AQA Psychology AS-level

Topic 7: Research Methods

Detailed Notes

Experimental Method

The experimental method concerns the **manipulation of an independent variable (IV) to have an effect on the dependent variable (DV), which is measured and stated in results**. These experiments can be: **field, laboratory, quasi or natural.**

Aims

An aim is a general statement made by the researcher which tells us what they plan on investigating, **the purpose of their study.** Aims are developed from theories and develop from reading about other similar research.

Hypotheses

A hypothesis is a precise statement which **clearly states the relationship between the variables being investigated**. The hypothesis can either be non-directional or directional. A directional hypothesis states the direction of the relationship that will be shown between the variables whilst a non-directional hypothesis does not.

E.g. If a researcher is carrying out a study to investigate whether sleep helps memory performance:

- A directional hypothesis for this would be - **"The more sleep a participant has the better their memory performance."**
- A non-directional hypothesis would be - "The difference in the amount of hours of sleep a participant has will have an effect on their memory performance, which will be shown by the difference in the memory test scores of the participants."

A directional hypothesis tends to be used when there has already been a range of research carried out which relates to the aim of the researcher's investigation. The data from this previous research would suggest a particular outcome. However if there has been no previous research carried out which relates to the study's aim or the research is contradictory than a non-directional hypothesis is appropriate.

Independent and dependent variables

The **independent variable** refers to the aspect of the experiment which **has been manipulated by the researcher or simply changes naturally to have an effect on the DV which is then measured.** The **dependent variable** is the aspect of the study which is **measured by the researcher and has been caused by a change to the IV.** All other variables that could affect the DV should be carefully controlled so that the researcher is able to confidently conclude that the effect on the DV was caused by only the IV.

In order to properly test the effect of the IV we need different conditions: the experimental condition and the control condition. You can have various experimental conditions which will allow you to compare the effects of different levels of the IV.

Operationalisation of variables

Operationalisation refers to the act of a researcher **clearly defining the variables in terms of how they are being measured.** This means the variables should be defined and measurable. The hypotheses states should also show this operationalisation e.g. the aforementioned directional hypothesis would be even better if operationalised:

"Participants that get at least four hours of sleep will show better performances on the memory test, shown by them achieving higher scores than the participants that got less than four hours of sleep." It could even be further operationalised when more details of the investigation are given, such as the number of questions in the test, hence the maximum score a participant can achieve.

Control of Variables

Extraneous variables and confounding variables

In an experiment, the only aspect that should affect the DV is the IV. Any other variables that may interfere with the IV or the DV should be **removed from the experiment or well controlled.** Such variables can be confounding or extraneous. An **extraneous variable** refers to **any other variable which is not the IV that affects the DV and does not vary systematically with the IV, they are essentially nuisance variables**. Examples are the lighting in the lab or the age of participants - these variables do not confound the results of a study but just make them harder to detect.

A **confounding variable** is also described as a variable other than the IV which has an effect on the DV. Unlike the extraneous variable, confounding variables **do change systematically with the IV**. With these variables it becomes **difficult for the researcher to be sure of the origin of the impact of the DV** as the confounding variable (not the IV) could have been the cause. An example for the aforementioned sleep study would be time of day the experimental task is done - those who complete the memory test later in the day may be more tired and therefore do worse, obscuring the true relationship between lack of sleep and memory performance. Therefore, potential confounding variables must be identified and controlled; in this case the participants should take the test at the same time of day.

Demand characteristics and Investigator effects

Demand characteristics refer to **any cue the researcher or the research situation may give which makes the participant feel like they can guess the aim of the investigation** . This can cause the participant to act differently within the research situation from how they would usually act. This is as participants from the start of the experiment are trying to figure out what's going on in this new situation they find themselves in - this is known as participant reactivity. They may change their behaviour to fit the situation rather than acting naturally.

They may act in a way they think the researcher wants them to which is known as the **'Please-U effect'** or they may intentionally underperform to sabotage the study's results, the **'screw-U effect'.** This unnatural behaviour then affects the validity of the results, hence demand characteristics provides a problem for research.

Participant reactivity may also lead to **investigator effects** which refers to **any unwanted influence from the researcher's behaviour, either conscious or unconscious, on the DV measured (the research's results)**. This includes a variety of factors :- the design of the study, the selection of participants and the interaction with each participant during the research investigation.

Randomisation and Standardisation

To minimise the effects of extraneous or confounding variables different steps can be taken by the researcher like randomisation and standardisation. **Randomisation** is the **use of chance to**

reduce the effects of bias from investigator effects. This can be done for the design of materials, deciding the order of conditions, the selection of participants e.t.c.

Standardisation describes **using the exact same formalised procedures and instructions for every single participant involved in the research process.** This allows there to eliminate non-standardised instructions as being possible extraneous variables.

Experimental Method: Types of Experiment

Design	Description	Strengths	Limitations
Laboratory	An experiment that takes place in a **special environment** whereby **different variables can be carefully controlled.**	**High degree of control**- experimenters control all variables,the IV has been precisely replicated, leading to greater accuracy. **Replication** - researchers can repeat experiments and check results.	**Experimenter's bias**- this bias can affect results and participants may be influenced by these expectations. **Low ecological validity**- high degree of control makes the situation artificial, unlike real life.
Field	An experiment conducted in a more **natural environment, not in a lab** but with **variables still being well controlled.**	**Naturalistic -** so more natural behaviours hence high ecological validity. **Controlled IV**	**Ethical considerations-** invasion of privacy and likely to have been no informed consent. **Loss of control-** over extraneous variables hence precise replication not possible.
Quasi	An experiment whereby the **IV has not been determined by the researcher**, instead it **naturally exists** e.g gender difference studies.	**Controlled conditions**- hance replicable, likely to have high internal validity.	**Cannot randomly allocate participants** to conditions so there may be confounding variables presented. This makes it harder to conclude that the IV caused the DV.
Natural	An experiment in which the **IV is not brought about by the researcher** hence would have happened even if the researcher had not been there e.g. if studying reactions to earthquakes.	**Provides opportunities-** for research that would have otherwise been impossible due to practical or ethical reasons. **High external validity**- as you are dealing with real life issues.	**Natural occurring events**- may be rare this means these experiments are not likely to be replicable hence hard to generalise findings. **Very difficult to randomise-** participants into groups so confounding & extraneous variables become a problem.

Sampling

The researcher needs to decide how they select participants to take part in their investigation.The **population** is a group of people from whom the sample is drawn.

E.g. If the sample of participants are taken from the sixth formers going to schools in London, the findings of the study can only be applied for that certain group of people and not all the sixth formers in the UK.

There are various methods that a researcher can use to select participants:

Sampling Method	Explanation	Strengths	Limitations
Opportunity sampling	Participants **happen to be available** at the time which the study is being carried out so are **recruited conveniently.**	Easy method of recruitment which is **time saving and less costly.**	**Not representative** of the whole population hence lacks generalisability. **Researcher bias** is presented as they control who they want to select.
Random sampling	This is when all members of the population have the same **equal chances of being the one that is selected.** The method used is :- each member of the population is assigned a number then either **a random number table or a random number generator or the lottery method** is used to randomly choose a partner.	**No researcher bias** - researcher has no influence of who is picked.	**Time consuming-** need to have a list of members of the population (sampling frame) and then contacting them takes time. **Volunteer bias-** participants can refuse to take part so can end up with an unrepresentative sample.
Systematic sampling	A predetermined system is used whereby **every nth member is selected from the sampling frame.** This numerical selection is applied consistently.	Avoids researcher bias and **usually fairly representative** of population.	**Not truly unbiased** unless you use a random number generator and then start the systematic sample.

Stratified sampling	With this method the **composition of the sample reflects the varying proportions of people in particular subgroups (strata) within the wider population**. Firstly you identify strat. Then you calculate the required proportion needed for each stratum based on the target population. Then select sample at random from each stratum using a random selection method.	**No researcher bias-** the selection within each stratum is done randomly. Produces **representative data due to the proportional strata** hence generalisation is possible.	**Time consuming** to identify strata and contact people from each. A complete representation of the target population is not possible as the **identified strata cannot reflect all the differences between the people of the wider population.**
Volunteer sampling	Involves **self selection** whereby the participant offers to take part either in response to an advert or when asked to.	Quick access to willing participants which makes it e**asy and not time consuming.** As participants are willing to take part they are **more likely to cooperate in the study.**	**Volunteer bias**- they study may **attract a particular profile of a person**. This means generalisability is then affected. **Motivations like money** could be driving participation so participants **may not take study seriously,** influencing the results.

Experimental Design

Design	Description	Strengths	Limitations	Solution
Independent groups design	The participants only perform in **one condition of the independent variable (IV).**	-There are **no order effects** presented. - Participants are less likely to guess the aims of the study (**demand characteristics are eliminated**).	- No control over **participant variables** whereby different abilities of participants in the various conditions can cause changes to the DV.. - You need more participants than other designs to gather the same amount of data.	**Random allocation** solves the first limitation mentioned.This is as it ensures that each participant has the same chance of being in one condition of the IV as another.
Repeated measures	The **same participants take part in all conditions of the IV.**	- Eliminates **participant variables.** - Fewer participants needed, so **not as time consuming** finding and using them.	- **Order effects** presented e.g. boredom may mean in second condition done participant does not do as well on task.	**Counterbalancing** - this is when half of the participants do conditions in one order and the other half do it in an opposite order.
Matched pairs	**Pairs of participants** are **first matched on some variable** that has been found to affect the dependent variable (DV), then **one member of each pair does one condition and the other does another.**	- **No order effects.** **- Demand characteristics** are **less** of a problem.	- **Time consuming and expensive to match** participants. - A **large pool of potential participants is needed** which can be hard to get. - Difficult to know **which variables are appropriate** for the participants to be matched.	

Pilot Studies

A **pilot study** is a **small-scale version of an investigation which is done before the real investigation is undertaken**. They are carried out to allow potential problems of the study to be identified and the procedure to be modified to deal with these. This also allows money and time to be saved in the long run.

Single-Blind and Double-Blind Procedures

Single-blind procedure

A research method in which the researchers do not tell the participants if they are being given a test treatment or a control treatment. This is done in order to ensure that participants do not bias the results by acting in ways they "think" they should act-**avoids demand characteristics.**

Double-blind procedure

A research procedure in which neither the participants nor the experimenter knows who is receiving a particular treatment. This procedure is utilised to prevent bias in research results.

Double blind studies are particularly useful for preventing bias due to demand characteristics or the placebo effect. Gives a way to reduce the investigator effects as the investigator is unable to unconsciously give participants clues as to which condition they are in.

Control group/condition - **sets a baseline** whereby **results from the experimental condition can be compared to results from this one.** If there is a significantly greater change in the experimental group compared to the control than the researcher is able to conclude that the cause of effect was the IV.

Observational Techniques

Type of observation and description	Strengths	Limitations
Naturalistic- Watching and recording behaviour in the **setting where it would normally take place.**	- High ecological validity - **High external validity** as done in a natural environment	- Low ecological validity if participants become aware that the are being watched. - Replication can be difficult. - Uncontrolled confounding and extraneous variables are presented.
Controlled - Watching and recording behaviour in a **structured environment e.g. lab setting.**	- Researcher is able to focus on a particular aspect of behaviour. - There is more control over extraneous and confounding variables - Easy replication.	- More likely to be observing **unnatural behaviour** as takes place in an unnatural environment. - **Low mundane realism so low ecological validity.** - Demand characteristics presented.
Overt - Participants are watched and their behaviour is	- **Ethically acceptable** as informed consent is given.	- More likely to be recording unnatural behaviour as

recorded with them **knowing they are being watched.**		participants know they are being watched. - Demand characteristics likely which reduces validity of findings.
Covert - the participants are **unaware that their behaviour is being watched and recorded.**	- **Natural behaviour** recorded hence high internal validity of results. -removes problem of participant reactivity whereby participants try to make sense of the situation they are in, which makes them more likely to guess the aim of the study.	- **Ethical issues presented** as no informed consent given. Also could be invading the privacy of the participants.
Participant - The researcher who is observing **is part of the group that is being observed.**	- Can be **more insightful** which increases the validity of the findings.	-There's always the possibility that behaviour may change if the participants were to find out they are being watched. - Researcher **may lose objectivity** as may start to identify too strongly with the participants.
Non-participant - The researcher observes **from a distance so is not part of the group being observed.**	- Researcher **can be more objective** as less likely to identify with participants since watching from outside of the group.	- Open to observer bias for example of stereotypes the observer is aware of. - Researchers may **lose some valuable insight.**

Observational Designs

One problem with carrying out observations is that **observer bias** is easily presented. This is when **an observer's reports are biased by what they expect to see.** A solution to this problem is checking the **inter observer reliability** of the observation. This is done by many researchers conducting the observational study , their reports are then compared and a score calculated using the formula :-

Total number of agreements / total number of observations x 100 .

The score that shows high inter observer reliability is **any score above 80%.**

There are different types of observational designs and each has their strengths and weaknesses:

Design and description	Strengths	Limitations
Unstructured- consists of **continuous recording** where	- More **richness** and **depth of detail.**	- Produces qualitative data which is **more difficult to**

the researcher writes everything they see during the observation		**record & analyse.** - Greater risk of **observer bias** e.g. only record **'catch the eye' behaviours.**
Structured- Here the researcher **quantifies** what they are observing using **predetermined list of behaviours and sampling methods.**	- **Easier** as is more systematic. - Quantitative data is collected which is **easy to analyse and compare with other data.** - There is **less risk of observer bias.**	- Not much **depth of detail.** - Difficult to achieve **high inter observer reliability** as filling the predetermined lists in is subjective.

Whilst conducting structured observations, **behavioural categories** can be used. This is when a **target behaviour which is being observed is broken up into more precise components which are observable and measurable e.g. aggressive behaviour can be broken down to - shouting, punching, swearing etc.** When forming a behavioural categories list, it is important to make sure that behaviours do not overlap with other behaviours, so very similar behaviours should not be listed e.g. grin and smile. They should be clearly operationalised. During structured interviews there are different types of sampling methods:

Method and description	Strengths	Limitations
Time sampling- this is the recording of behaviour within **a timeframe that is pre-established** before the observational study.	- It **reduces the number of observations t**hat has to made so it is less time consuming.	- The small amount of data that you collect within that time frame ends up being **unrepresentative of the observation as a whole.**
Event sampling- this involves the **counting of the number of times a particular behaviour is carried out** by the target group or individual you are watching.	- It is **good for infrequent behaviours** that are likely to be missed if time sampling was used.	- If complex behaviour is being observed, **important details of the behaviour may be overlooked** by the observer. - If the behaviour is very frequent, there could be **counting errors.** - It is difficult to **judge the beginning and ending of a behaviour.**

Correlations

A **correlation** is a **mathematical technique that is used to investigate an association between two variables** which are called **co-variables**. Correlations differ to experiments as:

- The variables are simply measured, **not manipulated** like in experiments.

- Only an association is found, **no cause-and-effect relationship found** hence the terms DV and IV are not used.

During correlational studies **correlation coefficients** are calculated. This value determines the strength and the relationship between two variables. This doesn't necessarily mean that one variable is causing another, but that there is a relationship of some sort.

There are various relationships which can be shown between the co-variables :-

- **Negative correlation** - when one variable increases the other decreases. When the data is presented on a scattergram the line of best fit has a negative gradient. It has a correlation coefficient of **less than 0.**
- **Positive correlation -** when one variable increases the other also increases. When the data is presented on a scattergram the line of best fit has a positive gradient.It has a correlation coefficient of **more than 0.**
- **Zero correlation -** no relationship is found between the co-variables. When the data i s presented on a scattergram, no line of best fit can be drawn as the points on the scattergram are random. It has a correlation coefficient **equal to 0.**

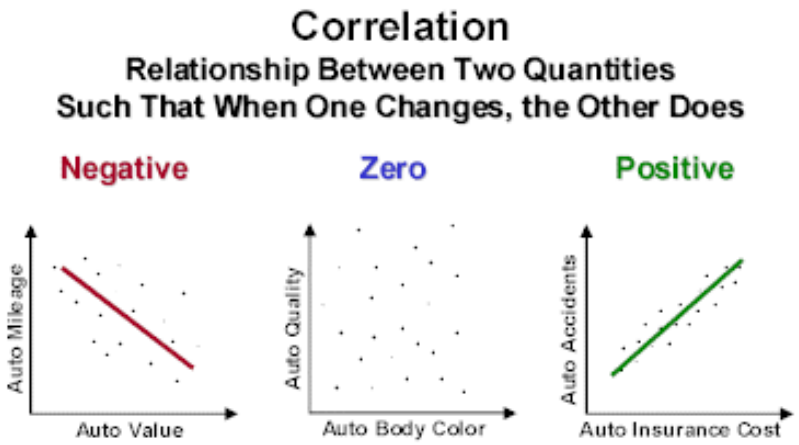


Image Source

- **Curvilinear relationship-** as one variable increases, so does the other but only up to a certain point after which as one variable continues to increase the other begins to decrease. Ona graph this forms an inverted U shape. An example of such a relationship is shown by the **Yerkes-Dodson Law from the topic of Memory which shows how anxiety affects eyewitness testimony.**

Just as you have hypotheses for experiments researchers also state hypothesis for correlational studies. **A directional hypothesis states whether there will be a negative or positive correlation between the co-variables being studies whilst a non-directional hypothesis only states there will be a correlation but the type is unknown.**

Strengths and Limitations of Correlations:

Strengths	Limitations
- They can be used as **starting points** to assess patterns between co-variables before committing to conducting an experimental study. - **Quick and economical** to carry out. - **Secondary data** can be used in the correlational study which makes it **even less time consuming.**	- It is **difficult to establish a cause and effect relationship,** really only an association is found. -The **third variable problem** is presented - this is when there is a chance that there is another variable, **a third variable which the researcher is unaware of that is responsible for the relationship between the co-variables.** - Lastly, correlations tend to be **misused or misinterpreted** especially when made public by the media - correlation is often presented as causation.

Data Analysis: Types of Data

Type and description	Strengths	Limitations
Qualitative data- data which is **displayed in words , is non-numerical.**	- More richness and depth of detail. - Allows participants to further develop their opinions hence has greater external validity. - A more meaningful insight into the participants' views is achieved.	- Difficult to analyse. -difficult to make comparisons with other data. - Researcher bias presented as conclusions rely on the subjective interpretations of the researcher (interpretative bias).
Quantitative data- data that is **displayed numerically, not in words.**	- Can be analysed statistically so converted to graphs or charts. - This makes it easy to make comparisons with other data.	- Lack of depth in detail. - No meaningful insight into participants' views. - As participants are not able to develop their opinions the results have low external validity.
Primary data - this is when information is **obtained first hand by the researcher** for an investigation.	-Targets the exact information which the researcher needs, so the data fits their aims and objectives.	- Requires time and effort. - Can be expensive.
Secondary data - this is when information is collected by someone else other than the researcher yet is used by the	- Expensive - Data is accessed so requires minimal effort to collect.	- It may be likely that the data is outdated or incomplete. - The data may not be reliable- the researcher was

researcher for their investigation. Also known as **'desk research'.**		not there when the study was conducted so is likely to be unsure of the validity of the results.
Meta-analysis - this is when a researcher **combines results from many different studies** and uses all the data to form an overall view of the subject they are investigating.	- More **generalisability** is possible as a larger amount of data is studied. - The researcher is able to view the evidence with more confidence as there is a lot of it.	- Publication bias such as the **file drawer problem** may be presented- this is when the researcher intentionally does not publish all the data from the relevant studies but instead chooses to leave out the negative results. This gives a false representation of what the researcher was investigating.

Data Analysis: Descriptive Statistics

Descriptive statistics are the use of tables, graphs, and summary statistics to analyse data.

Measures of central tendency

These measures refer to **any measure which calculates an average value within a set of data.**

Measure	Calculation method	Strengths	Limitations
Mean- arithmetic average.	Total of all values in a set of data is divided by the number of values.	- Makes use of all values. - Good for interval data.	- It is influenced by outliers (extreme scores) so it can be unrepresentative.
Median	Arrange data from lowest to highest then find the central value.	- Not affected by extreme scores. - Good for ordinal data.	- Not as sensitive as mean, does not use all data.
Mode	The most frequently occurring value in a set of data.	- Useful for nominal data (data in categories).	- Is not useful when there are several modes.

Measures of dispersion

These measures refer to **any measure that calculates the variation in a set of data.**

Measure	Calculation method	Strengths	Limitations
Range	Minus the lowest score from the highest score.	- Easy to calculate.	- Affected by extreme values. - Does not use all data.
Standard Deviation (SD)	The square root of the variance calculates SD. A low SD means that more data is clustered close to the mean hence there is less data spread	- Precise measure where all data values are taken into account.	- Difficult to calculate. - Affected by extreme values.

Presentation and Display of Quantitative Data

There are various ways of representing data:

Summarising data in a table

One of these ways is summarising data in a table. This is usually not in the form of raw scores but the **data has been converted into descriptive statistics** for example of the form below :-

Table showing the mean and mode of scores of a memory test

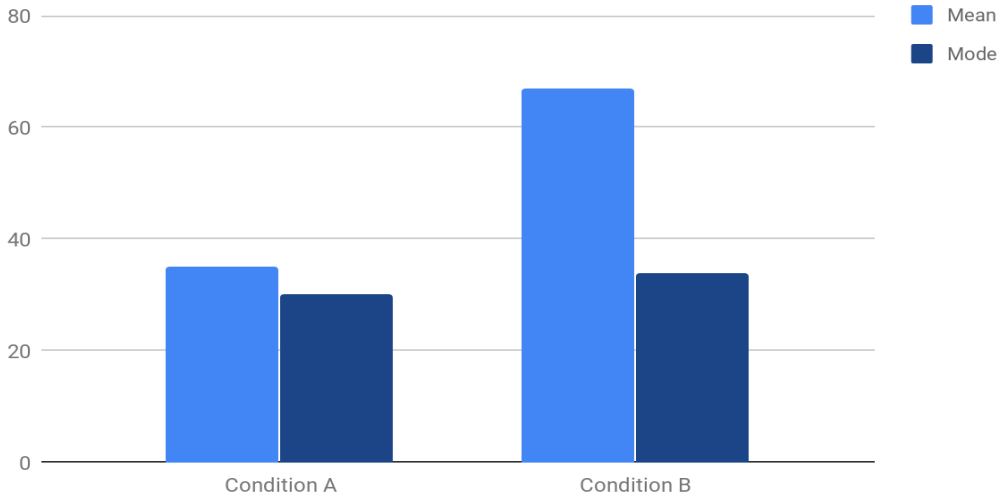
	Condition A	Condition B
Mean	35	67
Mode	30	34

Below the table there is usually a description of what the table's data means.

Bar Charts

This way of representing data allows for differences in data to be seen more clearly. They are used for **discrete data**, which describes **data that has been divided into categories.** The bars **do not touch each other which shows that we are dealing with separate conditions**.The amount of frequency for each category is plotted on the y-axis (vertical axis) whilst the categories (below these are condition A and B) are plotted on the x-axis (horizontal axis).

Table showing the mean and mode of scores of a memory test



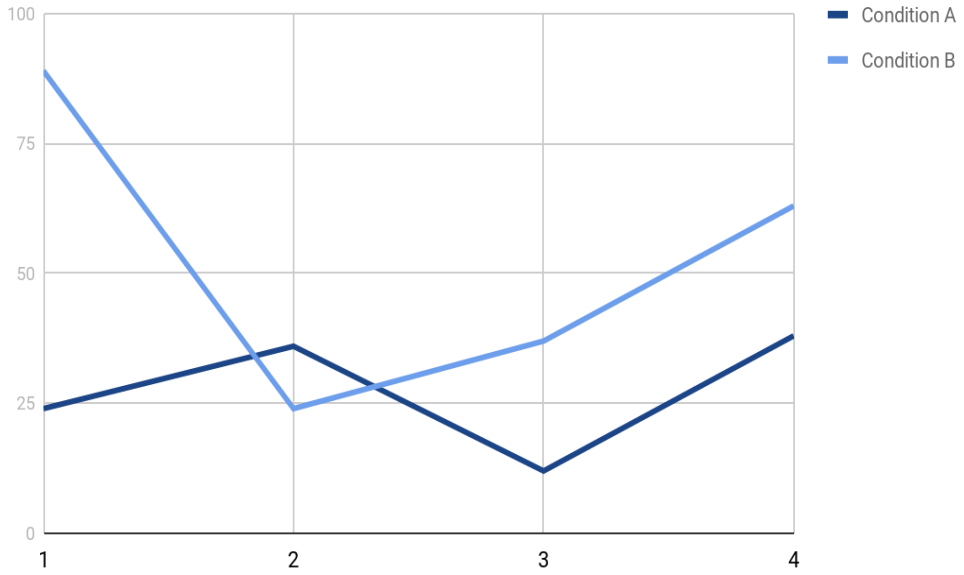
Histograms

In this form, **the bars touch each other unlike in bar charts and this represents that we are dealing with continuous data rather than discrete.** Therefore the x-axis has equal sized intervals of one category (e.g. scores of an english test in intervals 0-10, 11-21, 22-32, etc.) whilst the y-axis represents the frequency (the number of people that score each mark).

Line graphs

This form also represents continuous data , whereby **points are connected by lines to show the change of values**. As per usual, the IV is plotted on the x-axis while the DV is plotted on the y-axis

Memory test scores over a month



Scattergrams

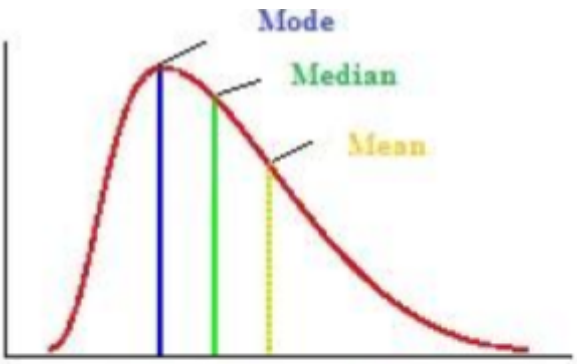
These are used to show **associations** between co-variables **rather than differences hence we came across them in the correlations topic.** Either of the co-variables can occupy the x-axis or the y-axis, and each point displayed on the graph coincides with the x and y position of the co-variables.

Distributions

Normal distribution is **a symmetrical pattern of frequency data that forms a bell-shaped pattern.**

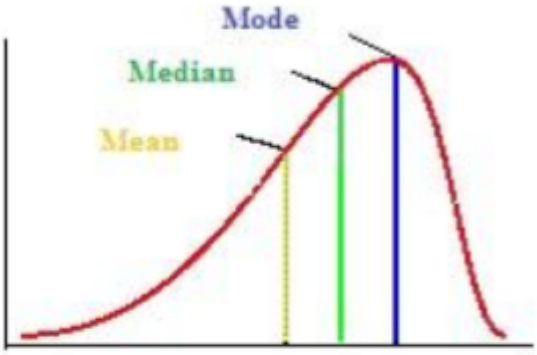
A **skewed distribution** is **a spread of frequency data that is not symmetrical, instead the data all clusters to one end.** There are two types of these :-

- **Positive skew** whereby most of the distribution of data is concentrated on the right.



Right-Skewed (Positive Skewness)

- **Negative skew** whereby most of the data distribution is concentrated on the left.



Left-Skewed (Negative Skewness)

Peer Review

AO1

Peer review is **the assessment of scientific work by experts in the same field**, it is done to make sure that all research intended to eventually be published is of **high quality**.

Main purposes of peer review:

- To know which research is **worthwhile hence funding can be allocated to it.**
- To **validate the relevance and quality of research**. This is important to prevent fraudulent research from being released to the public.
- To suggest possible **improvements or amendments** to the research study.

AO3

- **Anonymity is a problem;** reviewers sometimes use it to settle old scores or bury rivals, especially if they're competing for funds. This means that **anonymity affects the objectivity of reviewers.** Due to this, some journals have started doing **open reviewing** to avoid this problem.

- **There is publication bias involved in peer review.** Editors tend to prefer to publish **'headline grabbing' findings and positive results**. This brings about the file drawer problem whereby negative results are intentionally not published. All this causes there to be **a misconception of the current state of psychology.**

- **It can be difficult to find an expert.** Smith (1999) argues that because of this a lot of poor research is passed as the reviewer didn't really understand the work.

- **In peer review, any research that opposes mainstream theories tends to be suppressed.** This means that established scientists' work is more likely to be published and the new and challenging ideas are usually rejected. This means that the **rate of change in scientific fields is slowed down.**

- **Fraudulent research can be long-lasting which is a large problem.** An example of this is when the **MMR vaccine link to autism was found by Andrew Wakefield (1998).** This finding had implications as caused the number of measles cases to increase. It was later found that the research was fraudulent but even now there are still many people aware of these said risks and still anti-vaccine for MMR.

The Implications of Psychological Research for the Economy

The **implications** that research has refers to **how what we learn from psychological research influences our country's economic prosperity**. The **economy** is the **state of the region's activities of producing or consuming goods & services**. Absence from work costs the economy an estimate of **15 billion pounds** a year and this absence is mainly due to **mental illness** e.g. stress, anxiety. For such problems, psychology research has been able to present solutions to them and this expresses why psychology research is important for the economy.

From the various AS and A2 topics we have learnt , research in these topics has had implications for the economy:

Topic	Links to specific areas	Economy
Psychopathology	**Treatments** - Cognitive Behavioural Therapy and Rational Emotive Behavioural Therapy for depression, drug therapy for OCD.	- Workers able to return to work.
Attachment	**Role of the father -** Tiffany Field (1978) found that fathers can take on the role of being a primary caregiver.	- Mothers can return to work. - More flexible working arrangements within families. - Can maximise their income and effectively contribute to the economy.
Social Influence	**Social influence leading to social change -** Minority influence, appealing to NSI, disobedient models.	- Health campaigns. - Unions strike- make working conditions better. - Environmental campaigns- like getting companies to reduce their waste and use of non-renewable energy.
Memory	**Eyewitness testimony** - How leading questions or post event discussion can affect eyewitness testimony.	- Led to police using the cognitive interview which reduces wrongful convictions hence reduces waste of money and space in jail.

Levels of Measurement

Quantitative data can be divided into different levels of measurement, either - **nominal, ordinal or interval.**

Nominal data refers to a type of data that is **in the form of categories.** It is **discrete**- one item can only appear in one category. It **does not enable sensitive analysis** as it does not yield a numerical result for each participant.

Ordinal data refers to data which is **represented in a ranking form** e.g. 1= hates maths, 10= loves maths. There are **no equal intervals** between each unit. A weakness of it is that it **lacks precision as is based on the subjective opinion of people.**

Interval data refers to the type of data that is **based on numerical scales which include equal units of precisely defined size.** This is the most sophisticated form of data as it is based on objective measures. It is needed for the use of a parametric test.

Appropriate measures for each level of data:

Level of data	Measures of central tendency	Measures of dispersion
Nominal	Mode	n/a
Ordinal	Median	Range
Interval	Mean	Standard Deviation

Introduction to Statistical Testing: Use of the Sign Test

Statistical testing provides **a way of determining whether hypotheses should be rejected or accepted.** It can tell us whether differences or relationships between variables that have been found during experiments **are statistically significant or if they have only occurred due to chance**.

An example of a statistical test is the **sign test**. A sign test can only be used for a study that :-

- Looked for a difference not an association.
- Used a related experimental design- repeated measures design.
- Collected nominal data.

How to conduct a sign test:

- **Step 1** - State the hypotheses- this includes both the alternative and the null hypothesis.
- **Step 2 -** Record data and work out the sign. For example, the sign will be negative (-) if the value has decreased in the second condition but positive (+) if it has increased. If the value has stayed the same , this value will be ignored and the N adjusted to exclude it.
- **Step 3**- Find the calculated value for the sign test, S, which is the number of times the less frequent sign occurs.
- **Step 4** - Find the critical value of S - use the calculated N value (which is the total number of values with the ignored values excluded) and $p \leq 0.05$ which means there's a less than 5% probability that the results occurred by chance.
  If S ≤ critical value- reject the null hypothesis, there is a significant difference.
  If S ≥ critical value - accept the null hypothesis, there is no significant difference.
- **Step 5 -** State conclusion whereby you refer back to the hypothesis mentioning the IV and Dv and support your conclusion with the exact values of -the critical value, S, N and what p value you used.

Ethical Issues & Ways of Dealing with Them

Issue	Explanation	Solution
Informed consent	Participants must be told the purpose of the investigation (their aims) and about any potential risks they may be subject to when taking part in it. This allows them to make an informed decision on whether they want to participate in the research study. Researchers don't always wish to disclose this information as it could lead to demand characteristics being presented hence result bias.	There are various methods of dealing with informed consent: - **Prior general consent-** participants give permission to take part in many studies whereby one of them involves deception so effectively they are consenting to getting deceived, - **Presumptive consent-** when a researcher gathers opinions from a group like the participants in the study but does not inform the actual participants. Allows demand characteristics to be eliminated. - **Retrospective**- this is when the participants are asked for consent after they have participated in the study.
Deception	This is the act of deliberately withholding information from participants or misleading them during the research study. This is only seen as acceptable when the participants knowing the true nature could guess the aims of the investigation or when the deception will not cause distress.	- **Debriefing**- all participants would be debriefed after the study, it can be a written or verbal debrief. During the debrief the true nature of the study must be said and the participants should be told what their data will be used for. After the debrief participants have the right to choose to withhold or withdraw their data.
Protection of harm	Participants must be protected from physical and psychological harm. It is the job of the researcher to make sure of this. All through the investigation, participants are also reminded that they do have the right to withdraw, especially if the study is causing them harm.	- If the participants have been subject to any stress or psychological harm, the researcher should provide counselling if it is required. - **A Cost-Benefit Analysis** should be done before a study is carried out. This is done by the ethics committee whereby the pros and cons of the study are weighed up to determine

		whether the study will be ethical. This can be difficult and an example of where this was done but went wrong is for Zimabardo's Stanford Prison Experiment in 1973 (Social Influence topic).
Privacy and confidentiality	**Right of privacy** refers to the right that participants have to controlling information about themselves- how much is released and how it is used. It can be difficult to avoid invading a participant's privacy for example if it is a field study- these are done in natural environments. The right of privacy can extend to the location of the study whereby the institution is not named. **Confidentiality** refers to the right participants have which concerns any personal data of theirs being protected.	- Anonymity can be maintained. This is achieved by the researchers not recording any personal details of their participants so that none of the results data can be traced back to them. Instead the researchers can refer to the participants using numbers or initials when writing up the investigation e.g. HM case study. -The participant should be reminded during both the briefing and debriefing of the investigation that their data will be protected

Self-Report Techniques & Design

Self-report techniques refer to any sort of method where a person is asked to give their opinions, feelings, experiences and behaviours in relation to a particular topic. There are two types of these non-experimental investigations:

- **Questionnaires** - These assess **a person's thoughts or experiences through a number of different written questions.**
- **Interviews -** This involves a live encounter where **a set of questions is asked by an interviewer to an interviewee to assess their thoughts or experiences.**

Questionnaires

There are two types of questionnaires:

Type and description	Strengths	Limitations
Open Question - This is when the questions are phrased in a way that the participant is free to answer however they like, there are no restrictions. This type collects qualitative data.	- Rich in depth and detail. - Useful for sensitive topics as participants can elaborate on their answers.	- Difficult to convert to statistical data hence more difficult to analyse.
Closed Question - In contrast, this type of questionnaire consists of questions which restrict you to a fixed number of responses. This type collects quantitative data. Examples: - **Likert scale**- the respondent indicates agreement with a statement, ranges from agree to strongly agree. - **Rating scales**- a rating scale works in a similar way but gets respondents to identify a value that represents their strength of feeling about a particular topic. - **Fixed choice scales**- the question includes a list of possible options and respondents are required to indicate those that apply to them.	-Easy to analyse data and compare with data from elsewhere.	- Lack of depth and detail. - Can be limiting which can be frustrating for participants.

There are various strengths and limitations of questionnaires:

Strengths	Limitations
- Cost-effective. - Gathers large amounts of data quickly. - The researcher does not need to be present. - They are easy to analyse. - As responses can be anonymous this usually	- Difficult to know whether the target population it was intended for answered it e.g. if it is online. - They take a long time to design. - It is difficult to assess the validity as biases

means participants are more open.	such as social desirability bias (when the participant wants to present themselves in a positive light so is not truthful) are presented. - Participant bias presented from factors such as time, age, gender. - Response bias presented e.g. acquiescence bias whereby participants simply agree with all the questions, instead of putting effort into considering an answer for each question.

Construction of questionnaires:

There are various factors that need to be thought about when designing questionnaires :-

- **Clarity** - the questions should be phrased in such a way that it is clear for the respondent on what answer is needed from them.
- **Avoid overuse of jargon, emotive language, double-barrelled questions, double negatives and leading questions**. All these can cause biases which affects the validity of the results.
- **Sequencing questions** - easy ones can be first then followed by the harder ones. This allows a build up of confidence in each participant.
- **Filler questions** - these are questions which have nothing to do with the aims of the investigation and are put in to distract the participant from guessing the real aim of the study. Therefore these eliminate demand characteristics.
- **Pilot study** - can be carried out to ensure that the questionnaire is suitable and if not amendments and improvements can be made.

Interviews

There are two main types of interviews:

Type and description	Strengths	Limitations
Structured - Involves **a set of predetermined questions being asked during the interview.** The interviewer asks the questions and for each waits for a suitable response.	- Standardisation is possible. - Easily replicable. - Can make comparisons between participants easily which is a strong benefit for job interviews.	- Interviewer bias which can be presented through aspects such as body language, listening skills, when to ask a question and interpretative bias (how answers are recorded). - Social desirability bias. - Not being able to elaborate can be frustrating for participants.
Unstructured - There are **no predetermined questions , instead questions develop as the interview goes on.** This allows for questions be **tailored to individuals and is**	- Lots of data is collected with more depth and detail. - As can be tailored to individuals they can provide more insight.	- Skilled interviewers needed. - Interviewer bias also presented. - Social desirability bias. - Difficult to make comparisons between participants. - The analysis of data is difficult

more free flowing.		as may have to sift through a lot of irrelevant data.

There can also be semi-structured interviews whereby most of the questions are already set up but the interviewer is free to ask any follow up questions on certain answers.

Construction and design of interviews:

- **Recording information** - this can be done in various ways e.g. writing down answers, using a video recorder, using an audio recorder.
- **Ethical issues** - Informed consent is needed from the participant for the researcher to obtain and keep the data. The participant should be reminded that their answers will be kept confidential.
- **Location** - A quiet room away from other people is the most appropriate as this location is likely to get the participant to feel comfortable and open up.
- **Neutral questions** - These are usually started with to make the participant feel relaxed and help establish a rapport.