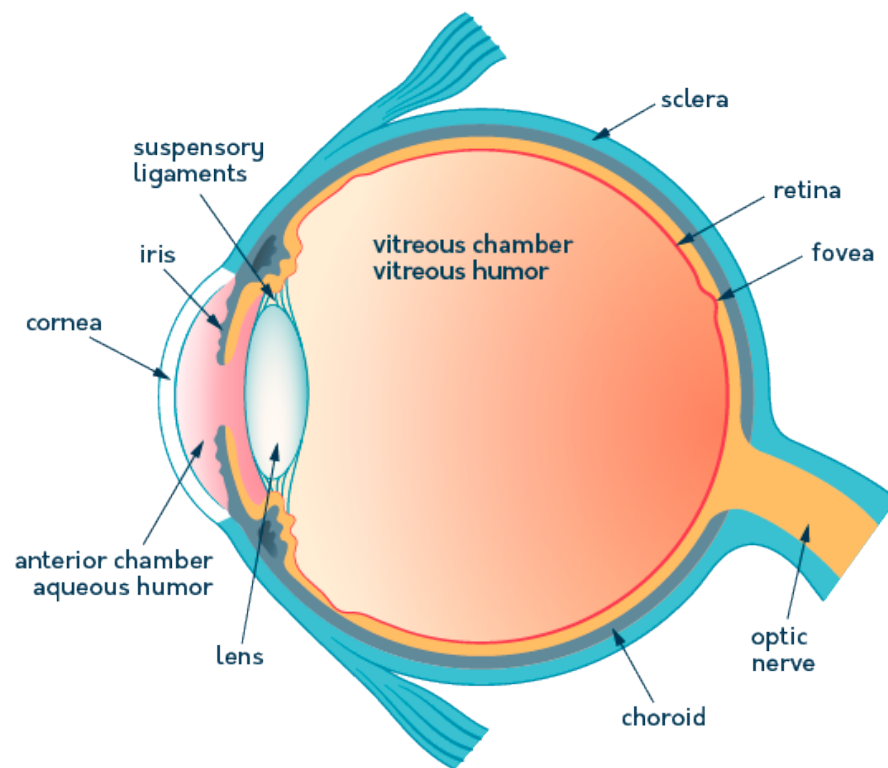
5.2.3 To the Visual Cortex

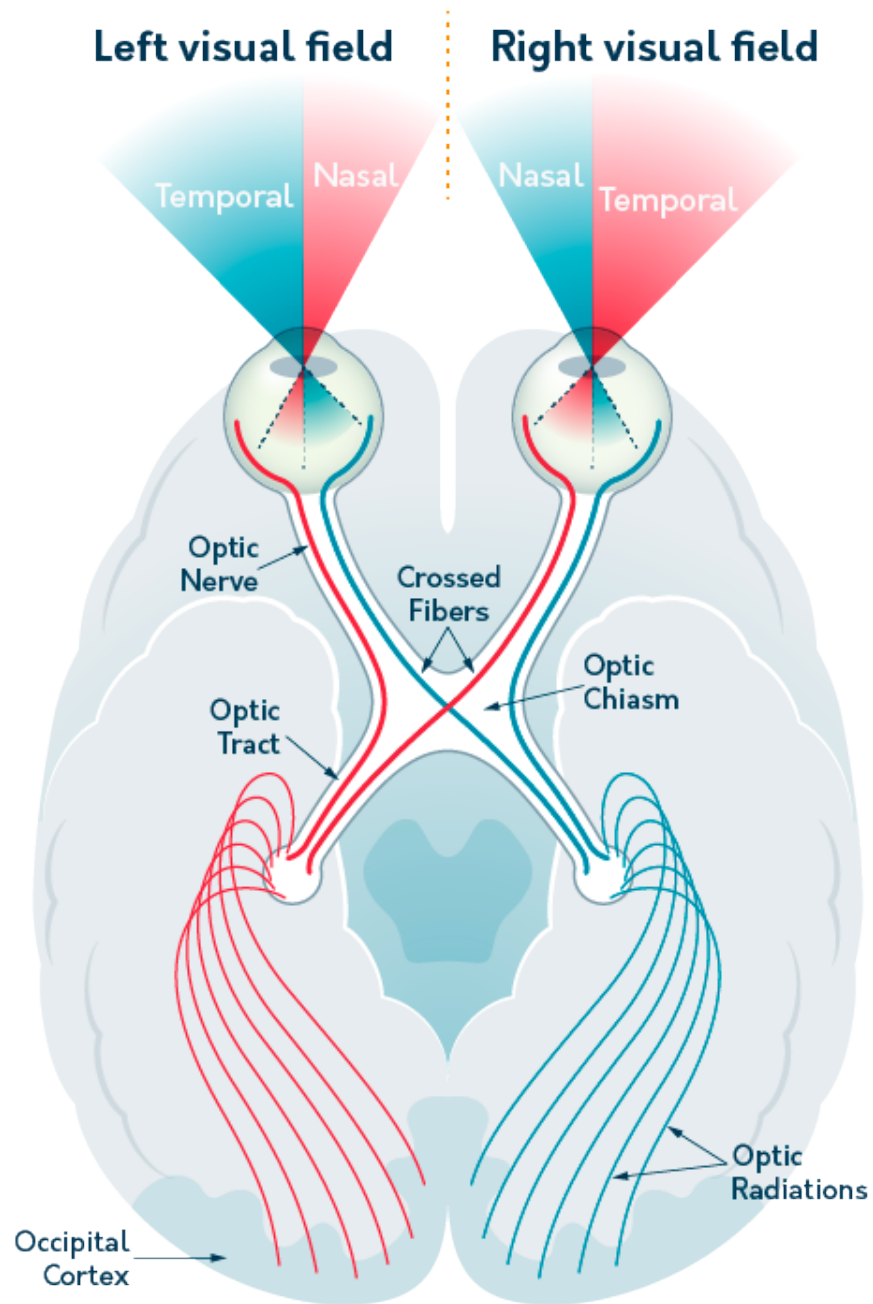
Optic chiasm Information from the right side of *both eyes* is sent to the left hemisphere, while information on the left side of the retina in *both eyes* is sent to the right side of the brain.

Lateral Geniculate Nucleus(LGN) of the **thalamus**, the LGN is organized into **six** sublayers, and each layer deals with specific types of information that correspond to both the **M** and **P** cells.

Visual Striate Cortex or visual cortex(VC) is located in the **occipital lobe**

Retinotopic organization We have over **30** areas in the back of the brain, every neuron maintains a spatial organization. *A specific point on my retina (Point A) is represented along the visual pathway, and a point right next to it (Point B) is represented by neurons right next to those responding to Point A.*





Ventral stream Then information travels along the **Ventral stream**(**What stream**) to the *temporal lobe*, identify what the object is.

Dorsal stream or **Where pathway** carries visual information to **parietal lobe**, where to understanding the *position* of object.

5.2.4 Colour Vision

Colour is the perception of wavelength.

Trichromatic theory of colour vision proposes that colour info is identified by comparing the activation of the different cones.

- **L cones** for long wavelength, red light.
- **M cones** for mid wavelength, green light.
- **S cones** for short wavelength, blue light.

5.2.5 Colour Vision: Opponent Process

Trichromatic theory has difficulty explaining how people perceive yellow.

P ganglion cells will respond vigorously to one wavelength and reduce their firing if they receive a signal indicating a different one. Colours have been paired, so that the cell will increase its firing rate if it receives a message from one colour and will decrease if it receives a message from another.

- Red Green
- Yellow Blue
- Black White

After effect as the opponent process organization is maintained in the LGN of the thalamus.

5.2.6 Perceiving Depth

Monocular depth cues Require one eye, also referred as **pictorial cues**, or cues that can be represented on a two-dimensional canvas.

- **Occlusion** occurs when one image is *partially blocks* the view of a second object.
- **Relative Height** use knowledge of the *horizon*, objects closer to the horizon will appear further away and the greater the distance between the object and the horizon, the closer the object will appear.

- **Relative Size** when two objects are of equal size, the one that is further away will take up a smaller portion of the retina.
- **Perspective Convergence** used in *landscapes*, as parallel lines move away from us into the distance, they seem to converge or come closer together.
- **Familiar Size** judge distances based on our knowledge of that *object size*.
- **Atmospheric Perspective** occurs when more distant object appear *hazy* and often have a *slight blue tint*.

Binocular depth cues Require both eyes.

- **Retinal disparity** brain makes comparisons between the two eyes in order to understand depth, because eyes are in slightly different locations on head and images on retina are slight different. As images become farther away, they have greater degree of disparity on the retinas.
- **Convergence** use the degree to which the eyes must turn *inward* to focus on an object.

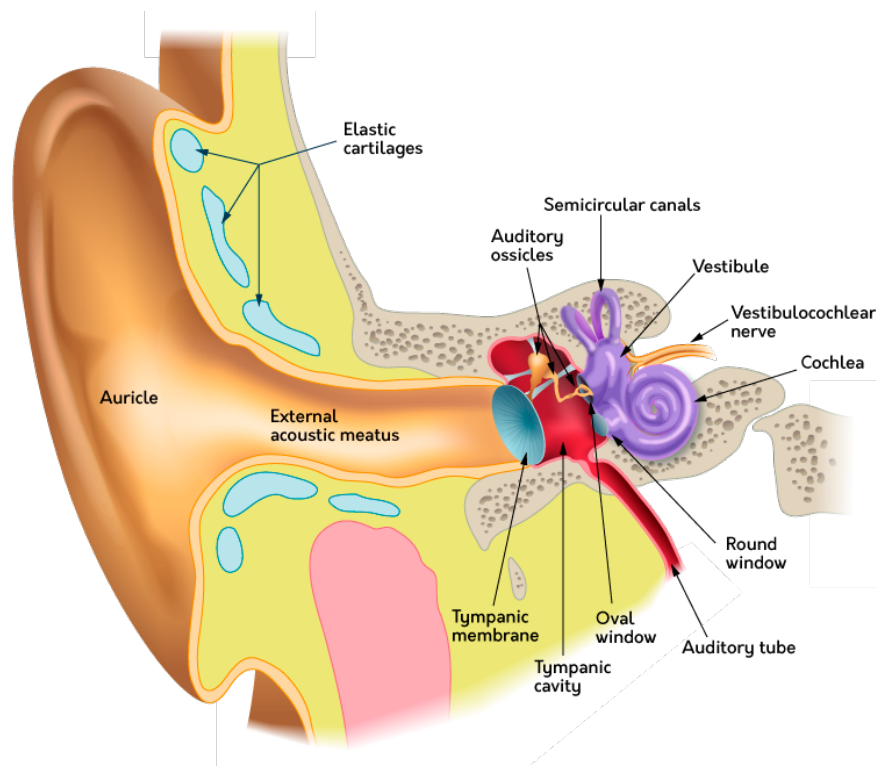
5.3 Hearing and Sound

Frequency of the sound is determined by the rate of vibrations. High frequency sounds having a higher **pitch**.

Intensity of the wave, which we perceive as *loudness*. Increased intensity causes the amplitude of the wave to increase and the wave arrives at our ear with more force.

5.3.1 Entering the Ear

1. **Pinna** the part you pierce and is shaped in such a way that it helps to filter the sound into the ear.
2. **Tympanic membrane**, also refer to as **eardrum**.
3. **Ossicles** of the middle ear. Consist of the **malleus**, the **incus** and the **stapes**. Help to amplify the vibrations.
4. **Oval window** transfers vibrations to the bony sound processor of the inner ear.
5. **Cochlea** where sound is transferred into the *neural language of the brain* in a flexible piece of tissue called the **Basilar membrane**.



5.4 The Auditory Cortex

Medial Geniculate Different components of sound are organized and analyzed in the medial geniculate of the thalamus.

Tonotopic organization system maintained from the basilar membrane to the auditory cortex.

5.5 Skin and Body Senses

The skin helps with thermoregulation and protects us from the environment. The skin also serves as the source of information about the surface quality of objects.

The physical message of touch is **pressure**.

Mechanoreceptors Four types of mechanoreceptors:

- **Merkel receptor** Located at the *surface* of skin and fires **continuously**.
- **Meissner corpuscle** Located at the *surface* of skin and fires when the skin **first** encounters the stimulus and when it is removed.
- **Ruffini cylinder** Located *deeper* in the skin, and interpret the **stretching** of the skin.
- **Pacinian corpuscle** Located *deeper* in the skin, and feels the **vibration** and **texture**.

Somatosensory cortex organizes information from the body. and similarly to the visual system, maps are *spatially* organized. This is called **somatotopic organization**. The brain does *not* prioritize messages from all parts of the body equally, a large portion of the cortex devoted to analyzing information from hands and face.

5.5.1 Temperature

Temperature is a **relative perception**.

5.5.2 Pain

Pain is an **adaptive** response to tissue damage.

Nociceptive pain is pain caused by nociceptors.

Gate-Control Theory of Pain suggests that impulses that indicate painful stimuli can be blocked in the **spinal cord** by signals sent from the **brain**. And gate control theory suggests that input happens along **three** pathways.

1. **Small diameter fibers(S-fibers)** fire to damaging and painful stimuli.
2. **Transmission cell(T-cell)** is activated when S-fibers are active. Intensity of pain depends on the excitation of the T-cell.
3. **Large diameter fibers(L-fibers)** send signals to the brain about stimulation that is **not** painful. The activation of L-fibers **inhibit** the activation of the T-cells.

The Subjective Nature of Pain the experience of pain depends not only on the sensation from the world, but also what we *expect* to experience.

5.6 The Kinesthetic Sense

Kinesthetic sense, a basic understanding of *where* our body is in space and how to *move* our bodies to accomplish specific tasks.

5.7 The Vestibular Sense

Vestibular sense our sense of **balance**, and is located in the **cochlea**. **Two** structures respond not just to movement but also to **posture** and **acceleration**.

- The **semicircular canals**(filled with **hair cells** respond to the *force of gravity*) sense change in acceleration and rotation of the head.
- The **vestibular sacs** responds to cues associated with sense of **balance** and **posture**.

5.8 The Chemical Senses

5.8.1 Smell

Smell is the only sense that does not first go through the thalamus.

Chemoreceptors where perception of *smell* and *taste* begin. These sensory cells respond to properties in air molecules that are interpreted as smell and taste.

Olfactory receptors bind to the **cilia** of **hair cells** embedded in the **olfactory mucosa**, where **odorants** will come into contact with the **olfactory receptor neurons(ORN)**. Receptor cells send their message to the **olfactory bulb** in the brain, what cascades to various regions of brain.

In contrast to four types of photoreceptors to code vision, studies has shown that people have over **350** olfactory receptor types each responding to specific ranges of molecules. With those receptors, we can identify over 100,000 different odours.

The ORNs send their signals to **glomeruli** in the olfactory bulb.

Smell is also highly dependent on **expectation**.

5.9 Taste

Taste relies on the correlation between the molecular properties of substance and the effect of that substance on the body.

Taste begins at the **papillae**, the location of our **tastebuds**. Each taste bud contains **50-100** taste sensitive cells, which protrude into a **taste pore**.

Taste pore where transduction occurs. Messages are sent to **brain and stomach**.

Orbitofrontal cortex(OFC) where sensations from both smell and taste are combined.

Bimodal neurons contained in OFC, respond to more than one sense, specialize in determining sensations that *occur together*.

5.10 Methods

Psychophysics attempts to evaluate the way the physical experiences of light, sound, and the chemicals in our nose are translated into psychological perceptions.

5.10.1 Stimulus Detection

Stimulus detection is a technique that attempts to answer the question *'what is the minimum amount of stimulus required to generate a sensation?'*

Absolute threshold for the stimulus, is defined as the point of intensity required for a participant to detect the stimulus **50%** of the time.

Signal detection

Liberal response bias Individuals with high hit rates and high false alarms.

5.10.2 Difference Threshold

Difference threshold is the *smallest* amount of a particular stimulus required for a **difference in magnitude** to be detected.

Just noticeable difference(JND) based on several factors.

- Individual differences.
- The amount of stimuli already present. *change in marginal*.

Weber's Law the ability to notice difference between two stimuli is a **constant proportion** of the intensity or size of the stimulus.

6 States of Consciousness

6.1 Consciousness

Split brain Left hemisphere is where primary **language** processing occurs.

Components of conscious experience 2 components of conscious experience.

- **Conscious content** the *subjective* experience of your internal and external world.
- **State of consciousness** different levels of *arousal* and *attention*.

6.2 Attention

6.2.1 What is Attention?

Attention is the process of selecting information from the internal and external environments to prioritize for processing.

Passive attention is prioritized when **bottom-up** information from the external environment requires a response.

Active attention is then attention is directed by goals and **top-down** processing.

What is noticed depends a great deal on the *goals* and *state of mind* of the individual, and attention is often directed by an individual's *goals*, *expertise*, and *state of mind*.

6.2.2 Selective Attention

Selective attention occurs when you attend to one source of information while simultaneously ignoring other stimuli.

- **Stimulus salience Bottom-up** qualities of a scene that influence how we direct attention.
- **Top-down** processing.

As we become more proficient at skill, completing it requires less conscious attention.

Cocktail party effect *Many people have had the experience of being in a loud room and hearing their name yelled out and turning to find the source.* This illustrates that even when some information is not part of conscious awareness, this does not mean it is not being processed.

Dichotic listening task participants are asked to wear a pair of headphones that will play one message in one ear and a second, different, message in the other.

6.2.3 Divided Attention

Divided attention , or **multitasking**, is when we simultaneously attend to two (or more) tasks at the same time.

Automaticity , something is defined as automatic when performance is **not** impaired by other tasks.

In-attentional blindness occurs when we are engaged in one task and completely miss other information.

Flicker task participants are shown two variations of the same picture, usually with one difference between the images. Experiments that use the flicker task are known as **intentional change detection** studies, that's, participants are aware that a change will occur and are actively using *selective attention* to find it.

Inhibition while attention are held in one location, your brain is actively blocking the processing of other parts of the scene.

6.3 Stages of Sleep

6.3.1 Introduction

Freud and **Jung** were both interested in dreams.

Fatal Familial Insomnia a rare hereditary disease affecting the thalamus, that causes individuals to die from lack of sleep.

Electroencephalograms(EEGs) measure activity across the **surface of the brain**.

Electrooculograms are used to measure the movements of the **eye** as you sleep.

Electromyograms are used to measure tension of the **muscles of the jaw**.

Aspects to analyze the wave

1. **Frequency** of the waves.
2. **Amplitudes** of the waves.
3. **Regularity** of the waves.

Awake

- **Beta waves** are *irregular*, mostly *low amplitude*, waves that occur with a frequency of *13-30 HZ*.
- **Alpha activity** far more *regular* and *predictable* and occur at *8-12 HZ*.

Relaxed state to the early stages of sleep

- **Theta activity** 3.5 - 7.5 HZ.

Stage 1 is very light stage of sleep; if startled or awoken, most people report that they were not even sleeping.

Stage 2 appearance of

- **Sleep spindles** are brief bursts of activity(12 - 14 Hz) that occur roughly 2 - 5 times a minute during stage 1 - 4 sleep. Plays a role in **memory consolidation**.
- **K complexes** only occur during stage 2 sleep around once a minute, can also be triggered by *unexpected noises*. The wave itself is a *large period of coordinated excitation followed by neural inhibition*. If woken, you would not necessarily have any sense that you had been asleep at all.

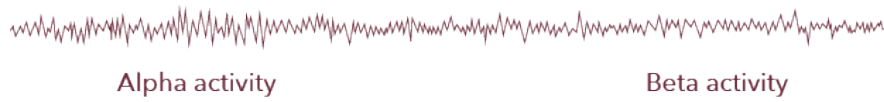
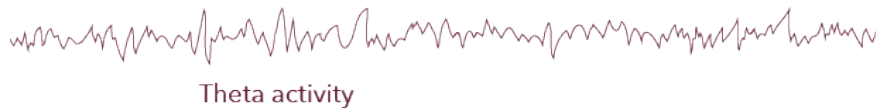
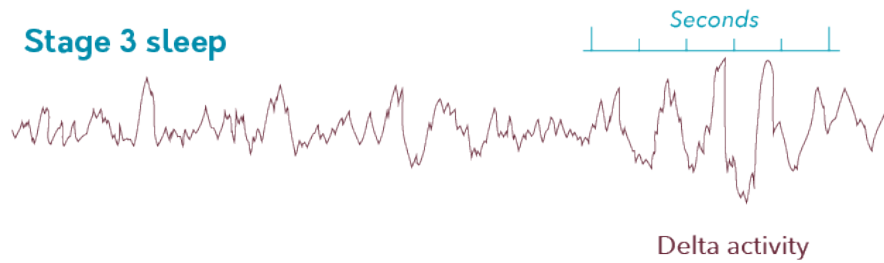
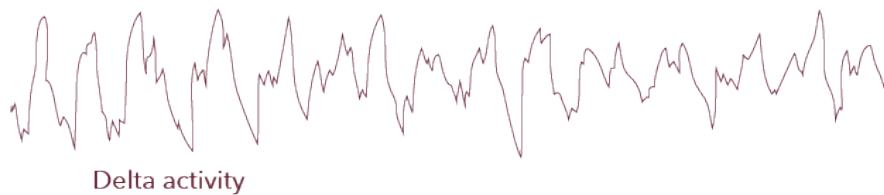
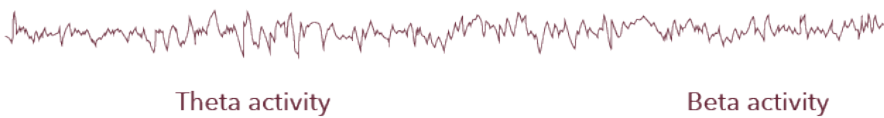
Awake**Stage 1 sleep****Stage 2 sleep****Stage 3 sleep****Stage 4 sleep****REM sleep**

Figure 6: An EEG Recording of the Stages of Sleep

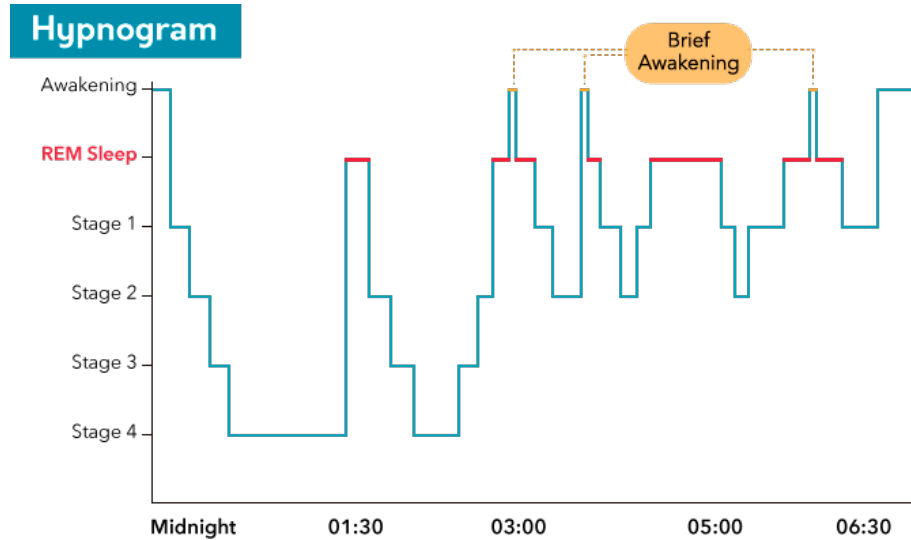


Figure 7: Hypnogram of sleep stages.

Stage 3 4 , combined with stage 4, also called **Slow-Wave Sleep(SWS)**. The *firing across* the cortex becomes coordinated and we transition to **delta** activity. Stage 3 includes around 20 50 % delta activity. And stage 4 includes more than 50 % delta activity. **Stage 4** is typically referred to as the deepest stage of sleep. Only a strong stimulus will wake you, and you would feel groggy and confused upon waking.

- **Delta** consisting of *slow* (less than 4 Hz), *regular*, *high amplitude* waves.

Rapid eye movement sleep(REW) **Desynchronized theta waves** will start to appear on the EEG, and your eyes will start to move side-to-side. Brain becomes *highly active*, EEG looks more similar to when you are awake and alert than the slow predictable waves from a few minutes earlier. *REM is also when we have those vivid, narrative-based dreams.*

6.3.2 Functions of Sleep

All **warm-blooded** animals exhibit REM sleep.

Functions of Slow Wave Sleep SWS seems to be more important for restoring the brain than the rest of the body. During SWS, the **metabolic rate** and **blood flow** of the **cortex** decline substantially relative to wakefulness.

Function of REM Rebound phenomenon suggests that there is a need for a certain amount of REM.

6.3.3 Dreams

Freud felt that our experience of consciousness was only a limited part of our internal world.

Two perspectives of current work on dreams.

- The experience of dreaming really has **no** explicit or reliable meaning. It is a **consequence** of the other processes that occur across the cortex during sleep.
- Dreams do seem to have some meaning and perhaps an *evolutionary purpose*. **Evolutionary hypothesis of dreams** Revonsu(2000) argues that we often dream about things that are directly related to *survival* and that they can lead to enhanced performance when encountering threatening events.

6.4 Altered States of Consciousness

Psychoactive drugs are broadly defined as substances that influence *mood, thoughts* or *behaviour*.

Addiction is defined as the presence of **drug tolerance**, when a larger and larger dose is required to achieve the same physical and psychological effects.

Dependence is the physical or psychological need for the drug in order to maintain *normal functioning*. Once dependency has been achieved, the absence of the drug is met with physical **withdrawal**.

6.4.1 Depressants

Depressants generally slow or depress the arousal of the central nervous system.

6.4.2 Stimulants

Stimulants are drugs that increase the activity of the nervous system.

6.4.3 Hallucinogens

Hallucinogens, also known as **psychedelic drugs**, directly influence the sensory systems and our interpretation of reality.

	Drug	Neurotransmitters
Depressants	Alcohol	Inhibits glutamate and increases GABA and dopamine
	Barbiturates/ Benzodiazepine	Increases GABA
Stimulants	Caffeine	Blocks adenosine
	Nicotine	Stimulates/imitates acetylcholine and increases dopamine
	Cocaine	Prevents reuptake of dopamine
	Amphetamines	Inhibit reuptake and stimulate release of dopamine
Hallucinogens	Lysergic acid diethylamide (LSD)	Serotonin agonist

Figure 8: Drugs and Their Neurotransmitters

7 Chapter.7 Learning

Learning involves a relatively permanent change in one's mental processes or behaviour that is a function of interactions with the environment. *Learning and cortical development are optimal when the person is exposed to highly enriched environment.*

7.1 Pavlovian Conditioning

Classical conditioning

Used concepts of **stimulus** and **response**, where stimulus can be anything in the environment that is measurable and evoke a response.

An **unconditional stimulus** causes an **unconditional response**.

A **neutral stimulus** is repeatedly paired with an unconditional stimulus so that the neutral stimulus becomes a **conditional stimulus**.

To create classical conditioning, Pavlov selected a neutral stimulus and paired it with an unconditional stimulus, which reflexively triggered an unconditional response.

Reflexes are *involuntary* responses that are triggered or **elicited** by an **environmental event** that precedes and causes the **response** or **action**.

Conclusion The organism learns to do an involuntary reflexive response to a new, formerly neutral stimulus.

Extinction if the conditional stimulus is presented without the unconditional stimulus, the strength of conditional response decreases over time.

Spontaneous recovery of the conditional response occurs if the extinguished conditional stimulus is again presented.

7.1.1 Associating Stimuli

- Start the pairing with the neutral stimulus presented first before the unconditional stimulus.
 - Short-delay.
 - Long-delay.
 - Trace conditioning.
- Simultaneous conditioning.
- Backward conditioning. (UCS comes before NS/CS)

The most effective pairing methods occur when the conditional stimulus precedes the unconditional stimulus.

Animals don't care about the conditional stimulus; it's the unconditional stimulus and its temporal relationship with the conditional stimulus that is important.

Aversive stimulus stimulus that is conditioned with unpleasant consequence.

7.2 How is Pavlovian Conditioning Related to "What We Do"

Appetitive Unconditional Stimulus Involving something pleasant.

Aversive Unconditional Stimulus Involving some degree of physical discomfort.

Example If a new product is paired repeatedly with an actor we respect and like, Pavlovian conditioning would suggest that we will associate our liking of the actor to the product.

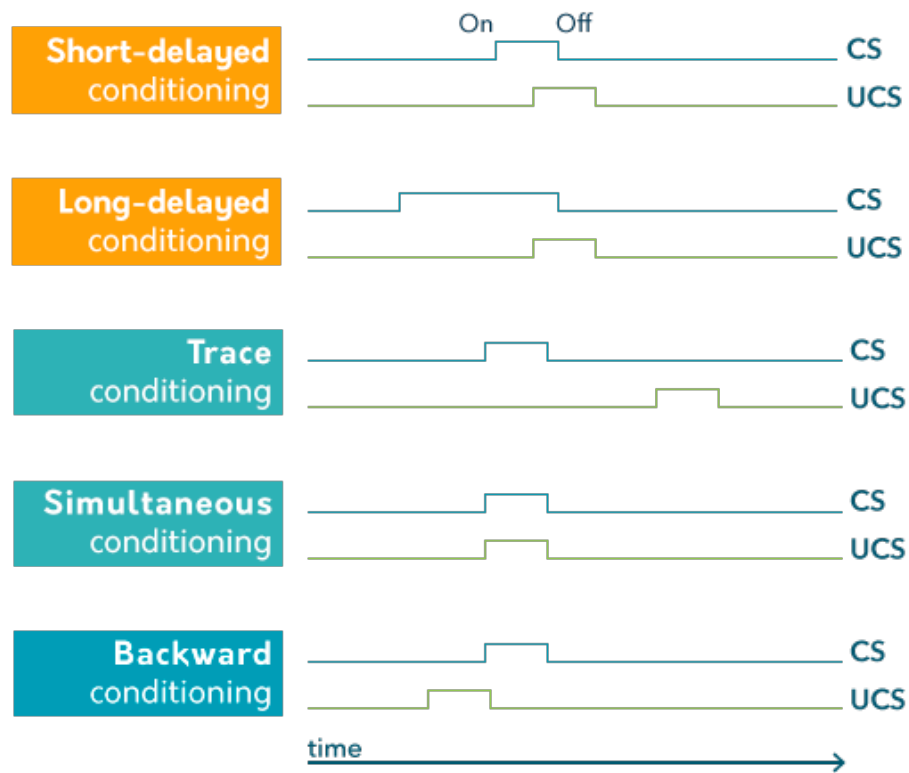


Figure 9: Five types of temporal conditioning procedures.

7.3 Other Principles associated with Classical Conditioning

Stimulus Generalization involves reacting in a similar manner to stimulus *share features* associated with the original condition stimulus.

Stimulus Discrimination with stimulus discrimination, conditional responses *only* when the original conditional stimulus is introduced. Similar stimuli do not elicit a response.

Higher order conditioning pavlovian conditioning can also occur when a **neutral stimulus** is systematically and repeatedly paired with an **existing conditional stimulus**.

Biological preparedness makes it easier to condition fear to snakes and spiders than to arbitrary stimuli like a flower and a tone.

Implication: phobias: Phobias are often different from fear conditioning in the laboratory, because phobias:

1. are easily acquired in a single trial.
2. can persist even when the person knows that the feared object is incapable of harm.
3. are of things that could harm our ancestors but are far less prevalent in today's world.
4. do not extinguish quickly or easily.

7.4 Development of the Behavioural Perspective and "Little Albert"

John B. Watson American psychologist.

Behaviourism is the perspective within psychology that focuses on the **acquisition** and **modification** of an organism's behavioural responses.

7.5 Operant Conditioning

E.L. Thorndike American psychologist.s

Also called **instrumental conditioning**.

Law of effect

- Behaviours that yielded satisfying consequences are more likely to recur.
- Behaviours that result in discomfort are less likely to be repeated.

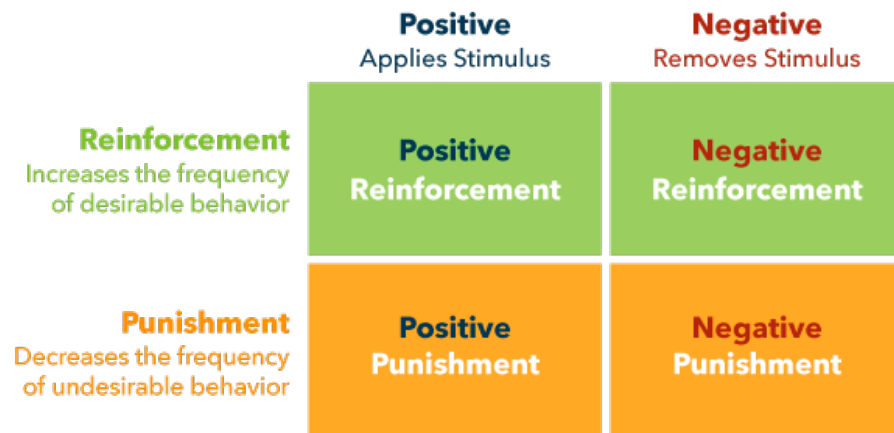


Figure 10: Types of effects on sub-sequential likelihood of behaviour.

Focus on how the **consequences** of *voluntary behaviour* influence subsequent behaviour.

B.F. Skinner Importance of the environmental events that preceded behaviour. (**antecedent stimuli**).

Lindsley: Dead man's test if a dead man can do it, then it isn't behaviour.

Skinner people and nonhumans learn about the environmental events (antecedents and consequences) that affect their behaviour.

4 Contingencies between responses and their consequences to describe these situations so that we can predict future behaviour.

1. **Reinforcement** the consequence of a response *increase the probability* of behaviour.
2. **Punishment** *decrease the likelihood* of a recurrence of a behaviour.
 1. **Positive** the application or the addition of something.
 2. **Negative** removal of something from the environment.

In these analyzed situations, we assume that the response *always* occurs, but what we don't know about it what will happen in the consequence.

If we're talking about a positive contingency, then both the response and the consequence occur. If we're talking about a negative contingency, then the response occurs but the consequence is that it (the environmental event) is removed or avoided.

Analyze contingency

1. Identify the response or **target behaviour**.
2. Identify the **consequence**.
3. Identify the **addition or removal** of consequence.
4. Identify the **change in likelihood** of future occurrence.

Extinction is **not** a contingency in and of itself. It's actually the absence of a contingency.

7.5.1 Escape and Avoidance

Escape is a situation in which the aversive stimulus is already present and a response removes or stops the otherwise ongoing aversive stimulus.

Avoidance is a situation in which the aversive stimulus is not currently present but will occur unless you emit a response to cancel the scheduled aversive event. And is sometimes called **active avoidance**.

When punishment is used by itself, the organism is only learning *what not to do* rather than what responses it should be doing instead. People who employ punishment are being negatively reinforced to do so because it decreases the response the person does not like (*the negative reinforcer*).

7.5.2 Extinction

Extinction a response used to produce a consequence, but that consequence is no longer provided.

Behavioural effects of extinction

- Temporary increase in responding, **extinction burst**.
- Emotional and aggressive responding.
- Responding eventually stops.

We know that extinction eventually decreases behaviour, but how quickly it decreases behaviour depends upon how regularly the consequence was delivered.

Partial reinforcement extinction effect Behaviour exposed to a *continuous reinforcement schedule* will extinguish *faster* in extinction than behaviour exposed to an *intermittent reinforcement schedule*.

7.6 Reinforcers

Reinforcers are events or stimuli that follow behaviour and *increase the future likelihood* of that kind of response.

Reinforcers are called **positive** if they strengthen *responses they follow*; they are **negative** if they strengthen responses that *lead to their removal*.

Primary(or unconditioned) reinforcers are **not** learned; they naturally affect responses they follow. *Primary positive reinforcers* generally are stimuli/events needed to maintain life. *Primary negative reinforcers* typically include aversive events such as heat and pain. Primary reinforcers tend to be involved in those contingencies proved by natural environment.

Secondary(or conditioned) reinforcers , both positive and negative, acquire their capacity to affect responses they follow because they have been associated or paired with *primary or already-conditioned secondary reinforcers*.(higher order conditioning.)

7.6.1 Using Consequences Effectively

Factors influence the effectiveness of the impact of reinforcers on responses.

- **Immediacy** means that there must **not** be a much of a delay between the occurrence of the response and the occurrence of the consequence.
- **Power** is the idea that the reinforcer must be strong enough to influence the response.
- **Contingency** requires that there must be an **if-then** relationship between the response and the consequence.
- **Instruction** explanation ti the person what the contingency involves.

Premack's Principle of Reinforcer Efficacy is based on how often behaviours occur. If behaviour A occurs more frequently than behaviour B, access to behaviour A can be made contingent on **first doing behaviour B**.

7.7 Scheduling Consequences

Schedules of reinforcement

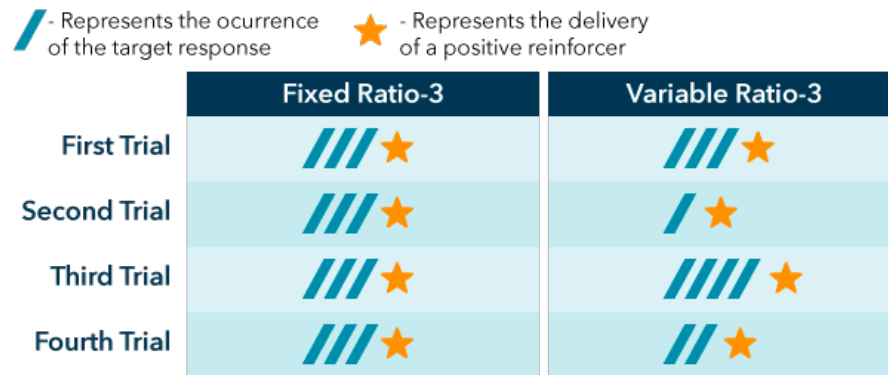


Figure 11: Required number of responses to trigger reinforcement for FR-3 compared to a VR-3 schedule.

7.7.1 Ratio Reinforcement Schedules

Schedules of reinforcement fall into two categories, **ratio** and **interval**, and each category has two sub-divisions, **fixed** and **variable**.

FR(n) : requires n times of target response for one reinforcer to occur.

FR(-1) : **Continuous**

VR(n) : the number of times that targeted response much occur changes around a mean average n.

7.7.2 Interval Reinforcement Schedules

Interval schedules require that a specific amount of *time elapse* before an occurrence of targeted response will trigger the delivery of a positive reinforcer.

FI-n min **None** of the targeted responses that occur during the one-minute interval are reinforced.

7.7.3 Operant Stimulus Discrimination

Discriminative stimulus the antecedent stimulus in operant conditioning, if it affects the likelihood of the response occurring.

Positive reinforcement is used to:

- Maintain a response at its current level.

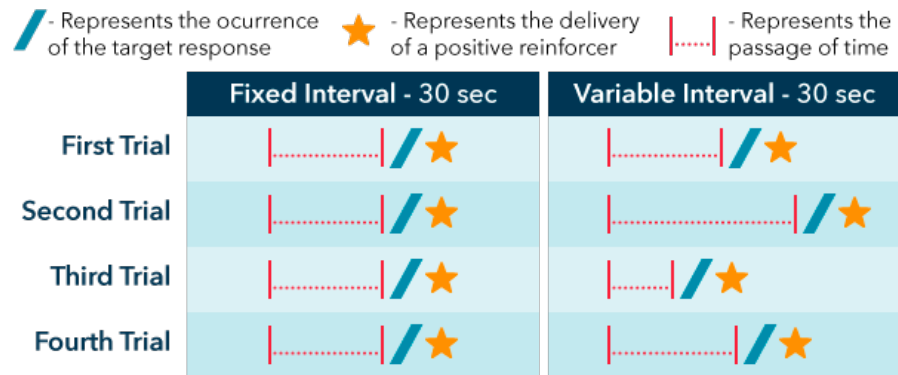


Figure 12: Required number of responses to trigger reinforcement for a FI-30 sec and a VI-30 sec schedule

- Increase a response over its current level.
- Teach new responses to the organism. (**shaping**)

7.7.4 Comparing Pavlovian to Operant Conditioning

Pavlovian Conditioning involving unconditional stimulus.

Operant Conditioning involving reinforcer/punisher.

Operant Conditioning the response **does** change the probability of the consequence.

Pavlovian Conditioning affects involuntary behaviours.

Operant Conditioning involves voluntary responses.

Pavlovian Conditioning a new stimulus (the conditional stimulus) evokes a response that the organism is **already capable** of performing.

7.8 Tolman's Latent Learning

7.8.1 Social Learning

The children who had observed the adults **modelled** what they saw the adults do.

Vicarious learning watching another person act, including any consequences the acting person experiences, can indirectly (vicariously) reinforce that action in the learner when she finds herself in a similar situation.

Four phases/processes/stages of observational learning

1. **Attentional phase** the learner must notice the behaviours being modelled.
2. **Retention phase** the learner covertly practices and encodes the performance being observed.
3. **Production phase** the learner **imitates** the behaviour observed.
4. **Motivational phase** the imitated performance is likely to trigger similar types of consequences (positive or negative) that may or may not have been during the attentional phase.

7.9 Biological Constraints on Learning and Learned Helplessness

Biological constraints how a species' characteristics, often genetic, can affect learning in that some responses and associations are more easily learned and others.

Learned helplessness when the organism's escape responses are ineffective at decreasing the painful events being experienced, the escape and avoidance responses eventually stop.

8 Chapter.8 Memory

8.1 Introduction

8.1.1 Metaphors for Memory

Plato and Aristotle described memory as a *wax tablet*. Experiences pressed into the tablet, creating shapes and patterns of writing.

Failure of search inability to remember something.

Reconstruction is a better metaphor because rather than specifically searching for information, you create a useful response given the situation at hand and what you've stored.

8.2 Encoding Memories: Prolonging the Present

Encoding how our brains commit an event to memory. The problem our brains have to solve in order to encode information is called the **encoding problem**.

Storing memories are stored as part of brain's physical structure. Correlated to **storage problem**

8.2.1 Sensory Memory: Icons and Echoes

*Sensory memory is a system that keeps information translated by the senses briefly active in a relative **unaltered**, **unexamined** form.*

Iconic memory In the **visual** system.

Echoic memory In the **auditory** system. *Echoes have been demonstrated to last longer.*

8.2.2 Immediate Memory: Manipulating Information

Immediate memory is the system that actively holds information at the **front** of your mind. Also referred as *short-term* or *working* memory

Characteristics of Immediate Memory

- **Representation**
 - **Inner voice** is evidence that information in immediate memory can be represented **verbally**. *the primary mode of coding information in immediate memory is believed to be auditory.*
 - **Inner eye** visual coding.
- **Duration** Information can be stored in immediate memory for **forever**. But, **rehearsal** is required.
- **Capacity** the average person could hold about seven separate pieces of information at a time in their mind. Called **memory span**. **Chunking** is potentially a route to improve the capacity of immediate memory.

The working memory model immediate memory is not simply a place for the storage of information, but primarily a place for the *manipulation of information*.

- **Phonological loop** is where **auditory** and **verbal** information is temporarily stored and manipulated.

- **Visuospatial sketchpad** is the representation of inner eye in the model, and represents a place where **visual** and **spatial** information is stored and manipulated.

Central executive to direct the flow of information to and from the phonological loop, the visuospatial sketchpad and **long-term memory**.

8.3 Long-Term Memory: Connection & Storage

8.3.1 Kinds of Long-term Memory

Episodic memories auto-biographical memories that are based on life events and all about **specific context**.

Semantic memories relate to **meaning devoid** of a specific context.

Procedural memories

8.3.2 The Transfer to Long-term Memory

Elaborative rehearsal refers to a process of **actively manipulating** information in *immediate memory* so that we can **meaningfully connect** it to other information that we've already stored in long-term memory.

Deep processing making meaningful connections to **existing knowledge**.

Shallow processing encoding information based on only its **surface characteristics**.

8.3.3 Effective Encoding Strategies

Massed practice not effective.

Spacing effect spacing out your studying over multiple hours, days, weeks, or months is the key to long-term learning.

Mnemonics work by providing a **framework** for your engage in the kind of meaningful processing.

Mind palace

Retrieval practice

Type of Elaboration	Example	Cautions	Further Reading
Imagery	<p>Imagine a coffee shop, and place imagery that represents all of these words into it:</p> <p><i>You walk into a coffee shop, and order a hot TEA from the BARISTA. You are here to study for this class by reading your TEXTBOOK on your COMPUTER, scrolling through the pages with your KEYBOARD. You are taking notes in your NOTEBOOK with your PENCIL.</i></p> <p>The more vivid the imagery –imagining the heat of the tea and the smile of the barista, the feel of the pencil in your hand as you write, and so on– the more elaborately the information is encoded.</p>	Using imagery as a way to promote elaboration isn't perfect. Typically, information encoded using imagery isn't an exact representation of an object in the real world; it's more abstract. Think back to the chapter opening, when we discussed how easily people could remember pennies and the Apple logo—while people have a general idea of what these things look like, the details are not very exact.	Blake et al. (2015); Marks (1989); McKelvie & Demers (1979); Nickerson & Adams (1979).
Organization	Looking at the list of words, you might organize them into groups, searching for characteristics that they share. You might put PENCIL, TEA, NOTEBOOK, and BARISTA all in one group, thinking that these are all things an aspiring writer might have while working on a novel at a coffee shop. If you recall the word "NOTEBOOK", it should trigger the "aspiring writer" category, helping you also remember the other words in this group.	Remembering information using categorical or organizational strategies often leads to mistakes within the category. For example, you may accidentally remember the word "COFFEE" when the original word was "TEA".	Roediger & McDermott (1995); Seamon, Luo, Schlegel, Greene, & Goldenberg (2000).
Distinctiveness	Distinctive encoding is helpful when you want to remember something at the exclusion of other, similar items. For example, if you want to remember TEA and not COFFEE, or SODA, you might imagine a very specific instance of TEA: A cup of green tea next to a teapot, with the string of a teabag hanging out of the teapot.	Elaboration using distinctiveness is often time consuming, and using distinctiveness alone can make it difficult to remember large amounts of information. Most psychologists recommend using a combination of distinctiveness and organizational processing.	Hunt & McDaniel (1993)
Self-Reference	Relating information to yourself is also seen as a particularly effective way to engage in elaboration, as people generally know a lot about themselves. In this example, you might think about a personal memory for each of the seven items on the list.	Self-reference may be easy to do with a list of common nouns (such as those in this example), but more difficult with more detailed material (such as studying for a physics test). Self-reference is also more effective for people who come from individualistic societies like the United States, and less effective for people from more collectivistic cultures like China and Japan.	Symons & Johnson (1997); Wagar & Cohen (2003)

Figure 13: Types of Elaboration

8.4 Memory Retrieval

Cues are pieces of information in the present that help us remember events from the past, and they are central to remembering.

- **Free recall**
- **Cued recall**

The Encoding Specificity Principle a natural consequence of the importance of cues is that how we encode information affects how we are able to retrieve it.

Context at encoding matters.

Transfer-Appropriate Processing we should **not** only attempt to match the context that occurs at both encoding and retrieval, but also, we gotta attempt to match the *physical* and *mental* processes that are occurring.

8.4.1 Implicit Memory

Implicit memory we remember information without consciously realizing or intending it.

the kinds of elaborative encoding strategies that facilitate explicit remembering often have no effect on implicit memory.

8.5 Memory Errors and the Process of Forgetting

8.5.1 Memory Errors

Seven sins of memory

1. **Errors of omission** information cannot be brought to mind.
 - **Transience** describes how memory for any particular event or piece of information tends to *degrade* over time, often simply called *forgetting*.
 - **Decay**.
 - **Retroactive interference** *newly learned information* makes it more difficult to recall older information.
 - **Proactive interference** when *old information* interferes with new information.
 - **absent-mindedness** when information is not encoded to begin with, whether due to attention or a failure to elaborately rehearse the information.
 - **Blocking** relates to whether the cues we have available are enough to help us remember a piece of information.

- **Tip-of-the-tongue(TOT) state** when people cannot remember a piece of information, but have a powerful feeling that they know what they are trying to remember.
2. **Errors of commission** wrong or unwanted information is brought to mind.
- **Misattribution** occurs when we incorrectly recall the source of information we are trying to remember. Also referred as *Source errors*. *Dj vu we simply cannot remember the source of the information, rather than misattribute it.*
 - **Flashbulb memories** are memories for events that are both *surprising* and particularly *significant*. *These data suggest that for flashbulb memories, they aren't so much elaborately encoded as they are tinged with emotion.*
 - **Suggestibility** suggestibility requires the information that is misremembered have been *suggested by an outside source*. Example: **misinformation effect**.
 - **Bias** most common: **schemas** are highly organized sets of facts and knowledge about specific kinds of information.
 - **Persistence** occurs when the memory system fails to prevent the *recall of memory that is unwanted*.
- 3.

8.5.2 Forgetting and the Brain

Hyper-thymesia leads to near perfect auto-biographical recall.

Amnesia any memory loss due to physical damage or problems in the brain.

- **Retrograde amnesia** forgetting everything previous to the hit.
- **Anterograde amnesia** inability to make new memories.

9 Chapter.9 Language & thought

9.1 Introduction

Greatest power of language allowance for sharing and improving upon other's ideas.

Productivity Creation of new messages while speaking.

One import role of language is **social communication**

9.2 Development of Languages

- **Tonal Language:** Rely on change in pitch to alter a word's *meaning*. (e.g. Mandarin)
- **Intonation Language:** Primarily use pitch to convey *feeling*. (e.g. English)

Implication Children exposed to tonal languages become skilled at detecting pitch difference and are substantially more likely to exhibit perfect pitch compared to those exposed to intonation languages.

Grammar and Syntax

- **Grammar** (general) symmetric rules of a language.
- **Syntax** structure and consistent ordering of words.

9.3 Theories on development

B.F. Skinner argued that environmental influences strongly dictated language development, with Chomsky urged for the consideration of biological constraints on development.

9.3.1 B.F. Skinner: Nurture

Verbal Behaviour Skinner defined speech as a **verbal behaviour**, and applied **operant conditioning** to languages acquisition. *Other factors reinforce children's language ability.*

9.3.2 Noam Chomsky: Nativism

Nativism the belief that certain abilities are built into our brains.

- **Critical Period:** 7 – 12 months. During this period, it is necessary for children to receive environmental stimulation in order to promote healthy development.
- **Sensitive Period:** *Indicates that the neurological system is more malleable during early development but is still modifiable later in life with the proper environmental stimulation.*

Main patterns of languages

- **SOV:** Subject-object-verb order.
- **SVO:** Subject-verb-object order.

9.3.3 Emergentist perspective

Development of language is the result of interaction among:

1. **Inherited biology** Explains development constraints.
2. **Environmental factors**
3. **Social Exposure** Explains individual differences and growth.
4. **Behaviourist models(operant conditioning)** Provides predictions for how to modify verbal behaviours.

A nativist approach would focus heavily on how an inherited speech bias and early flexibility prepare us to learn language, whereas an environmental perspective would emphasize that our development of speech is dependent on our exposure to, and familiarity with, our native language.

9.4 Language and Brain

9.4.1 Broca's Aphasia / non-fluent aphasia

Example Patient Tan. *Initially appeared to have minimal head damage but soon worsened and was unable to produce speech.*

Linked to **Lower frontal lobe (Broca's Area)**.

Findings

- There may be a module in the brain controlling speech.
- **Hemispheric Lateralization** Language production is pre-dominantly controlled by the left hemisphere.

9.4.2 Wernicke's Aphasia / fluent aphasia

Wernicke's patient had damage to the temporal lobe and was still able to produce speech fluidly. However, the speech produced was not coherent.

Linked to **Temporal lobe (Wernicke's Area)**. *Wernicke's area, and other areas of the temporal lobe, contribute to processing and differentiating understandable sounds from nonsensical noise. Being able to organize incoming auditory information and attach meaning is large part of our language system.*

Ability to convey meaning is damaged.

9.5 Classifying words and objects

Average human can produce 2-4 words per second and retrieve them from an impressive memory store of 50000-100000 words.

Mental Lexicon information stored in Mental lexicon can be accessed within 80 ms and is organized by:

1. **Phonemes**: smallest unit of sound information.
2. **Morphemes**: smallest unit of language comprehension.
3. The word is then quickly linked to other information that is **semantically** similar, or connected by the word's meaning. This **semantic network** of stored information allows us to put a word in context, retrieve relevant responses, and detect errors in usage.

*The primary storage of conceptual knowledge is stored in our **left temporal lobe**.*

Family Resemblance Theory suggests that we classify the bird(objects) based on its **similarity** or **dissimilarity** to other members in our bird category.

Prototype is the most common or typical form a word assumes we imagine it.

Sapir-Whorf Hypothesis / Linguistics Relativity The structured differences in languages can alter one's perception and standing of reality. *Reference of time and space differ based on cultural language patterns, and consequently can influence how we perceive time.*

9.6 Problem-Solving

Problem-solving is commonly viewed as a sequential process involving this initial motivational state and the desired end-goal state.

Mental Set *Expectation of how to solve a problem* was influenced by their prior interaction and created a set effect, **fixedness**, limiting their application of new solution.

Function Fixedness Limiting us from using objects from purposes outside of their normal use.

Strategy / Algorithm An algorithm is a precise set of rules applied in order to solve a problem, and individual differences and environmental will dictate which algorithm we apply.

Trail and Error Commonly used when there are a limited number of available options. *You can feasibly attempt a series of moves with little or no cost to yourself before finding the solution.*

Heuristics Used to help *short-cut* the lengthy judgment and decision-making processes.

1. *Example 1* **Mean-End Heuristics**: Positive reinforcement if state is moving towards goal state, and negative reinforcement if moving away from goal state.
2. *Example 2* **Representative Heuristics**: Mentally comparing something to our stored **prototype** of an event, object or person.
3. *Example 3* **Availability Heuristics**: We make judgment based on how easily instances of the same or related events are to retrieve from our memory, or how easily available those memories are. *Analyze the **Frequency** / **Likelihood** of occurrence of event.*

Steps of creative processes

1. **Preparation** Gathering knowledge and proficiency with a topic.
2. **Incubation** Requires the idea to sit on the back burner of your mind while you consciously work on something unrelated.
3. **Illumination** To follow a period of *slight pre-awareness*. (But is often reported to come as a surprise).
4. **Evaluation** Evaluate your inspired idea and assess whether it is indeed, a creative and worthy solution.

9.7 Decision-Making

*We engage quick, short-cutting thinking that allow our minds to solve problems quickly. Although efficient, these shortcuts risk our decision making become **biased**, or systematically deviated based on our heuristics and judgment.*

Confirmation Bias : We have high tendency to seek out information that already confirms our ideas or beliefs. Additionally, with confirmation bias, information that is not consistent with one's existing beliefs is either ignored or distorted.

Framing of options Our choice and preferences are substantially altered based on the presentation or, framing, of options.

9.7.1 Dual process of decision making

Intuition Reliance on **experience** and **emotions**.

1. **System 1: Intuitive decision** Making decisions based on *quick, automatic* system. *This system predominantly relies on emotional systems and stored experiences to guide thinking.*
2. **System 2: Logical thinking** Counter commands those initial instincts. *This system recruits thinking and reasoning areas of the brain.*

10 Chapter. 10 Intelligence

Defining Intelligence *Flynn*

*The word "intelligence" comes from two root words, inter, which means "between" and legere, which means "to choose, pick out, read". The original use of the word referred to the **ability to discern true or important information** from information that was false or unimportant. The root meaning of the word intelligence is similar to the modern expression of being able to read between the lines.*

10.1 Measuring Intelligence

Francis Galton Focused on **physiological measures**.

Focused on the empirical measurement of man using **empirical methods** to ensure precise measurement. Galton conceptualized that one's general cognitive ability (g) was the product of heredity, and he believed that the intelligence was related to how well one uses one's sense.

Alfred Binet and Theodore Simion Focused on **behavior** measures of intelligence on three aspects.

1. **Direction** Ability to know what to do and how to do it.
2. **Adaptation** Ability to create strategies for implementing this knowledge and monitoring its progress.
3. **Criticism** Ability to step back and find error in one's thinking.

Lewis Terman: Stanford-Binet Test : Based on Binet's work. Terman assumed that his test only measured intelligence and was not being affected by things such as language and cultural knowledge.

$$IQ = \frac{\text{Mental Age}}{\text{Chronological Age}} * 100$$

Problem: Inaccuracy after age of 16.

David Wechsler: Deviation IQ

- **Age in-dependency:** Solve the inaccuracy caused by age in Stanford-Binet test.
- **Point system** is used so that an individual does **not** have to answer a set number of questions in order to receive a score.

10.2 Performance based measures of intelligence

Atkinson & Shiffrin Multi-Store Model of Memory.

It explains the cognitive processing involved in memory, this model explained memory in terms of how information flowed between different types of processors (i.e. sensory, short-term, and long-term memory) and various methods of processing (i.e. selective attention, maintenance, and elaborative rehearsal).

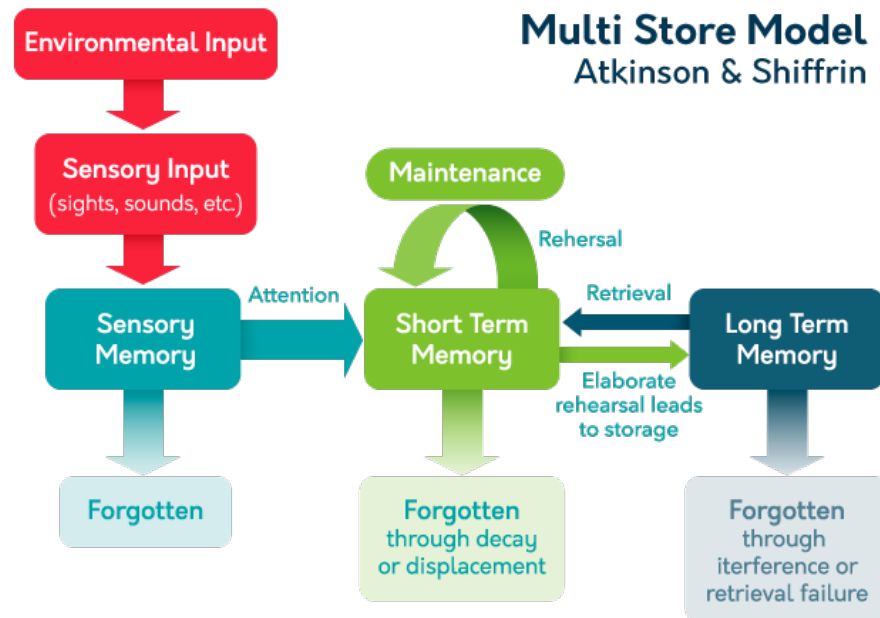


Figure 14: Multi-Store Model of Memory.

10.3 The use and misuse of intelligence testing

Example Social Darwinism.

10.4 Problems with comparing the different groups

Stereotype threat when people taking such (intelligence) tests, they feel pressure to **not provide** evidence supporting negative stereotypes of the group to which they belong.

Mindset A person's level of intelligence is part of that person's self-identity, which can ultimately affect a person's behaviour choices.

Gender and Intelligence

- Make: \Rightarrow Visuospatial tasks.
- Female: \Rightarrow Verbal tasks.

10.5 The nature of intelligence: g and s

Spearman initiated the use of **factor analysis** in the testing of intelligence. Factor analysis is the use of statistical measures to determine how much variable are related to each other in order to find clusters called "factors".

g: general ability This is a variable that stands for the general factor of intelligence, often simply called general intelligence or general cognitive abilities. Could be generalized across many different context.

s: specific application Contextually sensitive.

10.6 Raymond Cattell: Fluid intelligence and Crystallized intelligence

*Raymond Cattell(1971) tried to reconcile the **Spearman' theories** regarding two levels of intelligence with **Thurston's Theory** of primary mental abilities, which was comprised of two major factors found at the intermediary level: **fluid general intelligence(Gf)** and **crystallized general intelligence(Gc)**.*

Fluid intelligence the ability to think flexible and to handle complex and novel situations. *It is what you use to solve new problems that are not based primarily on knowledge you already process.*

Crystallized intelligence Ability to solve problems by applying previously accumulated knowledge.

Cognitive Flexibility Knowing how to apply one's knowledge.

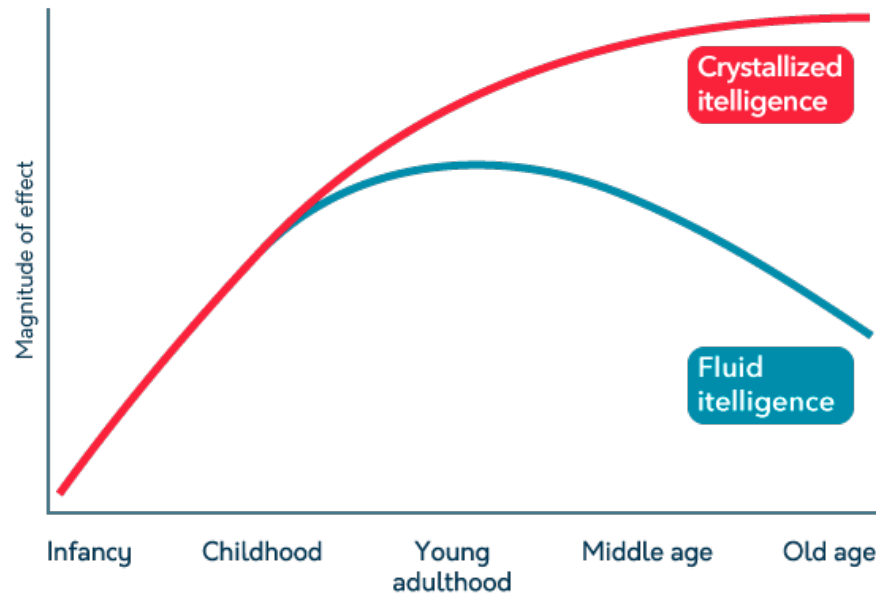


Figure 15: Fluid and crystallized intelligences across different stages.

Wisdom Paradox the fact that people seem to be able to become wiser even through many measures of cognitive functions show decline in later adult life.

10.7 Beyond the general intelligence

Emotional Intelligence (EI) considers 4 components.

1. Ability to **perceive** emotion accurately.
2. Ability to use emotions to **facilitate thought**.
3. Ability to **understand** emotions.
4. Ability to **manage** emotions.

Sternberg's theory of Triarchic Intelligence

1. **Analytical Intelligence** when the components are applied to the kinds of problems found in *standard IQ tests*.
2. **Creative Intelligence** when the components are applied to *unfamiliar situations* where novelty is important.

3. **Practical Intelligence** when the components are applied to *real world settings*.

Additionally, **successful intelligence**: the ability to appropriately use all these three intelligences so that one performs in the greatest possible variety of contexts.

Howard Gardner's Multiple Intelligence See Figure for details.

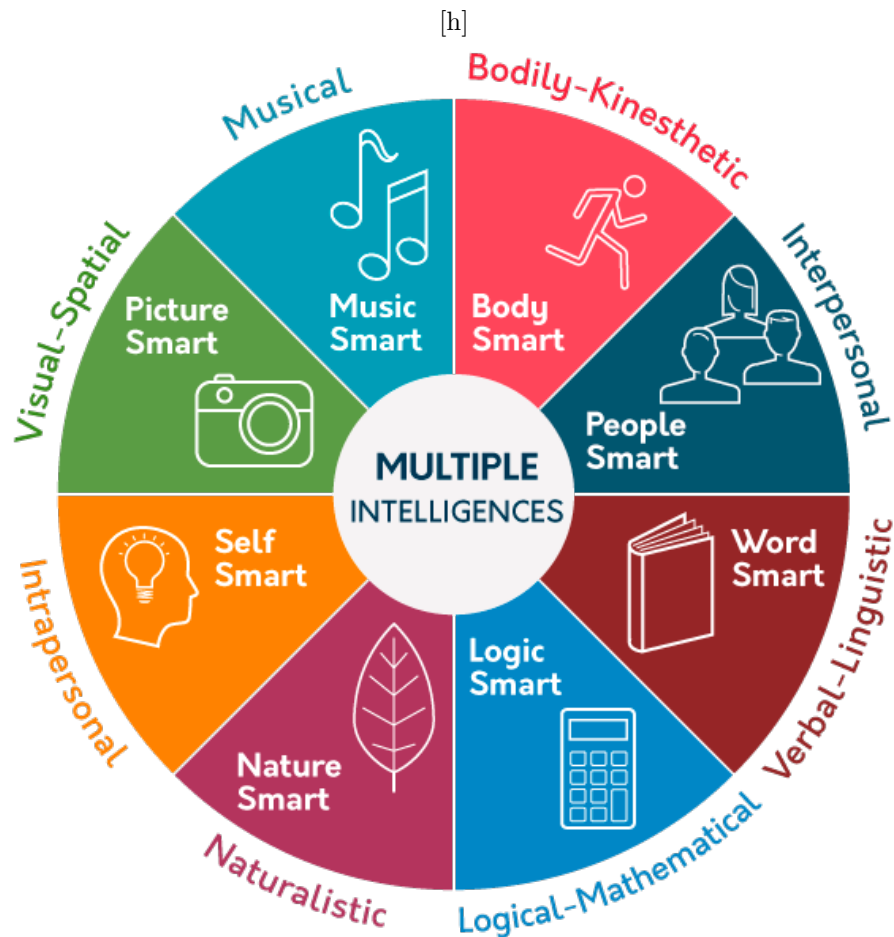


Figure 16: The Multiple Intelligence model by Howard Gardner

Cultural Intelligence Involving social learning abilities.

- Coordination of skills of attention.

- Working memory.
- Problem solving.
- Behavioural flexibility.
- Innovation.

Knowledge Illusion Thinking we know more than we do, and understand more than we do.

10.8 The biology and culture of intelligence

Genetic(nature) factors \iff **Environmental** (nurture) factors.

11 Reference

Introduction to Psychology on TopHat online course, link = <https://app.tophat.com/e/528681>.