CAIE Psychology A-level

Research Methods

Notes

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Variables

Variables	• describe what is meant by an independent variable and a dependent variable • identify independent variables and dependent variables in studies • understand what is meant by 'operationalisation' • operationalise: – an independent variable – a dependent variable • apply knowledge of variables to a novel research situation

Experiment: An investigation looking for a casual relationship in which an independent variable is manipulated and is expected to be responsible for changes in the dependent variable.

Independent variable: The factor in an experiment which is manipulated to create two or more conditions (levels) and is expected to be responsible for changes in the dependent variable.

Dependent variable: The factor in an experiment which is measured and is expected to change under the influence of the independent variable

Extraneous variable: A variable which either acts randomly, affecting the DV in all levels of the IV or systematically i.e., on one level of the IV.

Operationalise: To make the hypothesis testable and measurable.

- Ensure you have written your variables in your hypothesis in a way that someone else can read and repeat your experiment

Hypothesis and Aims

Hypotheses and aims	• recognise and write aims and directional (one-tailed) and non-directional (two-tailed) hypotheses and null hypotheses

Hypothesis: A testable statement of what the researcher predicts will be the outcome of the study.

Aim: Usually starts with 'to investigate', the aim of a study is a statement of what the researcher intends to investigate.

Directional hypothesis: A one-tailed directional hypothesis predicts the nature of the effect of the independent variable on the dependent variable.

Non-directional hypothesis: A two-tailed non-directional hypothesis predicts that the independent variable will have an effect on the dependent variable, but the direction of the effect is not specified.

Null hypothesis: There is no relationship between the two variables being studied (chance) (H0).

Alternative hypothesis: There is a relationship between the two variables being studied (significant in terms of supporting the theory being investigated) (H1).

Falsification: The action of falsifying/ proving a theory or piece of information to be wrong.

Experiments

Experiments	• describe the main features of each type of experiment – laboratory – field – natural • evaluate each type of experiment, in terms of: – reliability – validity – ethics • evaluate the use of experiments in psychological research, including the use of experimental and control conditions • apply knowledge of experiments to a novel research situation

1. **Laboratory Experiment:** An experiment conducted in an **artificially controlled environment**. There is usually a standardised procedure. The researcher manipulates the IV to see what effect it has on the DV.

- There are strict controls over EVs.
- Participants are aware that they are taking part in a study thought they may not know the true aims.
- Looking for cause-and-effect relationship.

Strengths
- High control over extraneous variables means you can make statements about cause and effect and therefore increase **internal validity**.
- Replication is possible due to standardisation, which means you can test if the findings are **reliable**.

Limitations
- The lab environment may be artificial which means we may not be able to generalise the findings to real-life situations (**low ecological validity**).
- The task can be artificial e.g. memory test so it may **lack mundane realism.**
- People know they are being tested and therefore pick up cues from the environment and change their behaviour (**demand characteristics**). This **lowers internal validity**.

2. **Field Experiment:** An experiment conducted in a **more natural environment** - anywhere outside a lab where the investigated behaviour could naturally occur. The researcher still manipulates the IV to the what effect it has on the DV

- The IV is still deliberately manipulated by the researcher but participants are not aware that they are participating in a research experiment

Strengths
- The environment is natural so there is normally **higher ecological validity**.
- The participants do not normally know they are in an experiment and therefore there is a **reduction in demand characteristics.**

Limitations
- There is **less control of extraneous variables** so cause and effect are more difficult to establish. This can **lower the internal validity**.
- There can be **ethical issues** if participants are unaware that they are being studied (e.g. lack of informed consent).

3. **Natural Experiment:** Experiments that are generally conducted in every day (real-life) environments. The experimenter has no control over the IV as it occurs naturally in real life.

- They are more common where the researcher cannot ethically manipulate the IV eg. natural disaster or size of a family

Strengths

- They **provide opportunities** for research that might not otherwise be undertaken for practical or ethical reasons. They offer unique insights.
- They often have **high ecological validity** because they study real-life events.

Limitations

- It can be **difficult to establish causality** (cause and effect) due to the lack of controls.
- A naturally occurring event may happen very **rarely**, reducing the opportunities for research.
- Participants may **not be randomly allocated** to conditions. This means you cannot be sure that the IV is affecting the DV and reducing validity.

4. **Quasi** (not on specification): When the IV is naturally existing in the person/ The researcher cannot manipulate IV.
   - Cannot randomly allocate therefore it is not a 'true' experiment.
   - The IV naturally exists in the person e.g. Down Syndrome/ autism/ neurotypical.

Strengths

- They are often carried out under **controlled conditions** (the same strengths as lab experiments).

Limitations

- The participants cannot be randomly allocated to conditions. This means that there may be **participant confounding variables.**

Experimental Design

Experimental design	• describe and evaluate experimental designs as used in psychological research (independent measures, matched pairs and repeated measures) • apply knowledge of experimental designs to a novel research situation, including counterbalancing, random allocation, order effects (fatigue and practice)

Design type	Description	Evaluation	Fixing problems
Repeated measures design	**Each participant takes part in BOTH conditions. They are selected for BOTH groups.** - A researcher recruits a group of participants - They would all complete condition 1 and 2	**Advantage:** - **Participant extraneous variables are controlled for** (reduced but never fully eliminated) - **Less participants needed** as they appear in both conditions **Disadvantage:** - **Order effects:** this is an extraneous variable where the **order in which conditions of the**	Order effect are a big problem - counterbalancing is a method to reduce the impact of order effects Example: Half do A while the other does B and vice versa. Sometimes referred to as ABBA effect

		experiment affects the results eg. practice effects or fatigue effects - **Demand characteristics:** a cue that **makes participants unconsciously aware of the aims of the study** or helps participants work out what the researcher wants to find and this causes them to change their behaviour	
Independent groups design	**Each participant takes part in ONE condition only. They are selected for ONE group only.** - Researcher recruits a group of participants - The participants are then divided equally into two groups through **random allocation** - One does one and the other does the other - only taking part in one condition	**Advantage:** - **Order effects are reduced** as participants only taken part in one condition - **Demand characteristics are reduced** - less likely to guess the aim **Disadvantage:** - **Participant extraneous variables between groups lower the internal validity of the study** - **Less economical** than repeated measures as you need twice as many participants	Random allocation - used to try and combat the problem of participant variables The researcher is required to have no impact on which participant goes where: 1. Manual/ lottery method 2. Electronically
Matched pairs	**Each participant takes part in ONE condition (group) only, but the participants are matched on variables considered relevant** (e.g. age, gender, IQ) - Researcher recruits a group of participants - **Match the p on specific variables** eg. age or IQ - Ex. a grade girl in the morning so they need a grade girl in the afternoon - one of the pair will go into condition a and the other in condition b	**Advantage:** - **Participants only take part in one condition** - order effects and demand characteristics are reduced - **Participant extraneous variables are reduced** (not eliminated) **Disadvantage:** - Although there is a decrease in the P variable, **the participants cannot be truly matched** - **More time consuming** thus less economical - More **difficult** to do and might have to recruit extra people	Restrict the number of variables to match on makes it easier eg. gender

Control of Variables

Controlling of variables	• describe how psychologists can control variables in a study • understand the difference between controlling variables and standardisation of a procedure, including extraneous, uncontrolled, participant and situational variables • apply knowledge of controls to a novel research situation

In psychology when conducting experiments we have to make a trade-off between control and realism.

Aronson and Calsmith (1968) introduced **the concept of mundane realism as a potential threat to external validity (ecological validity).**

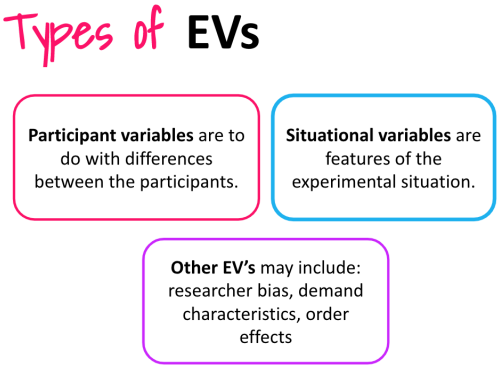
Experimental realism refers to whether an experiment has a psychological impact and 'feels real' to a participant and is a threat to internal validity

- **Laboratory experiments** have the highest control over **extraneous variables** but have the least amount of realism.
- It is good to have high control as this means that you can establish **cause-and-effect** relationships (causality).
- However, unless you conduct a study that has high realism then you **may not be able to generalise the findings** to real situations and environments.

Research should be a **cyclical process** whereby we see the findings in the lab experiment and then we test them in the real world. They need to be found in the lab first where it is highly controlled and we can establish causality.

Assessing Validity

- The time of day becomes a **situational confounding variable** if it has an effect on the results.
- **Confounding variables:** Any variable other than the IV, that has not been controlled and therefore may have had an effect on the DV, **lowering the internal validity of the study**.



Demand Characteristics: Any cue that may be interpreted by participants as revealing the purpose or aim of the investigation. This may lead to a participant changing their behaviour within the research situation.

- Impacts the internal validity (construct validity).

Please you effect
Participants may try to please the researcher by doing what they have guessed is expected of them.

Screw you effect
Participants may try to disrupt the results by doing the opposite of what they have guessed is expected of them.

Possible cues resulting in demand characteristics:

- The actual communication during the study: the instructions and any implicit clues from non-verbal communication.
- What the participant may already have heard about the study (for example, from other participants).
- The way the participant is approached initially and asked to volunteer.
- The type of person that the researcher is: whether, for example, he or she is formal or relaxed and so on.
- The setting of the study.

Investigator Effects: Investigator effects are where a researcher (consciously or unconsciously) acts in a way to support their prediction. This can be a particular problem when observing events that can be interpreted in more than one way

- It might lead to the participant fulfilling the investigator's expectations.
- These are where the investigator may **operationalise the measurement** of variables in such a way that the desired result is more likely.
- The investigator **loose procedure effect** is where an investigator may not clearly state the standardised instructions properly which leaves room for the results to be influenced by the experimenter.

Ways to control these extraneous variables

1. Random allocation: Each participant has the same opportunity to be assigned to any given group, so individual differences in responses or ability are far less likely to consistently affect results.
    a. This helps control participant extraneous variables
2. Standardised procedures: There will normally be an attempt at a standardised procedure for each experiment.
    a. This allows for replication to determine the reliability [consistency] of the results
    b. This helps control the validity [limit in situational extraneous variable increases the internal validity]
3. Randomisation: Presenting any stimuli in an experiment in a 'random' manner to avoid it having an effect on the DV. It reduces the chance of practice effects becoming a confounding variable.
    a. Example: Randomly choosing the order of words in a memory recall experiment
    b. This helps control situational extraneous variables
4. Single blind test: when the participant does not know which condition of a study they are in
    a. Example, placebo drug or non placebo
    b. This helps reduce demand characteristics
5. Double blind test: when neither participant nor the investigator know which condition the participants are in
    a. Example, neither investigator nor participant know about placebo vs non placebo
    b. This reduces researcher bias or investigator effects

Reliability and Validity

Why is it important?

- Good psychology has to be both reliable and valid in order for people to trust the results
- Particularly important for psychology:
    - Constructs that are studies may be abstract and hard to define
    - We use operational definitions

    - People disagree on the best way to measure certain constructs
- Applies to the methodology used and the effects observed:
    - Methodology: design, measures and procedures
    - Effects: the pattern of results

Reliability: The extent to which something is consistent.

Reliable methodologies will produce the same (or very similar) results each time they are used with a particular sample of individuals e.g. diagnostic test for depression.

Reliable effects are *replicated* across a number of different studies and individuals e.g. the Stroop effect.

Measures of reliability:

1. Test-retest reliability: This measures test consistency,i.e. the reliability of a test measured over time. Example: if a person completes the same test twice at different times, are the scores the same?
    - Two tests correlation coefficient of 0.8 or above -> we can assume the test is reliable
2. Inter-rater/ observer reliability: inter-rater reliability is the degree of agreement among raters
    - 0.8+ high correlation between the observers/ raters -> measure is reliable

Validity: Refers to the extent to which something is measuring what it is claiming to measure.

Valid methodologies: Measure the construct that they are intended to measure e.g. does you aggression questionnaire really measure aggression?

Valid effects: Can be attributed to the independent variable i.e.. they are not produced by confounding variables.

Types of Validity:

1. Internal validity: Refers to the extent to which a study establishes a cause-and-effect relationship between the IV and the DV. How much are extraneous variables being controlled for?
2. Construct validity: Refers to the degree to which a test measures what it claims, or purports, to be measuring, e.g. how effectively does a mood self-assessment for depression measure the construct of 'depression'.
    - Affected by demand characteristics
3. Concurrent validity: This asks whether a measure is in agreement with a pre-existing measure that is validated to test for the same (or a very similar) concept. This is gauged by correlation measures against each other.
    - E.g. does a new test measuring intelligence, agree with an existing measure of intelligence?
4. Predictive validity: The degree to which a test accurately predicts a criterion that will occur in the future.
5. Face validity/ logical validity: A simple form of validity where you apply a superficial and subjective assessment of whether or not your study or test measures what it is intended to measure.
6. External validity: Generalisability, refers to the extent the results can be generalised to other settings.
    a. Ecological (setting)
    b. Population (people)

Population validity

- Cultural bias
  - Individualistic: people from individualistic cultures place importance on themselves rather than the group
    - Generally people from western cultures live in a individualistic society
  - Collectivistic: importance placed on the group rather than their own individual needs
    - Generally eastern cultures

Yuki = people from individualistic and collectivistic groups judge emotions differently // collectivists focus more on the mouth while individualistic focus on the eyes

c. Temporal (time)

Making generalisations:

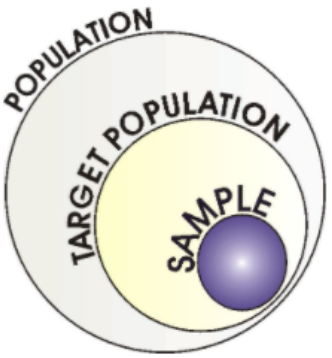
Generalisation focuses on the similarities between humans and take a **nomothetic approach** (one that focuses on the common features shared by human beings) to psychology rather than an **idiographic approach** (focusing on what makes each of us unique)

A benefit is that we can predict how people are likely to behave in a particular situation.

Sampling Methods

The target population is the group of people the researcher wants to study. They cannot study everyone thus they have to select a sample.

- A sample is a small group of people who represent the target population and who are studied
- It is important the sample is representative of the target population



How do we obtain our sample?

Random sampling: A sampling technique in which every member of the target population has an equal chance of being chosen

How to do it:

1. You need a sampling frame which is a complete list of all members of the target population is obtained
2. All of the names on the list are assigned a number
3. The sample is selected randomly for example, a computer-based randomiser or picking names from a hat

Advantages	Disadvantages
- There is **no bias** with this method. Every person in the target population has an equal chance of being	- **Impractical:** It takes more **time and effort** than other sampling methods because you need to obtain a list of all the members of the target population, identify the sample and then contact the people identified and ask if they will

selected. Therefore the sample is more likely to be **representative**.	take part and not all members may wish to take part. - **Not completely representative**: Unbiased selection does not guarantee an unbiased sample, for example, the random selection may only end up generating an all-female sample, making the sample unrepresentative and therefore not generalisable.

Opportunity sampling: A technique that involves recruiting anyone who happens to be available at the time of your study.

How to do it:

1. The researcher will go somewhere they are likely to find their target population and ask them to take part

Advantages	Disadvantages
- **Simple, quick, easy and cheap** as you are just using the first participants that you find. - Useful for **naturalistic experiments** as the researcher has no control over who is being studied.	- **Unrepresentative**: The sample is likely to be biased by excluding certain types of participants which means that we **cannot confidently generalise** the findings e.g. an opportunity sample collected in town during the day on a week day would not include those who are at work or college

Volunteer sampling: When people actively volunteer to be in a study by responding to a request which has been advertised by the researcher (they are self selecting). The researcher may then select only those who are suitable for the study.

How to do it:

1. Participants self select by responding to the advert

Advantages	DIsadvantages
- Most **convenient and economical** way to gather a wide range of people with particular requirements for a study compared to a random sample as they have already agreed to participate. - Can reach a **wide audience**, especially online.	- **Sample bias:** Particular people (with higher levels of motivation and who have more time) are more likely to volunteer so may be harder to generalise. What is it that has made them decide to take part? This may lead to a bias as they may all display similar characteristics.

Ethics

Ethics concerns questions of right and wrong. Issues arise in research if there are conflicting values between the researcher and the participants. A cost vs benefit analysis is taken.

Ethical Guidelines

- **Informed consent**
  - Revealing the true aims of the study
  - Participants must be aware of what they are needed to do as part of the study in order to give valid consent

  - If the study involves children, parental consent must be obtained
- **Deception**
  - Deceptions means deliberately misleading or withholding information
  - Deceiving participants must be kept to a minimum
  - Withholding details in order to avoid influencing behaviour is acceptable but deliberately providing false information cannot happen
  - If telling the truth will not have an effect on results, participant must be informed
- **Confidentiality**
  - Communication of personal information from one person to another and this trust must be protected
  - Psychologists need to be sure that the information they publish will not allow their participants to be identified
  - Anonymity cannot be compromised
- **Debriefing**
  - If consent cannot be obtained (e.g. field experiment) participants must be fully debriefed afterwards
  - Involves telling them about the experiment and then giving them the option of withdrawing their information
- **Right to withdraw**
  - Participants must be made aware of this when they sign the consent form
- **Privacy/ anonymity**
  - A person's right to control the flow of information about themselves
  - We have a right to privacy; if this is broken then confidentiality must be maintained
- **Protection from harm**
  - Participants should be no worse off when they leave the experiment compared to when they arrived
  - Risk is considered acceptable if it is no greater than what would be experienced in everyday life
  - Psychological and physical harm is included

Types of Data

Qualitative research: Gathers information that is not in numerical form, often describing thoughts, feelings and opinions.

- Rich in detail and might include a reason as to **why** the behaviour occurred
- Subjective
- Interpreting something
- **Rich insight as to why the behaviour occurred** - trying to see the world through someone else's eyes (their reality)
- The aim is <u>not</u> to establish a cause-and-effect relationship

Strengths:

1. Rich insight and understanding of the value/ issue
2. Helps explain the why of a phenomena
3. Less reductionist than quantitative data

Limitations:

1. More open to researcher bias (as it is subjective thus more open to interpretation)

Quantitative research: Numerical data that can be statistically analysed

- Does not include a reason or explanation (the why) for the numerical answer given - this is the **what.**

- Objective and scientific

Strengths:

1. Allows for easier comparison and analysis of data (e.g. means)
2. Objective and scientific
3. Less chance of researcher bias

Limitations:

1. Can't tell us the why something is happening
2. View as reductionist as complex ideas are reduced to numbers

Qualitative and quantitative data are not always mutually exclusive and whether the experiment generates qualitative data, quantitative data or both depends upon the research question.

Data Handling/ Analysis

1. **Descriptive statistics:** The use of graphs, tables and summary statistics to identify trends and analyse sets of data (comes first)
   - Suggests something about the hypothesis
2. **Inferential statistics:** This is where a statistical test is calculated in order to draw conclusions about hypotheses (note that **inferential statistics are not on the syllabus).**
   - Eg. 0.05 is the alpha value that is statistically significant
   - Concludes hypothesis, statistical significance or not?

Averages: Measures of Central Tendency

- **Mean**: Mathematical average of a set of scores
- **Median:** Middle score in a data set
- **Mode**: The value that occurs most frequently in a data set
  - Only used with categorical data

	Advantages	Disadvantages
Mean	It makes use of all the values in the final calculation	It can be misrepresentative of the data if there are extreme values
Median	Not affected by extreme values	Not all values are reflected in the median
Mode	Useful when the data is in categories	Not a useful way of describing data when there are several modes.

Measures of Dispersion

- **The Range** tell us whether a set of data are close together or spread out
  - Wider range: Large dispersion could be due to individual differences
- **Standard deviation**: Standard deviation is a single value that tells us how far scores deviate (move away) from the mean. The larger the SD, the greater the dispersion/spread within a set of data.
  - A low SD = good, therefore more reliable as a measure
  - A large SD = not all participants affected by the IV - individual differences

	Advantages	Disadvantages
Range	It is easy to calculate.	However, it only takes into account the two most extreme scores which may be unrepresentative of the data set.
Standard Deviation	This is a much more precise measure than the range as it includes all values.	It can be distorted by extreme values.

	Type of Data	Purpose
Bar Chart	Discrete	Shows differences in data
Scatter Graph	Discrete (Correlation)	Shows associations between co-variables
Histogram	Continuous (Grouped data)	Shows how grouped data is spread
Line Graph (frequency polygon)	Continuous (Not grouped data)	Shows how a variable changes (often over time)

Graphs and Charts

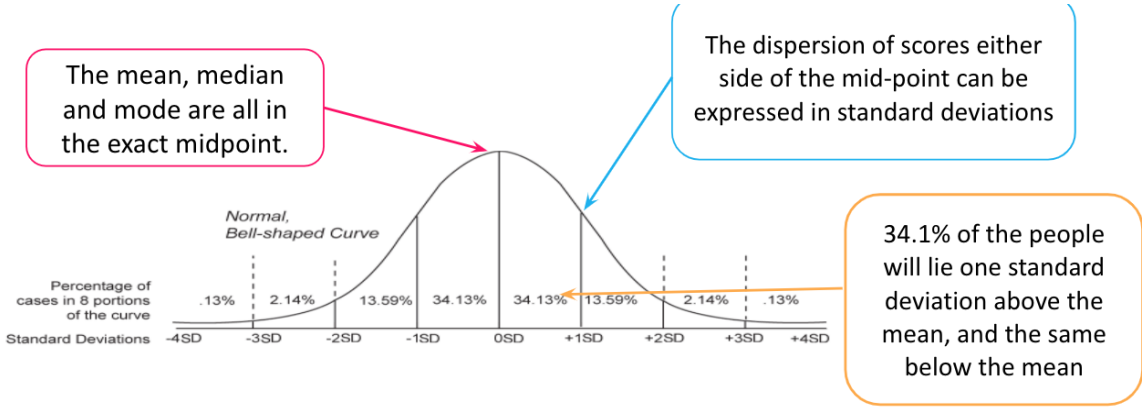
Discrete data is information that can only take certain values. This type of data is often represented using tally charts, bar charts or pie charts.

Continuous data is data that can take any value. Height, weight, temperature and length are all examples of continuous data.

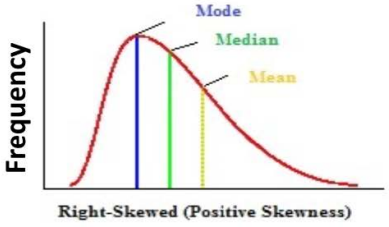
Ordinal data: Data can be put in order // rankings
Interval data: Temperature, length, time, etc // agreed value

Distribution Curves - Inferential Statistics

Normal distribution - bell-shaped curve

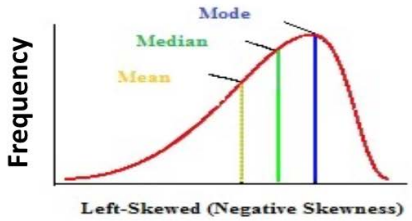


Positive Skew is where most of the distribution is concentrated towards the left of the graph, resulting in a long tail on the right. Imagine a very difficult test in which most people got low marks with only a handful of students at the higher end. This would produce a positive skew.



The **median** and **mean** are higher than the mode. This means that most people got a lower score than the mean.

The opposite occurs in a **negative skew.** A very easy test would produce a distribution where the bulk of scores are concentrated on the right, resulting in the long tail of anomalous scores on the left. The **mean** is pulled to the left this time (due to the lower scorers who are in the minority), with the **mode** dissecting the highest peak and the **median** in the middle.



The **median** and **mean** are lower than the mode.