PSYCHOLOGY STUDY NOTES

SCIENCE AND STATISTICS

- **Science** is a system founded on probabilities – does not result in ultimate truths
- Scientific theories are the best we have at any given time. They are the closest approximation to the truth. Science is self-correcting – it is a field that rewards criticism and disproving
- **Pseudoscience** – any of various methods, theories or systems that present themselves as scientific but are considered as having no scientific basis
- There are questions beyond the grasp of science
- Generally, if something can be tested with an experiment, it is scientific
- Other realms of debate such as morality cannot be tested by experimentation
- Science and religion are non-overlapping magisterial – not in conflict because they ask and answer different questions
- Different ways we **acquire knowledge**:
    - Revelation (revealed knowledge) – learned, told what to believe
    - Intuition, emotions, opinions – self-taught, self-realised, learned
    - Science – sometimes in conflict with our opinions and revealed knowledge
- Science's strength arises from its collection of knowledge and the expert scientists who understand that knowledge
- Key strength is the process – the scientific method and the attitude of science
- **Logical fallacies:**
    - Appeal to authority – if you believe something is true because someone very important said it or endorses it
    - Ad hominem – attacking the person instead of their claim / argument / evidence
    - Argument from antiquity – believing something is true because it has been known for a long time
    - Appeal to ignorance – if you are not certain about your argument, then mine must be true
    - Begging the question – assuming an answer in the way the question is phrased
    - Observational selection – counting the hits and forgetting the misses
    - Slippery slope – unwarranted extrapolation of the effects – one step in that direction and you wont be able to stop
    - Confusion of correlation and causation – since two things go together, one must have led to the other
    - Straw man – caricaturing (or stereotyping) a position to make it easier to attack
    - Weasel words – use of euphemisms and misleading terminology
    - The pragmatic fallacy – something is true because it works
    - Excluded middle – considering only the two extremes in a continuum of intermediation possibilities
- Science operates with an assumption that the current understanding is imperfect – science is all about criticism and progress
- Science never actually makes conclusions about possibilities, only about probabilities
- **Open-mindedness** – considering everything, but evaluating it before accepting (filter the evidence)
- Accepting everything before evaluating it is **blind credulity**

- **Construct** – an idea or theory often expressed as a single word, but containing lots of assumptions and conceptual relationships e.g. ecosystem
- A **conceptual definition** of a construct involves describing a construct in terms of what it is and what it is not and how it might relate to existing theories. It also requires consideration of how theoretically useful a construct is
- Scientific constructs are better approximations of reality, because they are more accurate and they arise from a more accurate understanding of the world
    - They need to be as clear as possible because we use them to make predictions
- The things psychology wants to measure are very hard to measure and may not even be real
- **Reification** (is a logical error) – to convert into or regard as a concrete thing – "to reify a concept"
- Reification occurs when a purely analytic or abstract relationship is treated as if it is a concrete entity
- **Vitalistic vs. scientific thinking about "energy"**
    - Vitalistic – healing, living, purifying, dying, growing, in motion, an emotion, good, bad etc.
    - Scientific – energy can manifest itself as heat; energy can be a physical capacity for doing work etc.
- When conceptually creating constructs one must consider **falsifiability** (can be assessed and measured and therefore disproven)
- Constructs, theories and individual predictions can all be **un-falsifiable**, meaning that no progress can be made and they are arguably beyond the realm of science
- **Pragmatic fallacy** – something is true because it works
- **Efficacy** – the ability to produce a desired or intended result
- Freudian example – some of Freud's theories are fascinating yet difficult to falsify – Freud's research has contributions to science but also has a lot of criticism
- Psychology cannot afford to be vague or equivocal when we want it to progress as other sciences do
- Previous research and current, well supported theories, must be taken into account when proposing new theories or seeking to establish new constructs – new scientific knowledge is constrained by existing knowledge

- An **operational definition** of a construct is an explanation of how that construct might be measured. How a construct is operationalized might depend on which aspect of the construct is important to particular research. An operational definition involves finding a way in which the construct can be observed
- Some **psychological constructs** are difficult to measure and some may not even be real e.g. consciousness
- **Self-report** measures are often used in psychology but have flaws
    - Do you have direct insight into yourself?
    - Self-reporting can be manipulated by the individual managing their social impression

- **Anecdote** – interpreted stories about a single occurrence – sample size of one, built-in bias:
    - There is no separation of theory and evidence – the theory is supported by the only evidence which is mentioned, and the only evidence which is mentioned is in there to support the theory
    - Anecdotes can change with retelling
    - Because they are a single instance or observation they cannot be replicated (un-falsifiable)
- **Case studies** and significantly more systematic because they arise from an earnest attempt to understand (scientific humility) and ALL details are recorded in a scientific manner
    - Small sample size
    - Unbiased recording or ALL information – there is no pre-judged or pre-determined point of view – open-mindedness
    - Qualitative observation
    - Objective nature of recordings means that alternative explanations are possible later – irrelevant clues become relevant as an after thought
    - Often the only way to study extremely rare disorders and conditions in psychology
- **Correlational studies** occur when at least two variables are measured from each case/person with a view to calculating a relationship between the variables
    - Measurements are simple taken, nothing is manipulated or controlled
    - Difficult to know the direction of causation or even if there is evidence of causation
    - Scatterplots and gradient lines can visually represent the relationship – the correlation is a description of how the points of data are grouped
- Correlation coefficients used to mathematically represent the relationship
    - Sign (+ or –) – indicates the direction of the relationship (slope on a graph)
    - The number indicates the strength of the relationship (magnitude – how clustered the points are)
    - P – the parameter (population value) of a correlation
    - r – the statistic (sample value)
- A **control condition** is the first essential requirement for inferring causation – it exists to rule out other causes
- If changes/differences can be measured in the **experimental condition** which has only 1 unique, carefully controlled feature, and those changes are not found in the control conditions, then you begin to attribute the changes to the unique manipulation
- The **control group** consists of the subjects who do not receive any special treatment
- An **experimental group** consists of the subjects who receive some special treatment in regard to the independent variable
- **Independent variable (IV)** is usually the presumed cause and is manipulated by the experimenter. Manipulation is the changing of the variable – present/absent, absent/level 1/level 2 etc. OR manipulation is control over a variable such that participants can be randomly allocated to levels of the variable.
    - An independent variable is a condition or event that an experimenter varies in order to see its impact on another variable
- **Dependent variable (DV)** is what will be measured by the experimenter to see if the independent variable has had an effect – it is simply measured, the experiment has no control over it
    - The dependent variable is the variable thought to be affected by manipulation of the independent variable
- **Random allocation** occurs when participants in a study arrive at the study not belonging to any level of the independent variable and can be given/administered or placed into a level/condition of the independent variable by a random process. Complete control over the independent variable to be randomly allocated is necessary
- **Correlation study –** observing correlation between two or more variables. There is no control over any variable. Technically all variables are dependent variables although something might be considered an independent variable if it is the presumed cause
- In a **true experiment** all independent variables of interest are controlled and able to be randomly allocated
    - A strong causal inference can be made
    - The only variation which is not cancelled out by random allocation is the systematic difference between levels of the independent variable
- In a **quasi experiment** at least one key variable of interest cannot be randomly allocated, but others can
    - In a sense it is a study involving pre-existing groups – meaning there are confounds which weaken any causal inference
    - Cannot say with certainty what caused a difference
    - Quasi experiments are the most common kind of research design in many fields of Psychology
    - Informally means "not quite an experiment"
    - Flagged by the use of matching or the fact that it involves random allocation of some variables but not others

- **Matching** involves trying to equate your pre-existing groups with a control group in order to rule out systematic differences caused by that variable
    - You have to think ahead to all the possible alternate explanations for the differences and rule them out one by one
- Controlling variables
    - As control increases the study becomes more artificial
    - As control decrease the study loses its validity?
- Almost every independent variable psychologists are interested in are impossible to randomly allocate and this is why quasi experiments are the most common research design
- **External validity** is the extent to which findings from the study can be generalised to the population. Can depend on:
    - Sample size
    - How the sample was chosen – random sampling, self-selection, is there bias?
    - How variable the effects being studied are – if the effect varies very little between individuals a large sample might not be needed
- **Internal validity** is the extent to which changes in the dependent variable can be attributed to changes in the independent variable. If a strong causal inference can be made, internal validity is high. True experiments have very high internal validity and correlational studies have very low internal validity
- In some cases, studies brought away from the real world into carefully controlled laboratory settings internal validity is increased at the cost of external validity
- **Blindness** is essential in research because bias can completely undermine the results of the study. Blindness refers to the participant being unaware of which condition they are administered to. Ideally both researchers and participants should be blind to which condition is being administered; this is **double blind**
- **Replication** is when the same findings are found by an entirely independent party following the method you followed – other scientists should be able to copy your study and find the same things eliminating fraud and sampling errors

- Science is good at – close approximations of reality and answering questions without prompting more
- Science is bad at – what we ought to do, should be doing and the meanings of these things e.g. morality
- **Descriptive statistics** are used to summarise a collection of data
- Graphs which summarise data – frequency distribution, histogram, frequency polygon
- The descriptive statistics we most often use either measure the **central tendency** or **variability** of scores
- Measures of central tendency:
    - **Mode** is the most common score
    - **Median** is the middle score
    - **Mean** (or average) is like the balance point of a distribution of scores
- **Symmetrical distribution** – the mode, median and mean are the same
- **Asymmetrical distribution** – is more common for raw scores and happen because the distributions have a **positive skew** or **negative skew**
- The shape of a distribution affects how good a measure of central tendency the mean, mode and median are
- The descriptive statistics that describe **variability** attempt to capture this overall spread of scores as s single score. The simplest measure is **range** – the difference between the highest and the lowest score
- You have a set of scores, count the number of scores (N) and calculate the mean. Then subtract the mean from the raw scores to get the deviation scores. Square the deviation scores and get the total. Divide this total by the number of scores (N), this gives you the **variance**. Square root the variance to get the **standard deviation**.
- An **experimental hypothesis** is a prediction of what will happen in your study. It should be derived either from the previous literature and findings, or from a theory that allows for specific predictions to be made. Predictions must be specific to be effective, vagueness can result in unclear results
- **Confirmation bias** – the tendency humans have to only ever look for evidence which confirms what they believe
- A **null hypothesis** is a construct we use in inferential statistics to help us overcome all our natural tendencies to avoid testing what we currently believe. The null hypothesis is a (usually very specific) statement of what would be the case if nothing is happening, if there is no effect - disproving a hypothesis of no effect asserts that something IS happening.
    - If you can disprove the null hypothesis you can **reject** it and say that you have found something
    - If you cannot find evidence inconsistent with the null hypothesis you must **retain** it
    - **Retaining** a null hypothesis is very different to **accepting** it – retaining means there is no evidence as of yet that can disprove it (there is no loyalty or even respect), accepting it means that you think the null is correct?

- More variability = higher standard deviation and vice versa
- 'Tails' are the small ends of skewed distributions
- When raw distributions become sample distributions, the height of the line above the axis tells us the likelihood or probability of obtaining a sample mean of that value – more likely at the peak, less likely at the tail
- Human behaviour varies and these independent differences that make measuring complex. This inconsistent behaviour, inexact measurement and constructs create **noise** in almost any psychology experiment
- **Inferential statistics** work by taking a sample from a population and running a study on that sample. We obtain differences/findings/effects in that sample and then we ask: **Can we infer from the differences/findings/effects in our sample, that there are differences/findings/effects in the population?** In other words, is the difference found in the sample indicative of a difference in the population?
- Sampling variability alone can cause effects in a sample

- The ultimate objective of inferential statistics is to be able to say something like – "**on the basis of what we observed in our sample, we can make this conclusion about the population**" – this means trying to draw generalised conclusions/theories from the sample that are applicable to the population
- When trying to establish if an effect is real, measures of central tendency are no longer as informative
- A distribution of raw scores is based on a real set of data
- **Sampling distribution** – the same study, of a particular sample size, is repeated a million times. Each time the entire study is repeated, a single sample mean is produced. A frequency distribution of those means is a sample distribution.
- A **sampling distribution** is a hypothetical distribution based on a hypothetical set of sample means. The shape of a sampling distribution tends to be normal (symmetrical?)
- The standard deviation of these means is called **standard error**
- The peak of the sampling distribution is the **population mean**
- Inferential statistics aims to calculate the probability of obtaining the result/sample mean you did, if the null hypothesis is true – if the probability is very low, you may have found something
- Approximately two thirds of all scores in a normal distribution fall within one deviation of the mean
- We usually decide something interesting is happening when there is less than 5% chance that we obtained the result we did by chance – calculating a distance from the hypothesised null mean in standard error units
- **P-value** is the actual probability of obtaining a sample value of a particular magnitude
- P-values vary between 0 and 1 and express probability – the probability we obtained the sample mean we did when the null is true by chance alone
- Researchers want to obtain low p-values because it suggests their null hypothesis is false and that they have found something
- **If the p-value is less than 0.05 we reject the null hypothesis. If the p-value is greater than 0.05 we retain the null hypothesis**
- <0.05 = statistically significant

- Critical cut-off convention (decision rule) is to reject the null hypothesis when there is less than 5% chance our result is due to chance, that implies **we will make an error 5% of the time**
- **Type 1 error** – the null is true and rejecting it is the error
- **Type 2 error** – the null is false and retaining it is the error
- As you reduce one error, the other grows
- **Statistical power** is the probability of correctly rejecting a null hypothesis which is false
    - The sensitivity of an experiment
    - The likelihood it will detect a real effect
- You never know the power but it can be estimated. Factors which affect power:
    - Variability of the effect (**more variability = low power**)
    - Size of effect (**large effect = high power**)
    - Sample size (**larger sample size = more power**)
- We have a lot of control over sample size and so it is usually what we use to control the power of the study.
    - Too little power caused by too few participants – study is not sensitive enough to detect an effect of importance
    - Too much power caused by too many participants – study is too sensitive, might find tiny effect of no practical significance
- Pr**actical significance is determined by the size of an effect and its application** – is it useful?
- Science operates via probability based decisions – does not claim or focus on certainty (humility)
- **Appeal to ignorance** (argument from ignorance) involves thrusting an assertion into a region of uncertainty
- **False dichotomy** – fairness of debating BOTH sides
- **Denialism** implies a broader rejection of a series of claims or an entire body of evidence and theories

PSYCHOLOGY STUDY NOTES

EMOTION

Emotions have 3 components:
- Cognitive (subjective conscious experience) – how we feel, difficult to measure – mixed emotions
- Physiological (bodily arousal) – sweating, shaking, body language
- Behavioural (overt expression)

Evolutionary perspective of emotion
- **Charles Darwin** and the role of emotion in evolution and natural selection
    - Emotions allow you to respond flexibly to survive
    - **Ontogeny** – development of an individual organism – biologically, growth of a human from infantry to adulthood
    - **Phylogeny** – evolution of a species
    - Shared evolutionary process could extend to emotion
    - Emotions good object for natural selection
    - We are biologically built for emotion
    - Innate reaction to certain stimuli e.g. happy = smile
    - Darwin emphasised continuities between human being and non-human primates
    - Basic emotional expressions are innate, they are produced and recognised automatically
    - Darwin pioneered the careful observation of facial expression of emotion including those of human infants and blind children
    - Emotions are expressed physically in the same way as all humans and some primates
    - Darwin's observational studies of infants and blind children found that infants are able to produce facial expressions to communicate their distress (crying) – this is a survival technique as others can recognise a distressed expression and help
    - Humans and primates can produce and recognise facial expression automatically
    - Darwin fundamentally changed the ways in which emotions would be conceptualized
    - Darwin grounded emotion in our evolutionary history and drew strong parallels between different species regarding the functions and adaptive value of emotional expression
    - **Darwin's theory of emotion** – general principles of expression: **serviceable associated habit** (example furrowing the brow, which is serviceable to prevent too much light from entering the eyes), **antithesis** (opposite emotions are made to look very different so that others are able to differentiate emotions) and effects of the nervous system (involuntary physiological reaction – screaming when in pain)
        - Example of antithesis in dogs – aggression (dominance) vs. submission (passive)
    - Darwin's work provided a framework for subsequent emotion research that is still influential today
- Opposing view to Darwin's – emotions are socialised and learned, taught to us by our culture, observations
- **Duchene** – focused on how a body is put together e.g. muscles
    - Duchene smile = genuine smile
    - Used electric stimulation to determine the facial muscles responsible for different facial expressions
    - Studied the organisation of facial muscles and found that we are predisposed to produce facial expressions

Are there basic emotions?
- we are born with innate emotions, universally felt and recognised
- **Eckman and Friesen**
    - Endeavored to show that certain emotions are universally recognised and understood to signify the same psychological state of the individual
    - Western civilization's influence on other cultures (media) posed a problem – resolved by going to Papa New Guinea where a lot of the towns are isolated by the geography of the country
    - Showed images of Caucasians expressions of emotions and asked Papa New Guineans to distinguish between then
    - **Papa New Guineans able to recognise emotions automatically, showing a remarkable continuity of emotional production and recognition across cultures**
    - There was some difficulty distinguishing surprise from fear
    - Happiness is the easiest emotion to recognise, possibly because of its passive non-threatening nature
    - Provide good evidence for universal recognition and universally shared understanding of certain basic emotions
    - Examined the possibility that contempt is a pan-cultural emotion – predicted that it was not because it is not observed in other primates, it is a fairly new emotion, it doesn't involve bilateral facial actions
    - Contempt (expressed as tightening and slightly raising corner of lip unilaterally was universally recognised (10 countries) and was more often recognised unilaterally than bilaterally
    - Conclusion – basic emotions are:
        - Happiness
        - Anger
        - Fear
        - Sadness
        - Disgust