

# PSY1101

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## Chapter 1

### Introduction

- **Definition:** study of mind and behaviour, the scientific study of how we think, behave and feel

#### A. THE NEED FOR PSYCHOLOGICAL SCIENCE

##### A.1 Limits of Intuition

- can be misleading and leads into error

##### A.2 Limits of common sense

- does not generate new knowledge
- develops as a result of learning/ knowledge
- hindsight biased ("I knew it all along")

##### A.3 Overconfidence:

- way too sure about knowledge than we should be
- more confident about our knowledge than accurate

**The Experts:** super confident, talk in facts

#### Over Confidence and the Average Person:

##### A.4 Illusory Correlation

- **definition:** tend to perceive a relationship between two variables when there is no relationship
- **examples:** superstitions such as thirteen being bad luck and black cats
- effects thinking, feeling and actions
- people tend to remember more and pay attention to any event supporting it, disregarding those that don't

## A.5 Perceiving Order in Random Events

- uncomfortable with uncertainty and randomness
- creation of rules and order that do not exist to put us at ease

## B. THE SCIENTIFIC ATTITUDE

- **curiosity**: hunger for knowledge
- **open-mindedness**: look at problem from different perceptions
  - if you are not open minded, your thinking will be rigid and inflexible
- **skepticism**: assess and evaluate evidence, ask questions
- **awareness of own bias**
- **humility**: knowing other people have good ideas, appreciate and value other people, ego out of the way

needs a balance between the two

## C. THE SCIENTIFIC METHOD

- **observation**: casual to systematic
- **theory**: helps organize observation
  - not truth or fact → it is an attempt to explain the observation, tentative
  - *hypothetical observation*
- **hypothesis testing**: relationship between two or more variables
  - follows straight scientific rules and provides operational definition (how they are measuring variable)

Optimism = seeing the glass half full

NOT observational definition

Optimism = Obtaining a score of 50 and above on the Haddad observation scale

observational definition

**Replication**: redo research for similar results

**Generate or Refine:**

## Types of Research Studies

### A. DESCRIPTIVE RESEARCH

### A.1 Purpose

- observe and describe what is observed

### A.2 Case Study:

- very detailed investigation of one person or very small group of people

#### Advantages of a Case Study:

- most in-depth research
- allow us to keep a record of rare cases
- may end up learning information about humans beings, not just who they are researching

#### Disadvantages of a Case Study:

- researchers are biased → they interpret information based on researcher
  - objective records are used to avoid this
- sample is small so it is not possible to generalize to population

### A.3 Survey (Correlation Research)

#### Population:

- when a survey is done, researchers focus on a certain population
- it is impossible to interview every single person from population, so they use a sample
- *goal: to use info from sample to generalize population*
- in order for a survey to be scientifically reliable, the researcher must have a *representative sample* (characteristics of sample must closely reflect characteristics of population)

#### How do you get a representative sample?

1. researchers use RANDOM SAMPLING
2. every member in population has EVEN CHANCE to participate in sample
3. CHANCE only decides who will be participating

**Advantages of Survey:**

- very cheap and easy
- include people that don't usually participate in scientific studies (people who can't read or write)
- only way to find information is to ask

**Disadvantages of Survey:**

- how the question is worded, gender, race, age (characteristics of person) will effect results

**A.4 Naturalistic Observation**

- researcher goes out to natural environment and does research in the real world
  - never interferes, just observes

**Advantages of Naturalistic Observation:**

- watching real behaviour in real world
- may end up noticing stuff that wouldn't be noticed in lab

**Disadvantages of Natural Observation:**

- researchers are biased
  - video, audio record, or having multiple researchers avoids this
- presence could effect behaviour of subjects
  - blend in to prevent this

**B. CORRELATIONAL RESEARCH**

**B.1 Purpose**

- allows us to determine if there is a reliable and systematic relationship between two or more variables

### **B.2 Do they Covary?**

if one variable is present, is the other one too?

if one variable changes, does the other one too?

### **B.3 If they Change, in what Direction?**

**positive correlation:** two variables change in the same direction

**negative correlation:** two variables change in the opposite direction

### **B.4 To What Extent?**

turn to correlation coefficient:  $r$

value of  $r$ : -1, 0, +1

-1 means negative correlation

+1 means positive correlation

0 means no correlation

#### **EXAMPLES:**

$r = 0.13$  ← *weak correlation*

$r = 0.59$  ← *moderate*

$r = -0.88$  ← *strong*

#### **Advantages of Correlational Research:**

- excellent first step
- great when there's no other option
- describes and predicts
- take precautions and prevent bad things, instigate positive change

**Disadvantages of Correlational Research:**

- can never infer causality

- the only research allowing to talk about cause and effect is experimental research

**C. EXPERIMENTAL RESEARCH**

**C.1 Introduction**

- only research allowing to talk about cause and effect for two main reasons:
  1. Manipulate the independent variable of interest
  2. Control all the other independent variable (known and unknown) that can effect results

**Independent Variable:** causes change in another variable; influences and effects

**Dependent Variable:** effected and changed by the independent variable

**C.2 Manipulate the Independent Variable**

- the researcher has to create at least two levels of the independent variable of interest
- one group is exposed to the independent variable (experimental group)
- one group is not exposed to the independent variable (controlled group)

**C.3 Control all other Independent Variables**

- must control all other independent variables in an experimental research
- if this does not happen, you can't be certain that the manipulation of the independent variable is what changes the variable
- the other independent variables are both known and unknown
- confounding variables

**Known Independent Variable:** variables scientifically documented to change variables which have to be controlled

**Unknown Independent Variable:** control for unknown independent variable's by doing **random assignment:**

- chance and only chance will determine who will be in the experimental and controlled group
- every subject has an equal chance of being in the experimental or controlled group

### **Placebo Effect**

- substance that is inert —> fake treatment
- getting and feeling better after taking a placebo
- if we believe a treatment will make us better, we may get better just because we believe
- no therapeutic value

### **Subject Bias:**

- What your subjects knows or doesn't know will effect your results
- **blind subject:** keep subject in the dark about most important info about the study
  - example: not telling them the treatment is a placebo

### **Researcher Bias:**

- **double-blind procedures:** subject and researcher are both blind

## **Statistical Reasoning**

### **Introduction**

- stats are essential and fundamental for research

- descriptive and inferential statistics

## A. DESCRIPTIVE STATISTICS

### A.1 Purpose

- allows to organize, summarize, and describe data in a clear, concise and understandable way
- **Histogram or Bar Graphs:** examples of descriptive statistics

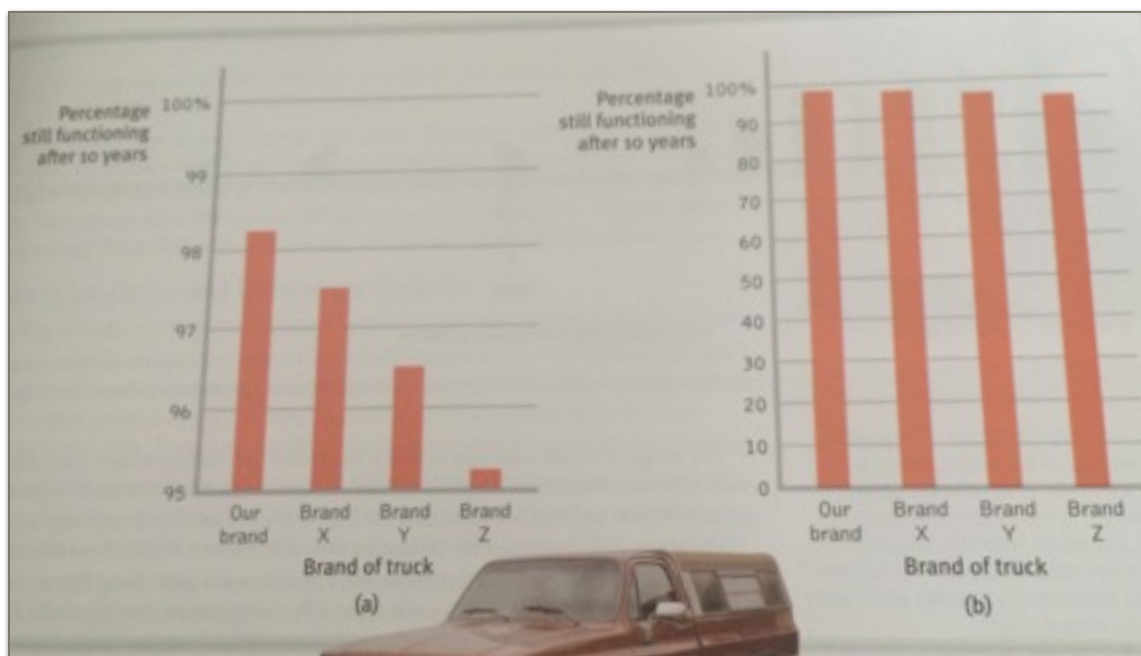


Figure 1.6

### A.2 Measures of Central Tendency

- descriptive stats that give us an idea of that typical score in data set

1. **The Mean:** mathematical average of a data set

- have to be cautious because it is easily effected
- extreme scores will artificially pull mean up or down

**2. The Median:** the score that falls in the centre of the distribution of scores, ordered from lowest

- also known as the **50th percentile**
- the median is not sensitive and not effect by extreme scores
- have to be cautious because it only takes into account one number and is not typical of the rest of the data

**3. The Mode:** most frequently occurring score in a distribution of scores

- have to be cautious because the most occurring score is not necessarily the most typical

### **A.3 Measures of Variability**

- gives an idea of the typical variation in a data set

**1. The Range:** the difference between the highest score and the lowest score in the data set

- the range may not give the typical difference of scores

**2. The Standard Deviation:** takes into consideration every single score and difference between individual scores and means

- gives idea of average difference
- the closer data sets to the mean will have the smaller standard deviation, the farther away to the mean will have a larger standard deviation

- if data sets cluster the mean then it represents the standard deviation well

## B. INFERENCE STATISTICS

- helps researcher draw conclusions from data and make inferences from data
- generalize from sample to population
- allows us to answer question: are my results statistically significant or a result of chance?
- results are considered to be statistically significant when chance is small

**P. Value:** probability that the results are due to chance

### VARIES BETWEEN 0 AND 1:

0 = probability that the results is 0% due to chance

1 = probability that the results are due to chance is 100%

$P \leq 0.005$  = statistically significant (0.05%)

## Frequently Asked Questions about Psychology

### CAN LABORATORY EXPERIMENTS ILLUMINATE EVERY DAY LIFE?

- The experiment intends the laboratory environment to be a simplified reality - one that stimulates and controls important features of every day
- a laboratory experiment lets psychologists re-create psychological forces under controlled conditions
- an experiments purpose is to to recreate the exact behaviours of every day life, but to test **theoretical behaviours**
- it is the resulting principles - not the specific fundings -that explain every day behaviours

- **THE POINT TO REMEMBER:** psychological science focuses on seeking general principles that help explain many behaviours

### **DOES BEHAVIOUR DEPEND ON ONE'S CULTURE AND GENDER?**

- culture (shared ideas and behaviours that one generation passes on to the next) matters
- shapes behaviour
- it is also true that our shared biological heritage unites us as a universal human family
- gender matters as well → differences in what we dream, how we express and detect emotions, and our risk for alcohol dependence, depression and eating disorders
- psychological as well as biologically, women and men are still very similar
- **THE POINT TO REMEMBER:** even when specific attitudes and behaviours vary by gender or across cultures, the underlying processes are much the same

### **WHY DO PSYCHOLOGISTS STUDY ANIMALS, AND WHAT ETHICAL GUIDELINES SAFEGUARD HUMAN AND ANIMAL RESEARCH PARTICIPANTS?**

- many psychologists study animals because they find them interesting
- psychologists also study animals to learn about people (we are animals)
- animal experiments have led to treatments for human diseases
- the animal protection movements protests the use of animals in psychological, biological, and medical research
- out of this debate, two issues emerge:
  - if it is right to place the well-being of humans above that of animals (varies by culture)
  - the safeguards that should protect the well-being of animals in research

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- one survey: 98% supported government regulations protecting primates, dog, and cats; 74% supported government regulations protecting for the humane care of rats and mice
- many professional associations and funding agencies already have such guidelines
- the American Psychological Association's ethics code urges researchers to (1) obtain potential participants informed consent, (2) protect them from harm and discomfort, (3) keep information about individual participants confidential, and (4) fully debrief people (explain the research afterwards)

### **IS PSYCHOLOGY FREE OF VALUE AND JUDGEMENT?**

- NOT value free
- values affect what we study, and how we interpret results; researchers value influence their choice of topics
- values can also colour "the facts"
  - preconceptions can bias observations and interpretations; sometimes we see what we want or expect to see
- popular applications of psychology also contain hidden values (value-laden advice)
- some people see psychology as common sense, others think it is becoming dangerous (used to manipulate people, etc)
- purpose is to enlighten, NOT deceive

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Chapter 2: The Biology of the Mind

## **The Nervous System**

## I. FUNCTION AND STRUCTURE

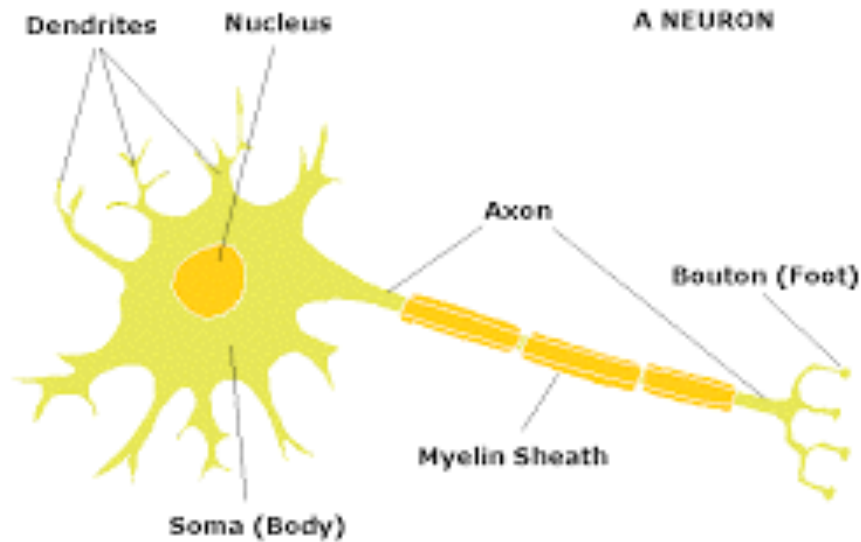
- central nervous system and peripheral nervous system (all the neurons outside the central nervous system)
- communication network
- receives information through environment and analyzes, organizes, and integrates it
- uses this info to send instructions to the rest of the body
- **conscious experience:** us being aware of ourselves and the environment

## II. NEURONS

### A. BASE FUNCTION AND STRUCTURE:

- basic building block of the nervous system
- basic unit of communication
- 3 types:
  1. **sensory neuron:** receives information from environment via the senses and sends it to central nervous system
  2. **interneuron:** found only in the central nervous system, only communicate with other neurones, most complex job —> receives information from central neurones and use info to communicate between sensory and motor neurons
  3. **motor neurons:** receive info from interneurone and send it out to muscle glands, etc

### Basic Structure:

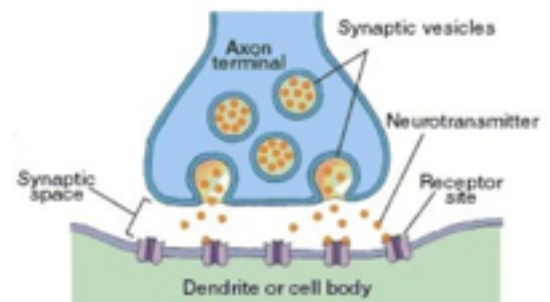


- **Soma:** cell body, where the nucleus is located, where most of the cell's organelles are located, where the cell grows, and where most of the cell's metabolic activities are carried out
- **Nucleus:** contains genetic material (DNA), controls the cell's activities, and is the site of ribosome production
- **Dendrite:** branching structures that receive signals from other neurons and pass the signals to the cell body. They take up much space, receive information from other neurons, and are covered with receptors. They do not have myelin sheaths.
- **Axon:** carries message produced by other neuron and delivers it (skinny tube)
- **Terminal Buttons (axon terminals):** release neurotransmitters
- **Myelin Sheath:** white, fatty-like substance, covers some axons, provides insulation and speeds up transmission of information between neurons
- **Synapse:** where neurons communicate with each other
- **Synaptic cleft or gap:** tiny gap in-between neurons
- **Presynaptic Neuron:** neuron sending message
- **Postsynaptic Neuron:** neuron receiving message

## B. COMMUNICATION

### B.1 Communication Within a Neuron

- the brain is 80% water
- dissolved chemicals in the water such as sodium ions, chloride ions, potassium ions



- found both inside and outside neurons, different concentrations
- concentration depends on what's going on with the neuron

**neuron at rest:**

- higher concentration ions on inside, more positive ions on the outside, electrical charge is  $-70\text{mV}$  on inside
- when the electrical charge is  $-70\text{mV}$ , it is *polarized*
- even at rest the neuron is receiving info from other neurons → this will still change the concentration

**neuron receiving inhibitory messages:**

- tells neuron to not communicate or send out messages
- change concentration to become more negative on the inside
- hyper-polarized = more negative
- when hyper polarization occurs, the neuron is less likely to send out messages

- **excitatory messages:** tells neuron to communicate and sends out messages
  - changes concentration in such a way that the inside becomes less negative (depolarize)
  - makes neuron more likely to send out messages and communicate
  - about  $-55\text{ mV} / 55\text{ mV}$  (**threshold of excitation**)

**KEEP IN MIND:** **action potential / nerve potential** are all-or-none phenomenon → every time the neuron fires, it is the same strength and travels in a domino-like effect

## B.2 Communication Between Neurons

- **neurotransmitters:** chemicals manufactured by neurons, used to communicate with other neurons
- **synaptic vesicles:** bags that contain neurotransmitters

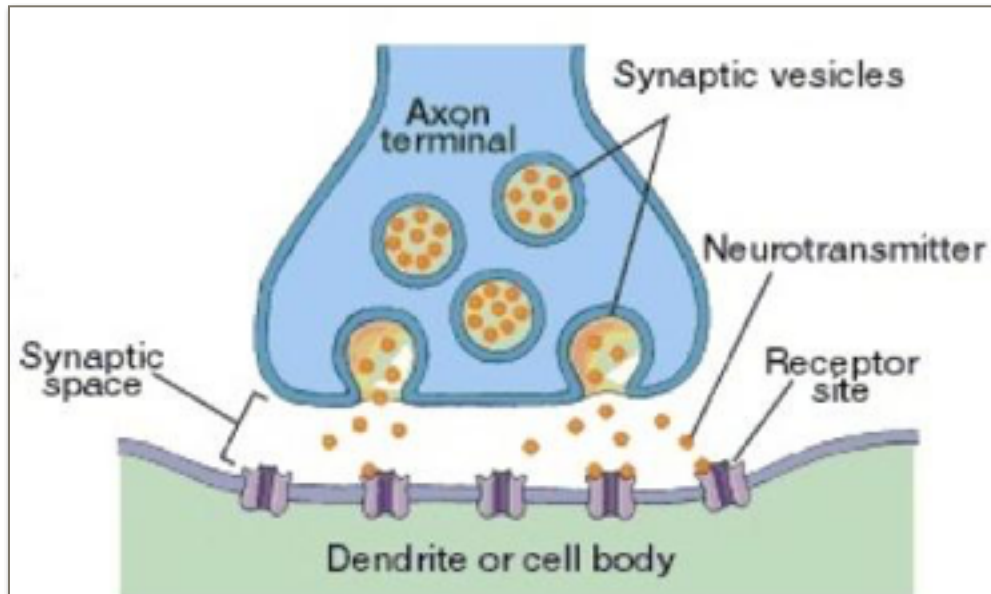
- **receptors:** structures on the postsynaptic neuron
  - neurotransmitters connect to receptor to deliver message
  - every neurotransmitter has its own receptors
- the presynaptic neuron fires, the action potential travels to terminal buttons, then the synaptic vesicles attach to membrane of terminal buttons, burst open, then release neurotransmitter
- neurotransmitter crosses synaptic gap, bind to receptor sites, and delivers the message
- either the neurotransmitter will after be reabsorbed or degradation will occur (an enzyme will come destroy the neurotransmitters)

### WHY?

If this does not happen, the neurotransmitter will stay in the synaptic gap and deliver the message over and over again which will over work or over inhibit the nervous system

### C. NEUROTRANSMITTERS

- healthy levels are fundamental and essential to function
- **Dopamine:** pleasure molecule, mood, motivation and motor function
  - low levels of dopamine are linked to **Parkinson's disease, schizophrenia**, etc.



## TABLE 2.1 AND MAIN TEXT

### D. HOW DRUGS AND OTHER CHEMICALS AFFECT THE BRAIN

- interfere with the communications between neurons at level of synapse at three levels:
  1. **presynaptic neuron:** enhance, inhibit, or reduce the release of neurotransmitters
  2. **activity in the cleft:** interfere degradation or uptake, either enhancing, reducing, or inhibiting
  3. **postsynaptic neuron** in 3 ways:
    1. **locks and blocks:** attach themselves to receptors, don't deliver any messages but blocks receptor so neurotransmitter can't deliver message
    2. **locks and mimics:** attaches to receptor and mimics neurotransmitter, sending messages
    3. **locks and enhances or dims:** attaches to receptor in such a way that the neurotransmitter can still attach, drug molecule dims or enhances message
- drugs can be of two kinds:
  1. **agonists** —> boosts, enhance, and strengthen neurotransmitters
  2. **antagonists** —> reduces or blocks neurotransmitters

### III. THE BRAIN

#### A. INTRODUCTION

- ancient greeks wanted to find out what each organ did and was not impressed by the brain

- Aristotle believed the heart controlled thinking, feeling, and seeing

## B. TOOLS OF DISCOVERY

### B.1 Clinical Observation

- oldest method, for the longest time the only method
- still used today
- observes what happens when the brain gets older, has accidents, or grows a tumour, etc

### B.2 Brain Manipulation

- the researcher intentionally interferes with the functioning of the brain, then observes to see what happens as a result
- **surgical manipulation:** to remove a piece of the brain
- **chemical manipulation:** ingest a chemical in a section of the brain
- **electrical manipulation:**
- **magnetic:** expose the brain to a positive magnetic field
- **optogenetics:** genetically engineer neurons to respond to lights, then use only light to turn on or off the neurons → only used on animals
- **sonogenetics:** use sound waves to manipulate the brain

### B.3 EEG

- put electrodes all over your head and picks up the electrical activity of the brain
- safe, non-invasive

## B.4 Neuro-imaging Techniques

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1. **CT or CAT scan:** exposed to radiation, use X-ray technology to take multiple images of the brain (structure)

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2. **MRI:** exposed to a powerful magnetic field and tissues emit electromagnetic signals that the machine picks up and computer turns these into pictures of the brain (structure)

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3. **PET scan:** tracks levels of glucose by ingesting you with radioactive glucose, creates colourful images of the brain

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4. **fMRI:** exposed to powerful magnetic field, tracks the flow of blood and oxygen in the brain (the more active the brain, the more flow of oxygen and blood), creates colourful images of the brain

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5. **DSI:** provides images of connections of neurons

## C. TOUR OF THE BRAIN

### C.1 Lower Brain Structures

#### C.1.1 Brain Stem

- spinal cord ends, brain stem begins
- **relay station:** all information has to go through the brain stem (going in or out of brain)
- *begins* analyzing info
- **cross-over point:** when the info reaches the brain stem, it crosses to the other side
  - info from the right side of body goes to the left side of brain and vice versa
- **life centre:** has structures in it that control vital functions



**Medulla:** controls heart beat, breathing, coughing, swallowing, vomiting

**Reticular formation:** arousal, consciousness, and sleep

without these you are DEAD

### C.1.2 Thalamus

- **relay station:** sensory info (except smell) is sent to thalamus, then thalamus sends it to higher areas of the brain and vice versa
- it also filters the information, highlighting what's important
- recent studies show that the thalamus directs attention to potentially significant stimuli
- regulates attention, arousal, and motivation

### C.1.3 Cerebellum

- "little brain"
- controls balance, posture, staying upright, voluntary movements and muscle tone
- responsible for us acquiring motor skills that become nature after learning (becomes automatic)
- 1/10th volume of the brain; over 1/2 of the neurons of the brain are in the cerebellum
- 20 times more connections of neurons in the cerebellum
- linked to learning and memory, language, and possibly creativity and voluntary movements
- very sensitive to effects of alcohol

### C.1.4 Limbic System

- consists of multiple structures, linked to many functions: learning, memory, emotion
- **Amygdala (two):**
  - linked and associated with emotions

- perceive emotions of other people
  - emotional memories
  - detects threatening stimuli even though you yourself may not be aware of them
- **Hypothalamus:**
- size of green pea, yet known as the “brain within the brain”
  - controls number of different essential functions
  - controls **drives:** hunger, thirst, sex
  - controls **homeostasis:** maintain internal balance within a healthy range
  - controls **endocrine system** and **autonomic system**
  - linked to pleasure centres
  - reward deficiency syndrome
  - some people’s who’s pleasure centres are sluggish turn to drugs (theory)

## C.2 CEREBRAL CORTEX

### Introduction

- last part of the brain to appear
- outer surface of the brain
- capable of higher mental functioning, adaptable and functional
- only 1/3 is visible, the rest is hiding in the grooves (nature's way of fitting more brain in our skull)

### **Glial cells or Glia:**

- outnumber neurons
- provide nutrition, insulation (make **myelin sheaths**) for neurons
- also provide protection and clean after the neurons

- researchers called them “**nannies**” of neurons
- thought they were secondary to neurons so they were neglected —> now believe they are responsible for vital functions
- essential for formation and healthy functioning of synapses
- seem to be associated with higher mental creativity, possibility creativity and knowledge

## **HANDOUT:**

We have two hemispheres: the left hemisphere and the right hemisphere

### **The Left Hemisphere:**

- received information from the right side of the body
- controls the right of the body

### **The Right Hemisphere:**

- receives information from the left side of the body
- controls the left side of the body

Each hemisphere consists of 4 lobes: **Frontal, Parietal, Temporal, and Occipital**

**INSERT PICTURE 2.23**

### **C.2.1 Primary Areas**

- primary areas are found in each lobe
- they are linked and associated with the processing of either motor or sensory information
- the primary areas are in:
  - **P. visual cortex**
    - located in the **occipital lobes** (processes visual information)
  - **P. auditory cortex**

- located in the temporal lobes (processes auditory information)

**INSERT FIGURE 2.28 2.27**

- **P. sensory cortex:**

- also known as P. somatosensory cortex
- located in the parietal lobes
- arches from one ear to the next
- receives information from the skin, muscles and joints
- processes information pertaining to touch, pain, temperature, etc

**INSERT FIGURE 2.24**

- The right part of the parietal cortex receives info from the left side of the body
- the left part of the parietal cortex receives information from the right side of the body
  
- each body part is represented in the parietal cortex
- body parts adjacent to each other (example: hand and arm) are serviced by areas from the right side of the body
  
- the actual size of a body part has nothing to do with the size of the area of the brain devoted to this part
- check the size of the area devoted to your hand compared to that devoted to the rest of your body

- **P. motor cortex (figure 2.24)**

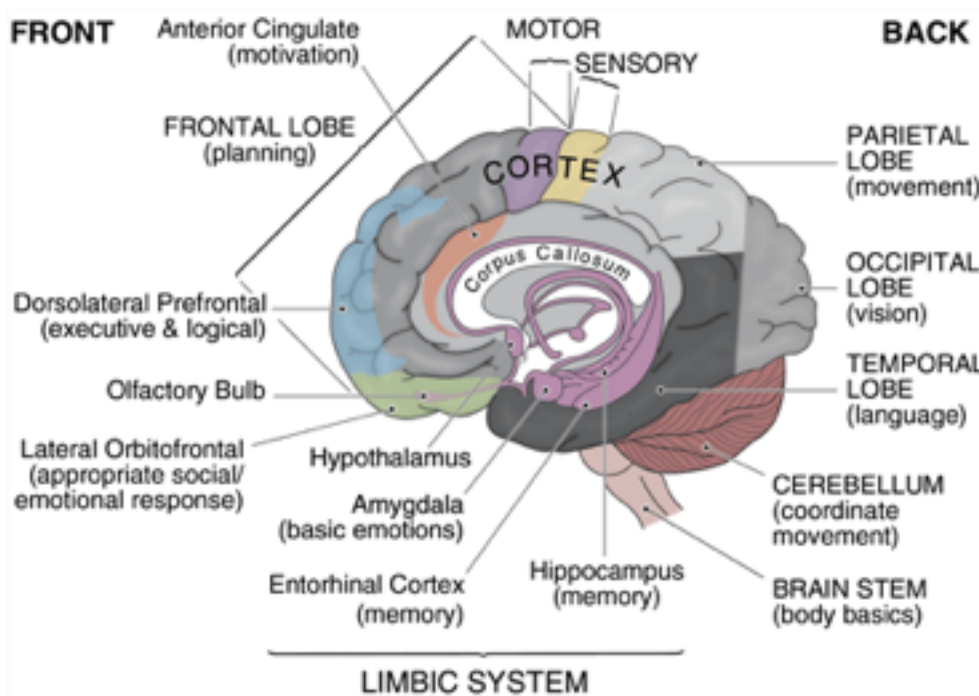
- located in the frontal lobes
- arches from one ear to the next and controls voluntary movements

- the right part of the motor cortex services the left side of the body and the left part services the right part of the body
- body parts adjacent to each other (example: hand, arm) are serviced by areas in the brain that are adjacent to each other
- the actual size of a body part has nothing to do with the size of the area of the brain devotes to this part
- check the size of the area devoted to your hand compared to that devoted to the rest of your body

### C.2.2 Association Areas

figure 2.29

- each lobe has two areas: **primary** and **association**
- **association areas** are found in each lobe and they are linked and associated with higher and more **complex mental functioning** (example: reasoning)
- the association areas are also involved in the processing of complex motor or sensory information



#### KEEP IN MIND:

The brain's lobes work in tandem to produce complex human behaviours and mental processes

### C.2.3 Brain Reorganization

#### Brain Plasticity

- brain continuously changes with

experience until it dies

### **Structural Plasticity**

- as a result of experience, an area of the brain can increase or decrease in size

- brain can shift functions from a damaged area to one that is not damaged
- increase and decrease areas of the brain functioning through experience

### **Function Plasticity**

**Neurogenesis:** formation of new neurons after birth

aerobic exercises form more new neurons

## **D. OUR DIVIDED BRAINS**

### **Functioning Asymmetry**

- while the two hemispheres carry out similar jobs, they also do different jobs and different tasks
- two hemispheres are always working together as a team

**left hemisphere = verbal**

**right hemisphere = nonverbal**

### **Split Brain Patients**

- patient who had their **corpus callosum** cut off to control severe epileptic seizures
- **corpus callosum:** bundle of **nerves/ axons** and the two hemispheres use the corpus callosum with to communicate with each other
- felt like they had two minds / brains

### **KEEP IN MIND:**

right visual field and a left visual field (not right eye and left eye)

info → RVF → LH

info → LVF → RH

### **Normal Brain:**

- when we flash info to one hemisphere, the other hemisphere will know about it (exchange info all the time)

### **Split Brain Patient:**

- when you flash info to one hemisphere, the other hemisphere will have no idea about it and its going to stay in that hemisphere only

LH → language, RIGHT body

RH → nonverbal, LEFT body

### **Split Brain Experiment:**

- flash pictures to one hemisphere and asks what they see (info flashed to right hemisphere sees nothing)

## **IV. SPINAL CORD (CNS)**

### **Highway of Information**

- all info going from body to brain has to go through spinal cord and vice versa
- anything below injury will lose contact with the brain

### **Rhythmic Movements** (walking, running, swimming, hopping, flying, etc)

- **pattern generator:** receive orders from brain and produce and control rhythmic movements

### **Reflexes**

- unlearned, involuntary movements we are born with

- essential for survival, info is processed faster than it would be if reflexes were controlled by the brain (info still goes to the brain)

## V. PERIPHERAL NERVOUS SYSTEM (PNS)

- connects the body to central nervous system and vice versa
- **main function:** to carry information from body to central nervous system and vice versa
- consists of all nerves and neurons that are outside the central nervous system
- consists of **somatic** and **automatic**

### Somatic Nervous System:

- two functions —> sensory and motor
- **sensory function:** collects info from sense and sends it to central nervous system, uses sensory neurones to do this
- **motor function:** motor neurons receive info from central nervous system and send it to skeletal muscles (muscles attached to bones that help move your body —> biceps)

### Autonomic Nervous System:

- controls glands, organs, visceral muscles (not attaches to bones, do not control them voluntarily —> heart)
- **consists of two divisions:** sympathetic and parasympathetic
- **sympathetic** arouses and prepares the body to fight or flight (take action)
- **parasympathetic** calms the body down, and conserves energy, helped the body prepare itself

### The Endocrine System

- communication network

- collection of glands, releases hormones in the blood stream

### **Hormones:**

- chemicals released by glands in the blood stream
- what the endocrine uses to communicate to the body and the brain
- 3 major classes:
  - **homeostasis**
  - **reproductive** (testosterone and estrogen)
  - **stress** (cortisol, epinephrine, adrenaline) → short term stress is good, constant stress (long term) is bad for the body and the brain → kills neurons in the brain (cortisol)

### **Nervous System and Endocrine System**

- influence and effect each other
- nervous system controls endocrine system
- endocrine influences and effects the nervous system, including the brain

### **Pituitary Gland**

- controlled by hypothalamus

## **BASICS OF SENSATION**

### **A. The Musts of Sensation**

1. **detection**: physical energy out there, limited
2. **transduction**: physical energy must be converted to language brain can understand
3. **transmission**: info must be transmitted to the brain

**Sensory Receptors**: found on highly specialized cells

- detect, transduce, and transmit
- **bottom-up processing**: start with very basic, then build up

### **B. Measuring the Senses**

- **psychophysics**: scientific study of how the characters of the physical world translate into perception
- **absolute threshold**: minimum amount of physical energy that must be there in order to detect it 50% of the time
- **difference threshold (JND)**: not enough to detect physical energy, we must be able to detect changes in physical energy
  - minimum change in order for me to detect it 50% of the time

**Webber's Law:**

- states that for an average person to perceive a difference, two stimuli must differ by a constant proportion (not a constant amount)
  - the exact proportion varies, depending on the stimulus

**Signal Detection Theory**

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- our ability to detect physical energy or change in energy is influenced by a number of different factors
- does not depend only on how strong the stimulation is (knowledge, motivation, emotions, beliefs, etc)

### **Subliminal Stimulation**

- below one's absolute threshold for conscious awareness

### **Sensory Adaptation**

- when we are repeatedly exposed to an un-harmful stimulus, our senses will detect it less or not at all
- our attention is limited so when something is harmless we disengage from it to pay attention to something more important or more harmful
- value: if we don't tune out, our sensory will crash
- **circumventing sensory adaptation:** there are instances where your body will not forget about the stimulus and adapt (adapt headaches and pain)
  - if eyes adapt and stop making small movements, stationary objects will disappear

### **BASICS OF PERCEPTION**

- **Definition:** the brain is going to take the sensory information and analyze, organize, integrate, and interpret it
- **top-down process:** use our knowledge, experience, assumptions, beliefs, etc. to interpret the stimulus

Is it possible to have sensation and no perception? YES

**Prosopagnosia:** people can see faces, but not recognize faces

Is it possible to have perception without sensation? YES

(people who take drugs, schizophrenia)

### **Influences on Perception**

- **Perceptual Set:** tendency to respond to stimuli or situation in a specific way
  - comes from past experiences, knowledge, beliefs, etc
- **Context Effects:** the context we are in will determine how we are going to interpret something

### **States of Being**

- influence and effect how we interpret stimuli and situations

## **VISION**

### **A. The Stimulus**

- there must be light
- **electromagnetic radiation** —> travels in the form of a wave
- electromagnetic spectrum
- **physical light:** only part of the spectrum we can see (400nm —> 700 nm)

**Wavelengths:** distance between two peaks

- physical characteristic and translates into the psychological perception of colour (brain translates wavelength to colour)

**Amplitude:** height of the wave

- physical characteristic that translates into the psychological experience of brightness

## B. The Eye

- light must enter your eye
- it will travel through different structures until it reaches the retina
- **retina**: made of neuro-tissues, this is where we have the sensory receptors when we have light, in the back of the eye

### FIGURE 6.13

## B.2 Retina Structure

- from innermost: rods and cones detect light
- send information to **bipolar cells** (rods and cones), then send them to **ganglion cells**  
—> bunch up together to make **optic nerve**
- sends info to the brain
- **Blind spot**: area where optic nerve leaves the eye and goes to the brain, no sensory receptors (just axons)
- **Forea**: centre of the retina, responsible for highest visual acuity

## B.3 Rods and Cones

- **photoreceptors**: detect, transduce, and transmit the light
- differ in shape, number (rods outnumber the cones by a huge number), function (rods are super sensitive to light)
- **rods**: responsible for seeing black and white and better to detect motion
- **cones**: responsible for us seeing colour, not sensitive to light
- cones allow us to see in fine details
- **differ in location**: no rods in the **forea**, found in **periphery**; cones found in **forea**
- **connections to bipolar cells**: several rods connect to bipolar cell, one cone connects to bipolar cell

## **C. Visual Information Processing (simplest → most complex)**

### **1. Retina**

- ganglion cells start to analyze information

### **2. Visual Cortex**

- **feature detectors:** highly detective cells, only respond to one stimuli (straight line, horizontal line)

### **3. Parietal and Temporal Lobes**

- **parietal:** “where” pathway → processed in such a way you can locate an object in space
- **temporal:** “what” pathway → identifies what object you are looking at

### **4. Parallel Processing**

- **serial processing:** done by consciousness, step by step
- **parallel processing:** done unconsciously, the brain will do multiple jobs at the same time

## **D. Colour Vision**

### **D.1 Young- Helmholtz Theory**

- **trichromatic theory**
- people knew we only needed the primary light colours we could perceive many colours
- therefore we need three cones (red, green, and blue)

Saturday, October 10, 2015

- while each type of cone can respond to a different number of colour, each is maximally responsive for one colour
- the brain is watching these cones to see what cones are being responsive, in what intensity and order to determine what colour we see
- if brain is watching and all cones are maximally responsive, we see white
- **minimally responsive:** we see black

## D.2 Opponent-Process Theory

### Hering

- misses concepts to above theory although he appreciates it

### Complex- afterimages

- continue to have perception after physical perception is gone
- seeing an image after looking at it

## 4 Primary Colours: RGBY

### 3 antagonistic colour system:

- RG will respond to red and green light, however responds to them in opposing ways
- if it is excited by red, it will be inhibited by green (same with BY and BW)
- brain watches all three systems to see whats excited, what's inhibited, to what intensity

## D.3 Bottom Line

- based on modern theories, both of these theories are needed to explain vision

## ORGANIZING AND INTERPRETATION

### Introduction

- **Gestalt Psychology:** find out how the brain organizes vision
- brain organizes info into a gestalt (form; whole)
- the whole may exceed the sum of its parts

### The Perceiving Brain

- does not passively perceive info
- actively interprets on info
- do not perceive the world as it is, but how your brain perceives it

### A. Form Perception

#### A.1 Figure and Ground

- figure is whatever your paying attention to
- figure and ground are constantly switching
- does not exist in physical world
- one stimulus, different perception

#### A.2 Grouping

- **proximity:** objects that are physically close to each other will appear as a single unit
- **similarity:** objects that are physically similar to each other will appear as one unit
- **continuity:** elements connected to each other will be perceived as single unit
- **closure:** some elements are missing in a scene, the brain will fill in the blanks

## B. Depth Perception

### Introduction

- how close or far it is to you
- allows us to perceive the world as 3D
- is depth perception innate or do you need to experience it?
- partly innate → visual cliff (6-14 months)
- experience is a must for depth perception
- uses two kind of cues to perceive depth (see below)

### B.1 Binocular Depth Cues

- brain uses information from each eye
- **convergence**: how much your eyes have to move in to see something
- higher the convergence, the closer the object
- **retinal disparity**: distance between two eyes therefore each eye is going to get a slightly different image
- the higher the disparity, the closer the image is perceived to be

### B.2 Monocular Depth Cues

- only need one eye
- **relative size**: image that looks larger will appear closer
- **interposition**: objects that block other objects are perceived to be closer
- **relative clarity**: the clearer and crisper an object is, the closer it appears to be
- **texture gradient**: the rougher and courser, the closer it is

## Relative Height

- objects higher in visual field will be perceived to be further away
- **Relative Motion (motion parallax):** when we are moving, stationary objects will appear to be moving to
  - stationary objects that are close look like they're moving fast and in opposite direction
- **Fixation Point:** according to Freud, a lingering focus of pleasure-seeking energies at an early psychosexual stage, in which conflicts were unresolved
- **Linear Perspective:** when two parallel lines appear to merge, areas at point will be perceived as farther away
- **Light and Shadow:** objects that cast a shadow on another object look farther away

## C. Motion Perception

- when we look at an object, it casts an image on our retina
- motion makes two assumptions: image on retina gets larger, brain assumes object move towards you; image on retina gets smaller, brain assumes its moving away

**Stroboscopic Movement:** experience when watching movie, playing video games on screen, they are not moving → brain perceives motion (flash 24 images per second)

**Phi phenomenon:** lights next to each other turned on and off in rapid succession one after the other (example: neon lights)

## D. Perceptual Constancy:

- **Definition:** allows us a stable view of the world, it is our tendency to perceive the shape, size, colour of the object remaining the same despite changes in lighting, angle, and/or size of retinal images

**Lightness Constancy:** tendency to perceive an object as remaining black, white, or grey in spite of changing in light

**Relative Luminescence:**

- explains both lightness and colour constance
- when brain assesses light coming off an object, it does so relative to the surroundings of an object, brain takes into consideration of other objects in the environment

**Size-Distance Relation:** size and distance are intertwined, brain uses size to determine distance and vice versa

**E. Perceptual Interpretation**

**E. Sensory Deprivation and Restored Vision**

- if blind at birth and suddenly can see:
  - colour, figure, and ground, motion perception is okay
  - serious problem: depth perception, shape perception, and perception of faces

**Critical Period:** period during our development where certain experiences must happen

- if not, then perception does not develop properly (vision → 0 to 6 years)

**E.2 Perceptual Adaptation (in visual)**

- ability of brain to adapt and adjust to a world that has artificially shifted or manipulated