Zig Zag Education

Psychology

A Level | OCR | H167/H567

Course Companion for OCR A Level Psychology

Component 1: Research Methods

Endorsed Edition v1.1, November 2023

A teaching and learning resource endorsed by

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Teacher's Introduction

This course companion is designed to support the A Level OCR Psychology Topic 1: Research Methods unit. Within the companion Research Methods has been divided into five chapters, with each one covering a single bullet point of the specification. These chapters follow the order of the specification so that knowledge of the topic can be built on and developed as the companion progresses. Section 1.6 'How science works' and Section 1.3 on 'Methodological issues' have been covered where appropriate.

The course companion provides a detailed set of notes on the specification content and is designed to be used in class by your students. Opportunities to put their learning into practice are found throughout the chapters in the form of tasks and questions.

Remember!
Always check the exam board website for new information, including changes to the specification and sample assessment material.

Tasks have been created to strengthen students' learning by providing ways to test and think about the information they have covered. You may also come across 'Think!' or 'Consider' boxes during chapters. These boxes are designed to encourage students to look beyond the information in front of them and consider wider implications such as how studies relate to one another, the significance of findings and how the findings relate to real life. Possible answers or points that could be raised are provided for these boxes.

At the end of each chapter will be two sets of questions to reinforce your students' learning. The first set is 'Check your understanding' questions, which focus on testing students' knowledge of the content they have learnt through the companion. Following these are 'Practice' questions which test students' ability to translate this information into practice answers. Possible answers have been provided for all questions, and also tasks when appropriate.

At the end of the entire set of five chapters there is a set of nine AS practice questions aimed at those taking both the AS and A Level courses. Questions 1–8 assess chapters 1–4, while question 9 assesses chapter 5. There is also a set of A Level only questions at the end of the pack. The A Level questions are marked by an asterisk (*). Suggested mark schemes are provided at the end of the answers section of the resource.

Teacher's Notes on Tasks

Short tasks for students to complete are provided throughout the companion, and tasks that require a level of teacher-student interaction or guidance are identified underneath. Below are recommendations for how to best use these tasks but adjustments can be made depending on the classroom.

Tasks 5.1, 5.2, 5.3, 5.4 involve the student designing and conducting a study. These could be set as homework and discussed in class.

Tasks 5.1, 5.3 and 5.4 could also be conducted in class. **Task 5.3** requires at least some of the students to bring in and consume an energy drink.

H Lewis, October 2017

Endorsement Edition v1.1, November 2023

- Added specification cross-referencing
- Removed irrelevant questions and answers: Q3 (p. 12 and p. 138); Q4 (p. 22 and p. 139)
- Added new content to cover the 'How Science Works' issue of 'Hypothesis testing' on p. 26
- Added new content to cover the 'methodological issue' of 'debriefing' to pp. 39–40
- Corrected statement about not needing to calculate standard deviation on p. 55, as it's a skill required for AS and A Level. Also, improved clarity and matched the steps for calculating standard deviation with the OCR Descriptive Statistics Workbook.
- Removed table detailing Pearson's R / Related t-test / Unrelated t-test from p. 76, as it is beyond the spec
- Improved content and corrected calculations on chi-square on pp. 85–86 to align with the OCR Inferential Statistics Workbook
- Added new content to cover 'observations' and 'self-reports' to the design on p. 96
- Corrected 'experimental design' to 'independent measures design' and updated the conditions on p. 122
- Corrected AO3 marks to AO1 marks for Q3a) and b) on p. 141 and Q3a) and b) on p. 144
- Made various minor wording amendments throughout. Plus, p. 7 and p. 137 'natural' → 'quasi' and 'characteristics' → 'effects'; p. 10 'participants' → 'researchers'; p. 35 'covertly' → 'overtly'; 'correlational study' → 'self-report study' (p. 102), 'observational study' (p. 110) and 'experimental study' (p. 116)

Chapter 1: Research methods and tec

Overview

In this chapter we look at several different ways that a study can be carried out: experiments, observations, self-reports and correlations. The same topic can often be investigated in many different ways and we evaluate each method by considering its strengths and weaknesses.

Learni

After studyin
able to:

- ❑ Describ
  conduct
- ❑ Evaluat
  their st

Key Terms

Associatio	A relationship or link between two variables suggestin related in some way
Cause ect	The idea that changing one variable causes a change i prediction possible
Closed question	A question with a fixed response, e.g. 'yes', 'no', 'alwa restricts how a person can respond to the question
Controlled observation	When the researcher manipulates the environment (a
Correlation coefficient	A number that describes the strength and direction of
Correlation	A measure of the association between two variables
Covert observation	The people being observed are not aware that they ar (and so have not given consent)
Demand characteristics/effects	When the participant's behaviour is a reflection of ho behave; responding to the 'demands' of the situation
Dependent variable (DV)	A variable which measures the presumed effect of the
Ecological validity	The extent to which the findings can be generalised to
External validity	The extent results are generalisable across settings an
Extraneous variables	Variables that may influence the behaviour in addition manipulation of IV) and so should be controlled for
Field experiment	An experiment that occurs in real-life settings but the
Independent variable (IV)	A variable which is manipulated to produce a presume
Internal validity	The extent to which the behaviour is the result of the in the IV)
Interview	A series of spoken questions with the aim of finding o
Interviewer bias	Sources of bias in which the of the interviewer a
Laboratory experiment	An experiment con uct in an artificial environment involv ai tion of the independent variable to
Likert scale	A type closed question where a person responds wi
Mundane reali	A comparison of how similar the study is to real life
Natu iment	An experiment that occurs in real-life settings where t manipulation
Natural IV	An independent variable that varies naturally without
Naturalistic observation	An observation that occurs in the natural environmen their natural behaviour
Negative correlation	As one variable increases, the other variable decrease
Non-participant observation	When observation is conducted from a distance with

Key Terms

Objective	Free from errors caused by subjective interpretation
Observer bias	When observers know the desired goal or outcome of unintentionally interpret the data that way
Observer effect	When the presence of an observer alters behaviour
Open question	A question that allows the person to respond with the qualitative data
Operationalisation	Precisely defining your variables so that a hypothesis
Outlier	An extreme point that differs from the other results a
Overt observation	It is clear that the person is being observed for researc
Participant observation	When the observer has a high level of interaction with
Perfect correlation	You are able to perfectly predict what the value of one
Positive correlation	As one variable increases, the other variable also incre
Qualitative research	A methodology that generates data of a more in-depth but is more difficult to analyse
Qualitative	In-depth exploration of non-numerical data to unders
Quantitative	Precise insights through numerical data analysis, often
Quantitative research	A methodology that generates data of a numerical nat
Quasi-experiment	An experiment that uses naturally occurring IVs; the re the IV or randomly allocate participants
Questionnaire	A series of written questions with the aim of finding o
Randomly assigned	Assigning participants to their conditions randomly ra
Rapport	A relationship built on mutual understanding and good
Reactivity	The participants may react to the setting they are plac aware they are being observed may intentionally or u
Reliability	The extent to which results are consistent, across obse
Semi-structured interview	An interview that has a mixture of fixed and non-fixed fixed questions and then follow-up questions for clarif
Social desirability bias	When a person alters their answer to avoid negative s
Standardisation	The procedures and materials of the experiment are p researcher could replicate the experiment exactly
Structured interview	An interview with a set of ordered questions that have
Structured observation	An observation in which the researcher plans in advan during the observation session. The observer does no are relevant to the research aims.
Unstructured interview	An interview that does not have a specific set of quest comparable to an everyday conversation. The intervie questions that they wish to ask which are determin
Unstructured observation	An observation in which the researcher records what which behaviours to record
Zero correlation	Points are dispersed randomly and there is no relation

Why do we conduct research?

In psychology, researchers aim to understand people's thoughts, beliefs and b
make observations, formulate theories about what is happening and then con
If their findings are incorrect then they refine their theories and test again.

Often, there are many different ways of investigating the same problem. For
forgetfulness you could:

- Ask people about times they have forgotten things
- Test how well people recall certain things
- Study the relationship between forgetfulness and other factors such a
- Observe situations of forgetfulness in real life
- Manipulate environmental factors to s[illegible] it [illegible]creases forgetfulness

We use many different metho[illegible] investigating a topic because different
different things. Whe[illegible]ing a topic, some methods are often more a
example [illegible]es[illegible] might not be a good method of studying forgetfulne
what th[illegible] forgotten!

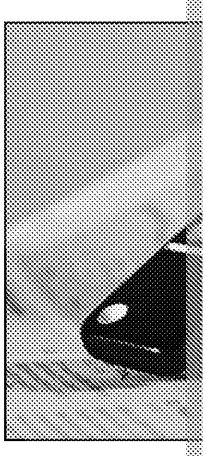
In the rest of the chapter we consider the strengths and weaknesses of differ

Research method: Experiment

Laboratory experiments

A laboratory experiment is conducted in an artificial environment which is co
experiences the same environment. The experimenter manipulates a variable
(IV) and investigates to see if this manipulation produces a change in another
variable (DV). For example, an experimenter might manipulate how difficult a
change in the percentage of correct answers. The goal of laboratory studies i
which says that if the environment is the same then the change must be beca

1.6 How science works: The study of cause and effect
In the study of human behaviour it is very difficult to *prove* cause and effect. This is because so many different things affect our behaviour; from things in our immediate environment, to our past experiences and our cognitive processes. Certain types of studies, such as laboratory experiments, are interested in trying to establish cause and effect. These studies achieve this by carefully controlling all other factors they think might affect the findings. However, a consequence of this is that the behaviour may not be [illegible]al



***Example**: McGinty et al. (2015) examined whether attitudes towards addictio by whether the condition was seen as treated or untreated. They randomly a vignette about treated addiction or mental illness, untreated addiction or men Afterwards the participants answered questions about their attitudes towards addiction. Those who were in the treated condition believed more in the effec willing to discriminate and showed less stigma than those in the untreated co*

Advantages	
Cause and effect: The high degree of control allows the experiment to establish that the IV causes the effect on the DV. This is possible because the experiment controls for extraneous variables tha might otherwise contribute to the effect on the DV.	**Artificial:** The envir experiment is typic settings. This make eal life (low mundi may be different fr natural settings.
Replicable: The high de f control of the environment a precise operationalisation of the variab this experiment to be replicated exactly. allows the experimenter to investigate the reliability (consistency) of the effects.	**Demand character** operationalised ma the study. This can 'demands' of the e that conforms to th rather than how the
Objective: Laboratory experiments are precisely measured which reduces subjective bias that may occur if findings or behaviour need to be interpreted. Objectivity increases the accuracy of the findings.	**Low external validi** experiment are the conditions and stan less generalisable t
High internal validity: Internal validity is the extent to which the change in the DV is the result of the IV. Given that the controlled environment reduces the influence of extraneous variables, it is likely that the change is due to the IV.	**Operationalisation** that is clearly meas (1951) experiment, whether or not a p length when this w meant that the hyp conform to the ma this task was unimp life conformity situ provide limited insi

Field experiments

A field experiment is an experiment that occurs in normal settings but still inv independent variable. As a result it tends to be more representative of real li experiments but field experiments also suffer from reduced control. Some pa not be aware that they are taking part in the experiment and this can result in

1.3 Methodological i Internal validity is th of behaviour is actua reduces the number confounding variable behaviour. As a resu brought about the b expect laboratory ex validity than field ex degree of control. Co studies (a type of lab not necessarily gene

Example: *Azar et al. (2013) conducted a field experiment investigating wheth change they were given at a restaurant. They used a real restaurant and vari small amount of extra change or a large amount of extra change. They found return the extra change and that customers being given higher amounts incre change. They identified a possible confounding variable in that a smaller amo be detected by the customer.*

Advantages	
Higher mundane realism: As field experiments occur in their normal environment, the findings are highly applicable to real life.	**Lower control:** A n rigorously controlle experiment and as actors that influen applied in attributi
Cause and effect: The IV is directly manipulated to produce an effect on the DV which allows the experimenter to establish cause and effect. However, in situations where it is clear that the low control of the environment may have produced the effect on the DV, cause and effect may not be established.	**Ethical implication** people who happe and often these pa are part of the stud about the lack of in compromised right
Reduced demand effects: In a natural setting, it is less clear that an experiment is being conducted and those who are unaware of the experiment are less likely to react to the 'demands' of the experiment.	**More difficult to a** observation and oth data. Often severa can be difficult to i conclusions from th

Quasi experiments

A quasi-experiment studies the effects of naturally occurring IVs (e.g. gender, controlled environment. In these cases it would often be unethical or impract induce a mental illness).

Example: *Lange et al. (2014) wanted to examine whether differences in two n would lead to differences in the child's inattention and impulsivity. There were male, overweight/obese male, healthy-weight female and overweight/obese f completed a computerised task which investigated their levels of inattention a overweight/obese males were more inattentive and the greater the weight, th*

Advantages	
Investigates natural IVs: A quasi-experiment investigates natural differences between individuals which is advantageous as it would be unethical or impractical to manipulate some variables. In the example above, it would be unethical to manipulate the weight of the children.	**An association:** As manipulate the IV i cannot be establish variables are assoc one variable cause
Controls environment: A quasi-experiment still controls the environment in which the experiment is conducted in. This is an advantage as it controls for extraneous variables making it more likely that differences in IV do influence the DV.	**Not randomly assig** differences betwee been randomly ass assignment is that assigned groups wi difference will com
	Ignores other varia on the relationship ignores that many DV. For example, i genetics are thoug

Check your understanding! Experiments

Q1. Describe one way that a quasi-experiment differs from a field ex

Q2. Explain a disadvantage of an artificial environment. (2 marks)

Q3. Explain how the operationalisation of the variables may lead to

Q4. Explain how investigating natural variation in independent var

Q5. Discuss one ethical implication of field experiments. (3 marks)

Research method: Observation

The best method to know how a p... or group of individuals acts in a parti... that setting. This can be a particularly useful when it is likely that the behaviou... report m...es, ...ikely to match up to the reality of the situation. This m... reality is ...s undesirable, for example, consider rates of public toilet hand... we have sparse knowledge of the area and want to gain detailed information ... the development of new research questions.

Structured observation

A structured observation is carefully planned beforehand and the researcher ... when observing. Researchers will establish what they are looking for and cre... These behavioural categories should cover all possible behaviours.

Advantages	
Easier to record and analyse: Structured observations allow the researcher to accurately record the behaviours present. This produces frequency information which can then be analysed and used in quantitative testing.	**Unexpected behav...** unexpected behavi... researcher expects ... the investigation. T... structured observa...
Replicable: If there is a controlled environment, then other researchers can test for the replicability of the findings by using the same observation schedule.	**Limited insights**: St... primarily on record... behaviours and this ... limited insight into ... researcher cannot ... the behaviour.

Unstructured observation

An unstructured observation involves the researcher writing down what they s
for specific behaviours, but will note down what they believe is relevant to th
observation can be difficult to achieve without using video recording because
observations.

Advantages	
Useful for exploratory research: This method is useful when the researcher has not got a strong idea about the behaviours they might see. Unstructured observations allow the researcher to learn about the situation as it is, rather than trying to view the situation within the constraints of certain ideas.	**Salient behaviours** Researchers are m stand out and they behaviours if they a
Provides rich data: An unstructu ap ch allows the researcher to record n a information relevant and this s such richer data than freque f b aviour. The researcher may be able to learn deeper insights and further research could study these insights.	**Difficult to analyse** which is more diffic affected by the res expectations and t

Naturalistic observation

In a naturalistic observation researchers observe the participants in their norm
studying their typical behaviour in these settings. In this type of experiment,
the environment.

1.3 Methodological issues: Ecological validity

Ecological validity is a type of **external validity** that is concerned with whether research can be generalised to settings outside of those the research was conducted in, for example, everyday settings.

Research with high ecological validity usually uses naturalistic real-life settings which mean that the findings are more representative of real life.

In contrast, research with poor ecological validity often uses artificial stimul
and laboratory settings which limit the generalisability of the findings.

Example: *Ramirez-Esparza et al. (2009) wanted to investigate whether there w Mexicans were more sociable than Americans. Participants were 54 American all participants completed a questionnaire that addressed self-reported sociab recording device continuously for two weekdays which made short 30-second s hour. After analysing the audio data, the researchers concluded that Mexican sociable but in fact were more sociable in their daily interactions.*

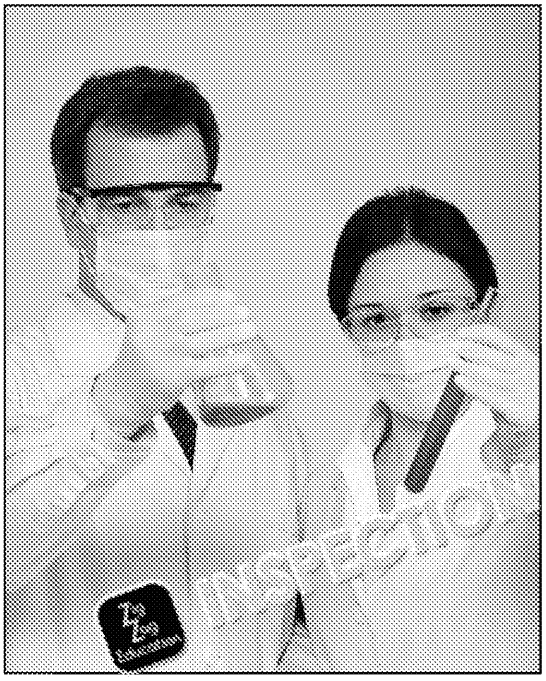
Advantages	
Non-laboratory scenarios: This method allows researchers to investigate situations that would be unethical to produce in the laboratory but naturally occur.	**Observer bias**: Whe or outcome of the s unintentionally inte
High mundane realism: Mundane realism is the extent a study situation is similar to real life. Since naturalistic observation uses real life and natural settings for behaviour, this method has high mundane realism.	**Reliability**: A single completely objectiv the need for multip observations are sim are not consistent t the research are uni
Good external validity: External validity deals with how generalisable the behaviours are to other settings. Observed behaviours in a natural setting are more generalisable than those produced in a laboratory setting as they represent real life.	**Reactivity**: In observ aware they are being to changes in behavi they desire to have a (social desirability bi observation is to ob which means reactiv

Controlled observation

In a controlled observation the researcher manipulates the environment the p might still be in a typical setting, for example, children in a classroom, but they precisely determined events, e.g. the head teacher entering at a specific time. Alternatively, the environment may be more clearly artificial when it is condu

Example: *Ainsworth and Bell (1970) set up an experiment called the Strange S attachment behaviour of infants. They set up a room with cameras and one-w interactions could be observed covertly. The environment the infant was in w effects of introducing or withdrawing the caregiver or stranger were observed regards to: behaviour on return of the caregiver (reunion behaviour), behaviou (stranger anxiety), and the reaction to the caregiver leaving.*

Advantages	
Greater control: The tighter control in this method reduces the effects of extraneous variables that can influence the behaviour.	**Lacks external validi** to which the results people or settings o
Replicable: As the observation has standardised procedures, the research process can be replicated. This makes it easy to compare the results.	**Demand characteris** subtle clues that th way and responding the 'demands' of th
Higher internal validity: Internal validity is the extent that the proposed cause of behaviour is actually the cause. Tighter control reduces the number of extraneous or possibly confounding variables that may influence the behaviour. As a result, it is more likely that changes brought about the behaviour.	**Low ecological validi** extent to which the other settings in re observations are do results may not be influences the resu



1.3 Methodological issues: T
Test-retest reliability is a sub
measures vary). It asks: Are

This method involves having
once and then repeat the tes
results are then compared a
changed.

If an adult completed an IQ t
be the same a month later, i
reli[illegible]y. However, other te
d[illegible]ession may not be expe
person's symptoms may imp

Test-retest reliability is easie
observation because the res
participants experience the s

Participant observation

In participant observation, the researcher actively interacts with the participa
occur in the form of covert observation and the person integrates themselves
behaviour as though they are one of the group's members.

Example: *Rosenhan (1973) conducted a field experiment where eight pseudo-*
to 12 different mental hospitals. They all claimed that they heard voices that
gained admission. After admission they presented no symptoms of abnormal
symptoms, they were completely accepted by members of the staff who chose
though it was typical patient behaviour. They interacted with patients and st
being in remission rather than sane. Initially observation notes were taken co
apparent that the staff just regarded this behaviour as another symptom they

Advantages	
Hard to study groups: Using this method, researchers can investigate groups that would typically refuse to be researched. For example, participants that engage in illegal activities would not agree to be researched.	**Researcher part of** DeWalt (2002) foun differently to resea Since participant o researcher factors [illegible]thnicity are likely t [illegible]espond to them a
Immersion: Complete immersion in the [illegible] provides a higher level of under[illegible] than distant observation. Research[illegible] better able to understand the [illegible] behind the behaviour and how th[illegible]k.	**Time and effort:** Fo the group then this effort to research.
More in[illegible]ation divulged: As part of the group, researchers are likely to be privy to more information and have fewer of the barriers non-participant observers have.	**May lose objectivit** in the group, the re they are part of the

1.3 Methodological issues: B
Researcher or observer bias
observer's beliefs about wha
study's findings. Participant
affected by observer bias be
interacting with the particip
researcher to view the obse
may not be impartial. Steppi
you are observing encourag

Non-participant observation

In non-participant observation, the researcher is not involved in interacting w
distance from the participants when observing. One method to do this is to u
microphones and videos which can be less intrusive than a physical person obser

Example: *Hughes et al. (2014) were interested in how low-income ethnic mino*
at meal times. They recorded videos of dinnertime in 80 families that fit the c
Hispanic or African American. They found that the type of personality traits in
made to encourage children to eat.

Advantages	
Distance encourages objectivity: Being less involved with the participants themselves encourages more objective measurements that may not be possible if the individual forms a personal opinion of participants.	**Limited scope:** Rese observation metho participants and se individuals will agre resembling their no
Often uses recording devices: Recording devices such as those that record video or speech are objective records. They allow several researchers to view the same information and compare conclusions.	**Restricted understa** knowledge about th correctly infer moti

Overt observation

Overt observation is where it is clear that the participant is being observed. T
explicitly saying what they are researching and the group cooperates with the
information they need.

Example: *Von Suchodoletz et al. (2014) were interested in the quality of teach*
preschools. In 63 different classrooms over 26 different preschools, interactio
Teachers had agreed to be observed and the observers did not play a role in te
children. Each classroom was observed four times in the morning (each sessio
with each observation session having a different observer. The interactions w
to teacher-child interactions on a seven point scale. They found that there wa
teacher-child interactions. Ratings were judged to be reliable if they did not d
observers; ratings were shown to be reliable.

Advantages	
Encourages trust: When researchers are open and honest about the kind of research they are doing, people are often happy to help and appreciate being told the nature of the study.	**Observer effect**: O person or group is a result, they may a results inaccurate.
Quicker and easier: Requires lower amounts of planning and preparation because measures to conceal the observation do not have to be considered.	**Some groups unab** be inaccessible to o be observed. For e in violent or illegal wish to remain sec

Covert observation

Covert observation is a type of observation where the person is not aware tha

1.3 Methodological issues: Dema
Demand characteristics occur whe
that tell them about the nature, a
experiment. This can cause them t
(consciously or unconsciously) and
advantage of covert observation i
affected by demand characteristic
deception can be used to make it l

***Example:** O'Brien et al. (1982) inve[illegible] whether there were differences in selected for snacks. Three [illegible] observers were sat on benches near fo 356 children were fi[illegible] on a scale of obesity and then observed for their found n[illegible] between the two groups and observers had a high degre*

Advantages	Dis
Necessary in some groups: Some groups of individuals do not take kindly to being observed (e.g. criminal gangs) and others would likely make significant changes to their behaviour if they were aware of being observed (think of teachers during Ofsted!).	**Unethical**: Dependent on th • Are you observing beha person would expect to • Are you observing beha person would not expe behaviour is not of a se • Are you observing beha person would not expe would experience disco concern about being de
Reduced observer effect: Behaviour is less likely to be modified as individuals are not aware that they are being observed, this minimises the risk of reactivity.	**Requires planning and time** the group's trust or to appea conducting the research.

Check your understanding! Observation

Q1. Identify two differences between naturalistic and controlled obs

Q2. Identify two differences between covert and overt observations.

Q3. Define participant and non-participant observation. (2 marks)

Q4. Discuss [illegible] problems related to covert observation. (4 m

HELPFUL TIP: While only the type of situation was discussed with regards to et
ethical issues could also be discussed:

Deception: the subjects are deceived as they do not know they are taking part i

Informed consent: the subjects have not given consent or informed consent to

Right to withdraw: as the subjects do not know they are in the study, they cann

Q5. Identify and briefly explain two limitations of participant obser

Q6. Evaluate the covert observation tec [illegible]. (6 marks)

Q7. Explain the ad[illegible] of controlled observation over naturalis

Rese[illegible] method: Self-report

Self-report is a research method technique in which the participant provides i
researcher's questions. Self-report methods include questionnaires and inter

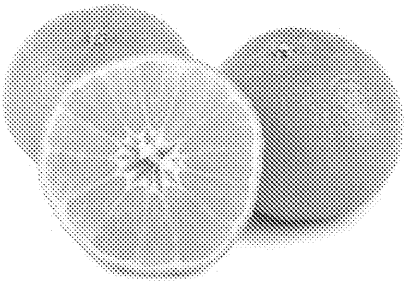
1.3 Methodological issu
Questionnaires and int
'social desirability bias'
concerned about maint
so they lie or alter thei
positive and socially de
bias can affect the vali
results are not accurate
researchers use is to hi
filler questions and the
topic of interest.

Questionnaires

Questionnaires involve a written list of questions that are answered by the pa
on a particular topic. Questionnaires usually concern the participant's experi
level of demographic information (age, gender, ethnicity, etc.).

Real-life application: Census
The biggest coordinated eff[illegible]sure and record the nation's people c
compulsory census in [illegible], the census was last conducted in 2011 and it
were 5[illegible]st[illegible]e 2011 census and some of the topics covered inclu
qualifi[illegible] and employment status. Since the first census in 1801, further
questio[illegible]aires and practices and 2011 was the first year to allow responde

Advantages	Dis
Large amounts of data in short amount of time: Once the questionnaire has been designed, the researchers can send it to a very large number of people with little additional effort. As such, questionnaires can fairly easily collect large amounts of data.	**Low response rates**: If sendi questionnaires to a group of that some of the people will problematic, if the people w representative of the sample
Cost-effective: Researchers can send a large number of people questionnaires and the cost per questionnaire is relatively small compared to methods that require more of the researchers' time such as interview	**Doubt over honesty**: Partici no way of checking the level answers and as such feel rec Whe wers may result in l a even greater chance tha answers to be viewed favour
Standardised: aires all have exactly me questions in exactly the same o which may not occur in interviews. This ensures that the experience of the responders is identical.	**Open to interpretation**: Wha not be the same to every pa question was 'What kind of m was 'very poor / poor / OK / g may respond differently to w and 'poor' are. Researchers their questionnaires, as the participant for further elabo



1.3 Methodological issues: Intern and split-half reliability

Internal reliability refers to consis

All parts of the measure should a (construct validity).

One test of construct validity is t test looks at whether the test is i involves taking half of a question other half. If the two halves produ measure is internally consistent. questionnaires and the whole qu the same construct.

Construct validity is important for other measure , b t e split-half method

Interviews

Interviews, like questionnaires, involve asking a person a list of questions, and
Unlike questionnaires, which involve fixed questions, some styles of interview
questions as the interview progresses.

General evaluation of interviews

Advantages	
Obtain the information you want to know: Interviewing directly asks questions to provide the information desired. As it often concerns experiences, thoughts and beliefs, it is useful when the interview allows the researcher to ask follow-up questions.	**Social desirability b** concerned about w them and may adju positively evaluated are typically face-to seem more importa
Does not require complex equipment: Unlike experimental practices, interviews do not require a complex set-up or equipment, making them easier and less expensive to carry out. An interviewer may use a Dictaphone, a device to record sound, to capture the interview before transcribing it.	**Careful phrasing:** W the desired length o they are given to w be carefully phrased answers.
Limited planning: Unlike other methods, interviewing usually only requires the development of a set of questions or themes of discussion, which reduces the time and cost of development.	**Complex analysis:** T generally means tha results of the data. amount of time and to compare with ot
Extra cues: Unlike questionnaires, interviews provide information about body language and voice tone. This can be useful in interpreting the person's answers.	**Effortful:** Interviews are more effortful than questionnaires and require the interviewer being present and then a long pro of analysis.

Structured interview

Structured interviews use an ordered list of questions that have been predete carried out. Using the same interview questions and in the same order, mean repeated on other interviewees. The style is often fairly direct and objective, boundaries between the interviewer and interviewee.

Example: Structured interview on smoking and quitting smoking

I: *Why did you first start smoking?*

P: I started when I was about 14 or 15 I guess. At lot of my friends had already been smoking for a especially the older ones. I was never peer-pres it or anything, but one day whe[illegible] offered I d accept. No real reason why that day was differen that smoking was quite a 'normal' part of my life Pretty much everyone was doing it, so I did too.

I: *Why do you continue to smoke?*

P: Hard to say really, habit I guess. It's part of m the moment. I'll have two smoking breaks at work light up if I'm waiting around at the bus stop or walking to somewhere. I like having something to little empty spaces of time when you're not doing never tried to quit before, never had a big enough

I: *What positive experiences have you had with smoki*

P: I enjoy the social aspect of it. Sometimes if I'm people I don't really know and it's a bit awkward start a conversation by asking if they have a lig can talk to anyone when you're out there and it's meet people… Also, sometimes it's just nice to ha Whether you're stressed from a work assignment, o one of those really busy days, it can be nice jus step back and have a break.

I: *What negative experiences have you had with smoki*

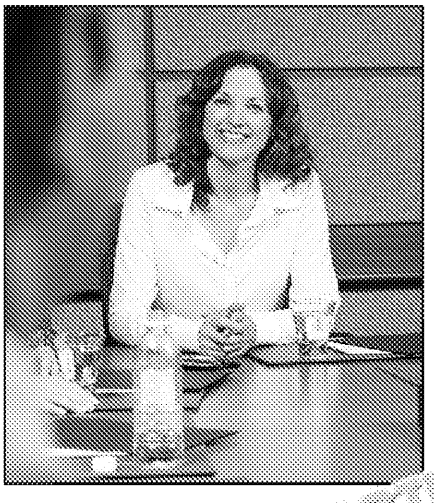
P: Um, well apart from smoking in the awful weather, been a couple times where I was ill and it didn't had a really bad cough once and every time I smok set it off.

I: *Have you ever thought about quitting or tried to*

P: I think every smoker probably 'thought' about but no, I've not tried. I'm sure one day, I wi whe[illegible] kids or something.

I: *What do you think would motivate you to quit?*

P: Um, lots of things probably. Like I say, if I ha probably wouldn't want to smoke around them. I n it when I see parents smoking into their kids' fa money would probably like cause me to stop or cut Cigarettes are expensive enough as it is, I know who wouldn't be able to keep up their smoking hab were more expensive.



1.3 Methodological issues: Inter-rate
Inter-rater reliability is a subtype of e
measures vary). Interviews are a form
difficult to analyse.

One method is called content analysis
responses into different themes and s
it is important that the researcher do
ideas onto the findings. A solution is t
analysing the same interview. The res
similar the [illegible] to one another. If the
similar [illegible], then we can say they have

Evaluati[illegible]tr[illegible]ed interviews

Advantages	
Standardised: As all the questions are standardised and presented in a specific order, this allows for the exact replication of the interview to be carried out. Interviews that are exactly the same in format are easy to compare and draw conclusions on.	**Inflexible:** Structur follow-up question gained from the int
Desired information: Structured interviews get exactly the information they desire and reduce the amount of irrelevant information provided.	**No true expression** are unable to get a fixed questions. Si neglect the bigger aspects.
Reduced interviewer bias: As questions are fixed this reduces the risk of leading questions which may bias interviewees towards certain responses. Additionally, rapport is not developed between the interviewee and interviewer and this encourages interviewer objectivity.	**Quality of question** structured intervie about the quality o need to be designe maximum relevant
Generalisation possible: Given that the interview is standardised, the findings of a group of interviews may be generalised within the sample they were drawn from.	**Does not develop r** encourage honesty an interviewee fee empathetic toward give away details th

1.3 Methodological issues
Criterion validity looks at h
related to a specific outco
subtype that considers if th
an existing similar measur

A structured interview is e
interviews and the questio
to draw on and improve o
This would allow the resea
establish concurrent validi

Unstructured interview

An unstructured interview is similar to a purposeful conversation in that the i spontaneously as the interview progresses. The interviewer may have a gene but there is no strict order of questions. The tone may be chattier than a stru interviewer may try to develop a sense of rapport, an understanding relations

Example: Unstructured interview on health and attitudes to change

I: *So I wanted to ask you first of all about what yo means to be 'healthy'?*

P: Um, well, I guess it's to do with not getting ill are healthy then you are less likely to get sick, less likely to die from diseases in the long run hard to be healthy.

I: *OK, so being healthy is really beneficial. In w you think a person can try to be healthy?*

P: Well, exercise and diet are the main ones everyon abo say you should try to do half an hou ex e and try to eat lots of fruits and vegeta day rso, smoking and drinking are not good for sometimes healthy can mean giving up bad things.

I: *So with your idea of healthiness in mind, how eas be healthy?*

P: Um, I think it's hard; I find it hard. Sometimes you just want a takeaway but you know you shouldn you had one a few days ago. After work it's diff convince yourself to exercise. It's too dark at for jogging in the evening, so you head to the gy your heart isn't in it; it's at home in front of to a pizza with extra cheese. [Laughs] It's hard idea but hard.

I: *Yes, sometimes life can make it difficult to fit in and healthy behaviours get pushed to the botto pile. Can you think of any ways that might help to your good intentions?*

P: Well, I can only really think of one. My friend for a run at 6am on the dot every morning and she that the routine really helps her. She knows tha it's raining she will convince herself to go. So routine might help; but I'm not so sure if it wou for me.

I: *Why might it not work for you?*

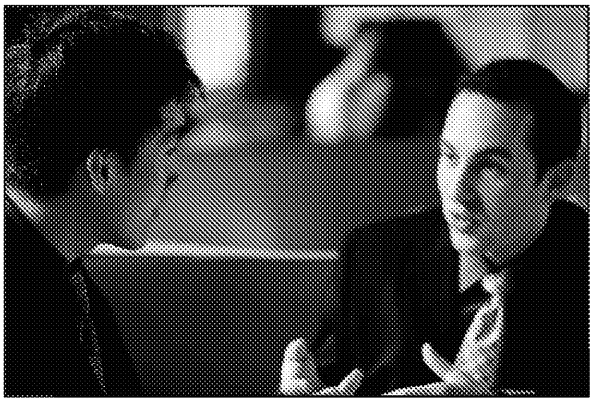
P: Well my schedule is really chan ; I don't go work at a fixed time and I've recently split from and we share custody o daughter... So I fin schedule is reall t rent from one week to the

I: *Have you thought about scheduling? Rather than a sa i the same time every day like your f co chedule in exercise and meals on a week-to- bas . So the week before, you might decide you for a run at say 7am on Tuesday and go to the gym and Saturday straight after work. Do you think t work for you?*

P: Err, yes that might work actually, with my schedu might work.

I: *Would you like to find out more about it?*

P: Yeah, that would be great. Thanks.



1.3 Methodological issu
Does the measure appea
For example, Beck's Dep
good face validity becaus
cognitive and this measu

Unstructured interviews
because the interviewer
wants to know about. Sk
needed to keep the conv

Evaluation of unstructured interviews

Advantages	
Rich and detailed infor n: Unstructured interviews crea d information and follow-up que an allow for the development of further in a particular area of interested.	**Cannot be replicated:** unique and as such int makes it more difficult conclusions about tren
Flexible: Interviewers are able to respond to the discussion as it develops and this allows them to go down avenues of conversation as they are discovered. This encourages viewing the bigger picture rather than discrete topics.	**Needs trained intervie** unstructured interview interviewer. The best interviewer and this re
Relaxed and conversational style: The relaxed style of the interview encourages giving information and reduces worry that the interviewer might negatively evaluate them.	**Difficult to generalise** different, it is difficult interview to another o
Avoids oversimplification: Many of the topics discussed using interviews are complex and cannot be simplified down to a few questions while maintaining accuracy. The unstructured interview allows for a more complete view of the topic.	**Interviewer bias:** Unst carefully selected que questions that predisp response. Furthermor may be less objective t developed between th

Semi-structured interview
Most interviews use a combination approach (semi-structured) which allows t
types of interview technique. A semi-structured interview has a mixture of fix
beginning with fixed questions and then using follow-up questions for further

This method is often used when diagnosing psychologic isorders. For exam
series of routine questions and then ask for fur ils to better understa

1.6 H ci e works: Objectivity
e rchers should practise objectivity; that is, th
research that is not influenced by their own perso
If research is not objective then this affects the va
findings may be the result of the researcher rathe

Qualitative research, such as interviews, in partic
subjectivity. Unlike quantitative research, where i
numbers, qualitative research requires a great de
is difficult to ensure that the analysis has not bee
researcher. One method of dealing with this issue
conduct the same analysis and compare the findi
then the analyses should be very similar.

Research method: Correlation

Obtaining data for correlational analysis

Strictly speaking a correlation is not a type of research method, that is, it is not
but a type of analysis or test that you can do on your research.

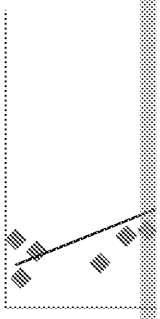
As such, you can actually obtain the data to conduct a correlation in many diff
different scores or measurements so that you can examine the relationship b

Here are some examples of ways you can obtain data that could be used for a

- A correlation between the number of times children raise their hands
  percentage (teacher records)
- A correlation between self-rated happiness (questionnaire) and numb
  (personal data)
- A correlation betw[illegible]height (self-report/measured) and attractiven
- A correlati[illegible]ve[illegible] reaction times (computerised task) and numbe
  [illegible]p[illegible]observed in a sleep study)

Positive correlation

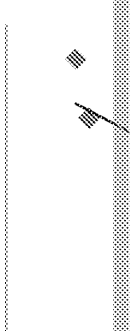
A positive correlation is a relationship where as one variable increases, the other variable also increases. For example, you might expect to find a positive correlation between height and shoe size, that is, a taller person is likely to have larger feet. A positive correlation is illustrated by correlation coefficient of between 0 and +1. On a graph you can identify a positive correlation by looking for points that go from the bottom-left to the top-right corners.



Positive (+0

Negative correlation

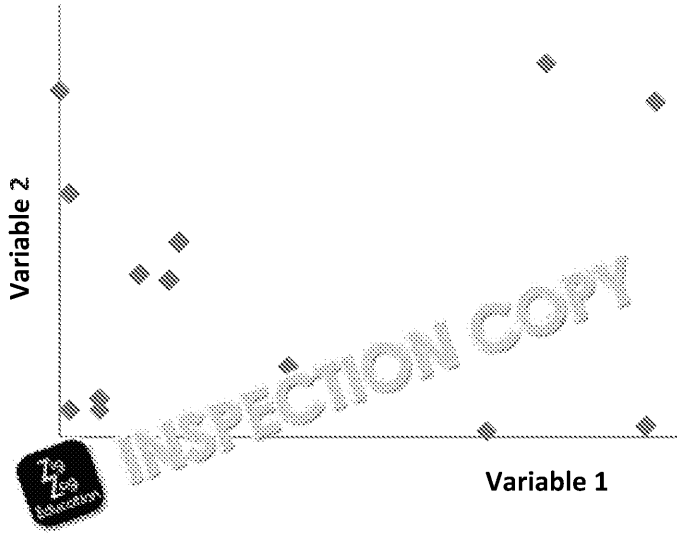
A negative correlation is a relationship where as one variable increases, the other variable decreases. For example, if a woman likes spending her wages on new shoes, then you might find that as her collection of shoes increases, the money in her bank account decreases. A negative correlation is illustrated by correlation coefficient of between 0 and -1. On a graph you can identify a negative correlation by looking for points that go from the top-left to the bottom-right corners.



Negative

No correlation

Sometimes the data is completely random, that is, there is no relationship be



In the example above, the points are widely distributed with no apparent ord having 'zero correlation'.

Evaluation of correlational analysis

Advantages	
Uncovers relationships: Correlations can be an excellent place to start researching a new area and identifying relationships. As evidence for the existence of a relationship between two variables, correlations can help promote later experimental research.	**Not cause and effe** researcher whethe change in another. association betwee third hidden variab between the variab
High mundane realism: The raw data used in correlational analysis is usually produced in natural rather than experimental settings. Unlike an experiment, variables are highly relevant to real life.	**Directionality**: It ca direction of the cor being nice to stran correlated, it is diffi happy makes you n or being nice to str
Self-report: Much of the data used in correlational analysis comes from self-report techniques such as questionnaires. Using questionnaires can be advantageous as it allows the researcher to g of data quickly and affordably. Com a questionnaire is seen as bei trul than taking part in an ex it may be easier to get dat a number of participants which improv eralisation.	**Self-report:** Self-re disadvantages. Un have low levels of c participants are be questionnaires, wh the results.

The difference between correlations and experiments

Correlations and experiments are different on a number of key matters:

- **Cause and effect**: Experiments are able to determine cause and effec variables that may influence the results. Experiments attempt to ens exactly the same environment so that the only change is the change t variable. In contrast, correlations do not directly manipulate the inde other variables, which makes it impossible to infer cause and effect.

> **Important note!** Experiments can rarely truly prove cause and effec variables that cannot be controlled and accounted for. This is even m where it is not possible to control for the participant's history, perso other factors. Therefore, experiments at bes a form 'causal relati the cause.

- **Similarity to real li** xpe ents are typically conducted in artificial operationali variables, which makes the setting dissimilar to ly duced from questionnaire data which asks questions rela tudes.

Chapter 1 Activities

Check your understanding! Correlations

Q1. Define a perfect correlation. (1 mark)

Q2. The correlation between happiness scores and anxiety scores ha three points we can learn from this coefficient. (3 marks)

Q3. Briefly describe one difference between correlations and experi

Q4. The majority of correlational research is obtained from self-repo explain one advantage of this. (3 marks)

Q5. Discuss whether we can establish causation from a correlation.

Q6. Identify and explain an advantage and a disadvantage of correl

Q8. A psychologist conducted a survey that investigated the relation
and how they view their health. The researcher produced the fo
results:

a) What type of correlation is this? (1 mark)
b) Circle any outliers. (1 mark)
c) Does older age cause the person to perceive they have bad h

Practice questions

A psychologist is interested in whether children are more likely to raise
teacher is female or if the teacher is male. The teachers introduce the ps
who is going to sit at the back and watch the lesson. The researcher tall
child raises his or her hand. She does this once in a class with a female
class with a male teacher. The results are compared.

Q1. a) Outline what is meant by ...ured observation. (2 marks)
b) Explain why the investigation into hand-raising is an exampl
observation. (2 marks)

Q2. The ...chologist used overt observation to collect data.
Describe how overt observation differs from covert observation.

Q3. a) Describe one strength of using naturalistic observation in this
b) Describe one weakness of using naturalistic observation in th

Chapter 2: Planning and conducting

Overview

This chapter will provide essential information about planning and conducting research. Using this information you should be able to understand the strengths and weaknesses of specific design choices and use these to consider the best way research could be conducted.

Learni

After studyin
able to:

- ❑ Unders
  conduct
- ❑ Evaluat
  conduct
  strengt

Key Te

Alterna erimental hypothesis	A prediction on the outcome of the researc
Behavioural categories	A recording that uses a behaviour checklist an observation session
Closed questions	A question with a fixed response, e.g. 'yes', how a person can respond to the question
Coding frames	A pre-planned list of codes that a researche systematically
Dependent variables (DV)	A variable which measures the presumed e
Event sampling	A recording of how frequently an event occ
Extraneous variables	Variables that may influence the behaviour (typically manipulation of IV) and so should
Independent measures design	Different participants take part in each con
Independent variable (IV)	A variable that is manipulated by the exper an effect
Likert scale	A type of closed question where a person r continuum scale
Matched participants design	Each participant is matched to another part factors important for the study. Each partic with its pair acting as its control.
Null hypothesis	States there will be no effect
One-tailed (directional) hypothesis	A hypothesis that predicts the direction of t
Open question	A question that allows the person to respon qualitative da
Operationalisation	Pr ly defining your variables so that a hy
Opportunity sampling	A sampling method in which the sample is time of the study and meets the required c
Populati	The people who are relevant to your resear
Rando e	A sample that is drawn so that members of being selected
Repeated measures design	The same participants take part in all of the
Research aim	What the study intends to research
Research question	The question you are trying to answer with
Sample	The participants that have been selected to
Sampling	The method of selecting participants from t your study

Key Terms

Self-report	A research method that gathers data by ask questions on the topic of interest
Semantic differential rating scale	A type of closed question where participant towards a topic on a scale that has polar-op either end
Snowball sampling	A sampling method where the researcher re those participants nominate their associates
Time sampling	A recording that uses regular intervals and present or absent in a time frame
Two-tailed (non-directional) hypothesis	A hypothesis that predicts that there will be direction of the effect
Volunteer/Self-selected sampling	Participants self-select; they choose to part

Aims and hypotheses and how to formulate t

Research aim

The aim is a statement about what the researcher intends to study in their re
researcher is asking 'What am I trying to find out?'. For most research, it is a
the theory or effects rather than specific experimental method. The aim doe
the study although it might remark that it is testing whether a certain theory
pieces of research could have the same experimental aim but use different m

Examples:

- *Imagine we are Zimbardo about to conduct our Stanford prison experim
study is to investigate the extent that our behav[illegible]s determined by st*
- *Or Watson and Rayner about to conduc[illegible] Albert phobias study
examine whether a phobia can be [illegible]t through the behaviourist appr*

Research quest[illegible]

Your res[illegible]u[illegible]ion is the question you are trying to answer with your res
study an[illegible]d as in the form of a question instead of a statement. Your qu
your study will not fully answer it.

Examples:

- What factors influence students to study harder during exam season?
- Is drug therapy an effective way of treating depression?

Null hypotheses

The null hypothesis states there will be no effect of the independent variable
Alternatively, if you are conducting correlational research, that there will be n
variables.

In psychology research, you try to disprove the null hypothesis. Disproving th
that there is an effect or relationship.

Examples:

- There will be no difference on measures of happiness between those
are married.
- There will be no relationship between the amount of time slept and s

Alternative/experimental hypotheses

A hypothesis (plural hypotheses) is a testable prediction about what the resea
study to be. The hypothesis is written in specific term[illegible]t relate to the expe

Example:

- *Imagine we are Asch about to conduct our line length conformity experi
some particip[illegible]s to conform to the majority by giving the same incor
d[illegible]th[illegible]t answer being evident'.*

1.6 How science works: Hypothesis testing

Hypothesis testing is important in scientific research. It involves the formul
designing experiments or studies, collecting data, and analysing the results.
based on existing theories or observations, conduct controlled experiments,
determine the significance of the results. By following this systematic proce
conclusions, make evidence-based claims, and contribute to the advanceme
Hypothesis testing is a crucial tool in ensuring the validity and reliability of s
researchers move forward and learn more about different subjects.

1.6 How science works: Induction, deduction and the hypothetico-deduct
There are two main methods of reasoning called deductive and inductive r

Deductive reasoning
You start out more generally by thinking up a theory and then you come u
observe a situation to test your hypothesis.

Deductive reasoning is the type you might use if you are trying to solve a c
potential suspect but you develop a theory about who it can be and narrow

Inductive reasoning
In inductive reasoning you start with a specific obs a on and then you th
develop a hypothesis to explore it and final y yo evelop a more general t

Inductive reasoning migh e th in a multiple-choice exam, the first four
hypothesise that x ne might also be a C.

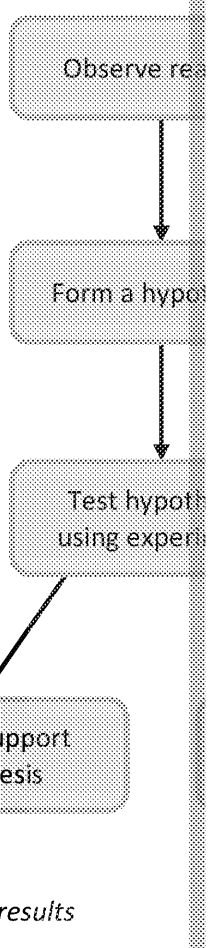
Note s would be flawed reasoning in this example because there is
would be a C!

Hypothetico-deductive method
When people refer to the scientific method they are referring to the hypothetico-deductive method.

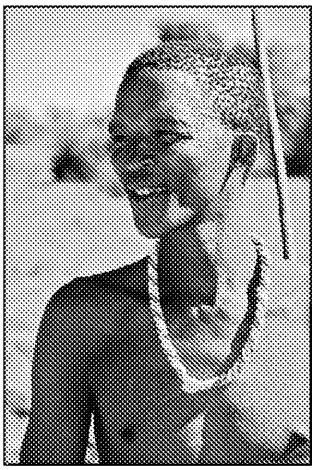
The hypothetico-deductive method argues that theories should be developed first, followed by experiments and then the theory is refined.

The hypothetico-deductive method uses both inductive and deductive reasoning:

- Inductive reasoning to form an explanation for the observations
- Deductive reasoning to predict what will happen if the explanation is right
- Deductive reasoning to choose a test that can investigate the prediction



Why Freud is not very scientific!
Freud studied Little Hans and believed the boy was affected by the Oedipu
work for the Oedipus complex was done before Freud met Little Hans (or h
adjusting his theory in light of the evidence he saw, Freud interpreted Littl
existing theory. Freud never made any attempt to find out if his theories w
his observations in terms of the theory.



1.6 How science works: Falsification

To falsify a theory would be to prove that it is
important principle in science. Any hypothesi
falsifiable; that is, it must be able to be tested
to say that every theory must be incorrect, it
correctness.

Some psychological theories cannot be falsifie
theories that argue that our behaviour is ada
evolutionary ancestors are not falsifiable. This
time and we do not ha ccurate information
Evolutionary t st often study our current
but th ence still does not allow us to fals

One-tailed (dir) and two-tailed (non-directional) hyp

Hypothe e ther be one-tailed/directional or two-tailed/non-directiona
hypothe e that states the direction of the effect, whereas a two-tailed
states that there will be an effect.

***Example 1**: Imagine you are conducting a study that examines the effect of kn
accuracy. Participants are divided into two groups and both are given the san
group is told that there they have five minutes to complete the task and the ot
limits. Prior to the study, the researchers had another group of participants to
on average it took no longer than three minutes to complete. Thus, the time li
due to time constraints.*

You could make two types of hypothesis:

- *One-tailed/Directional: 'Individuals who are told that there is a five-min
scores than those who have no time limit.'*
- *Two-tailed/Non-directional: 'There will be a difference in scores betwee
minute time limit and those who are not told of any time limit.'*

***Example 2**: Imagine you are conducting a study which compares the treatmen
individuals. One group receives the same dose of drug Paxil for 12 weeks and
cognitive behavioural therapy (CBT). You are interested in the reduction of sy
Depression Inventory (BDI).*

You could make two types of hypothesis:

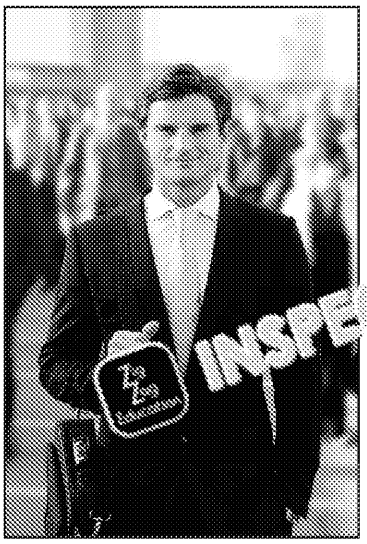
- *One-tailed/Directional: 'Cognitive behavioural therapy will produce a gr
Paxil as measured by BDI scores'*
- *Two-tailed/Non-directional: 'There will be a difference between sympto
cognitive behavioural ther pared to Paxil'*

When t se ailed (directional) hypotheses

A resear ll use a one-tailed hypothesis when they have evidence that s
For exam , if previous research has suggested that cognitive behavioural th
not very effective, you might use the directional hypothesis that suggests tha
be more effective than Paxil. The evidence can also be less specific, for exam
that drug-based treatments are not as effective as cognitive treatments, or th
as the symptoms of depression are mostly cognitive. Thus, evidence can be t

Populations, Samples and Sampling Techniq

A population is all the people who your study is relevant to. A sample is a gro
selected from the population to be participants in your study. A sample need
it to be representative of the entire population from which it is drawn. A sam
from sample bias.



1.3 Methodological issues: Representative
When selecting your sample you need to n
population you are interested in. If it repre
will be able to generalise your findings to t

For exampl , if o re interested in study
ma ds to take part. However, does t
, ur research question, your sample wo
races, socio-economic classes and so on. If
men aged 19–20 then you will only be able

One of the best ways of ensuring a represe
sampling. This type of sampling means tha
have an equal chance of being selected.

Random sampling

A random sample is drawn so that members of the population have the same
one person being more likely to be picked than another. The idea is that each
therefore, representative of the population.

For example, if you are interested in all the students who are doing A Levels a
all the students who meet this criterion and put all of the names in a hat and

Advantages	Di
• Sample is representative of your entire population • Removes bias as all participants have an equal chance of being selected	• Usually the populatio sampling to be condu • Not everyone may ag those that refuse may accept, making the sa

Snowball sampling

In snowball sampling, you recruit one or more participants and your particip
participants from their connections to take part in t dy. This is useful w
who are difficult to recruit or part of exclusive gro

Advant s	Di
• Useful for rec ficult to recruit pop s accessing participants who may not have identified themselves • Low-cost method of sampling as participants help to recruit new participants	• Participants may be r other potential partic ask them to do so • Sampling is not rando unlikely to be represe

Opportunity sampling

An opportunity sample is a sample drawn from whoever is available at the tim
required criteria for participation (for instance, they must be female or speak

For example, you might ask your friends and family to participate in a questio

Advantages	Disadv
• These participants are easy to recruit • Suitable for processes that are thought to be universal, for example, attention, memory, etc.	• Often results in quite a limited • The sample is likely to be biase the street on a Tuesday morni include young people who may work during this time.

Volunteer/Self-selected sampling

In a volunteer sample participants choose to respond to an invitation or a
is, they self-select.

For example, people might respond to an advert they have seen online for a s

Advantages	Disadvan
• Usually allows for a wider sample than opportunity sample • Fairly suitable for many investigations where people are unlikely to differ significantly from the whole population	• Likely to be biased, as those who s those who do not respond to an in Shaver's Love Quiz on attachment used an opportunity sample of tho advertisement. However, those w 'love quiz' may be more likely to ha positive outlook on romantic relati • Sample is restricted to those who h for the study

1.3 Methodological issues: Population validity

Population validity is a type of **external validity** that is concerned with whether the findings can be generalised to other people than the research sample.

All research aims to be generalised to the population they are interested in study but sometimes unique qualities of the sample mean that the findings are only applicable to the sample. Reducing sample bias leads to higher population validity.

Experimental designs

Repeated measures design

In a repeated measures experiment all participants take part in all of the cond
repeated measures is a pre- and post-test comparison. In this comparison, re
conducted before an intervention and measurements conducted afterwards.

Advantages	
Fewer participants: If there are only two conditions, a repeated measures design would require half the number of participants as an independent groups design. Reducing the number of participants sav time spent on recruitment and may be m re economical in terms of time and m or participants.	**Order effects:** Orde fatigue can alter ho conditions. A perso fterwards might in they have already c worse if they are b same thing again.
No individual di s: In repeated measures, each p ct s their own control as they compar results to their own results. There are no individual differences, which may make repeated measures a more accurate method of research.	**Materials need to** conducting a befor need to be designe terms of difficulty a be compared for a

Independent measures design

In the independent measures design each participant only takes part in one o

Advantages	
No order effects: As participants only take part in one condition the effects of previous conditions cannot carry over and affect results in other conditions.	**Individual differen** unevenly within th not be appropriate
Sometimes only option: In some cases, particularly naturally occurring independent variables, a participant cannot be part of more than one condition. For example, in the cases of gender and age, the participant cannot be both male and female.	**More participants:** requires new partic can be costly in ter the participants are

Matched participants design

A matched participants design involves having separate participants in each c
matched for being similar to each other. Important factors to the experiment
qualifications) and each participant is matched to another participant that is s

Advantages	
No order effects: Individuals do n t e the conditions which means t effect of one condition does not carry o e to the next.	**Difficult to match:** impossible to matc that are identified match participants
Similar individual differences): In each pair, the part pants act as controls for one another. The results from one participant are compared to someone who has few differences, allowing the researcher to avoid practice effects.	**Not always all fact** important to the ex identified until afte been ignored.

Variables and how they are operationalised

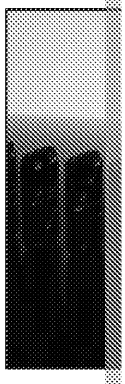
Independent and dependent variables

In an experimental design, a hypothesis is typically defined in terms of the ind

- The independent variable (IV) is the variable that you alter or manip change.
- The dependent variable (DV) is the variable which measures the cha the independent variable.

1.6 How science works: Manipulation of variables

A key aspect of experimental designs is the manipulation of an independent variable to see if it produces an effect on the dependent variable. Other types of study, such as correlational research, do not manipulate the independent variable because it is not naturally occurring. Manipulation of the independent variable is essential if the researcher wishes to suggest that the change in the independent variable *caused* the change in the dependent variable.



Example: Imagine you are interested in conducting a study into whether coffe times on a computerised test. You divide your participants into two groups: C

- The independent variable (IV): Coffee or no coffee
- The dependent variable (DV): Average reaction time scores on the co

Levels of IV

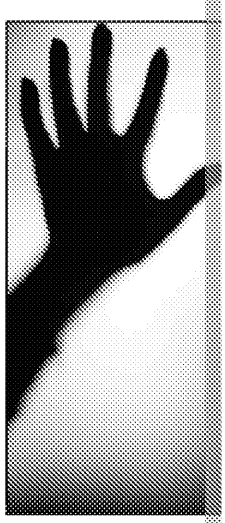
The levels of the independent variable are to do with how many different con above there are two conditions: Coffee and no coffee. We have one indepen

Some experiments have more than one independent variable, for example, w variable, gender, which has two levels: Male and female. Now we have two i person drinks coffee and gender, and four levels: Coffee, no coffee, male and

1.6 How science works: Quantifiable measurements

When research is conducted, the researcher needs to be able to quantify the effects of the independent variable on the dependent variable.

For example, a group of researchers are studying fear and have their participants watch part of a horror movie. Afterwards, the participants all agree that they felt fear. However, this information is not particularly useful to the researchers. Fear could instead be measured quantifiably by studying the participants' heart rates during the movie compared to their baseline levels. From this information, the researcher can more accurately measure the effect of different scenes of the movie on the participants' fear levels.



Operationalisation

Operationalisation involves very precisely defining your independent and dep
effects can be accurately measured.

For example, in this experiment, participants in the coffee condition may be r
shot (caffeine 150 mg) 10 minutes before the study.

The DV also needs to be operationalised; this could be measured as the reacti

Control of extraneous variables

Extraneous variables are extra variables that may have an effect on the DV in
researcher is studying. Extraneous variables should be controlled so that they
extraneous variables are identifiable and can be controlled by exposing all par
In the ideal experiment, the only thing that differs between the conditions is t

Example: *A study investigates whether age affects attention. They split partic
are aged 20 to 30 and those who are aged 50 to 60, and both groups perform
task. They find that younger participants performed better, suggesting ther
what they failed to mention was that when the 20 to 30 group performed thei
and it was noticeably colder. Cooler temperatures are associated with improv
contributed to the results. This extraneous variable could be controlled for by
complete the task at the same temperature.*

1.6 How science works: Control and standardisation

In laboratory designs, extraneous variables are controlled so that they do not affect the DV. This is important because the change in the DV may not be due to the IV. In addition, the precise situation of the experiment is standardised so that every participant experiences the same situation. If participants experience different situations then their differences in behaviour may be due to the situation instead of the IV. By doing this, researchers can try to establish cause and effect.

Designing observations

Task 2.1: Observe and record!

For the next three minutes observe your teacher or a classmate and wri
observations. Try to give an accurate report of what they are doing in t

How did it go?

Reflect on:

- What sort of method did you use?
- How did you decide what to record and w[illegible]o ignore?
- Do you think you missed anything?
- How could this method be [illegible]ved?

You could also do this at the same time as a friend and compare yo
same th

Behavioural categories

In the behavioural categories approach researchers decide on which behaviou
observation session and form a behavioural checklist of these behaviours. Th
forming the list itself as it involves operationalising the behaviour (strictly defi
included). The list should be formed so that:

- It covers the entire range of possible behaviours that could occur dur
- Only one category needs to be recorded each time; for example, 'viol
'punching' which would need to be altered so that they are mutually e
- It focuses only on observable behaviour and not possible motivations

Coding frames

Coding frames can aid you when you are recording your observations. To ma
determined codes for certain behaviours. The codes should aim to cover the e

For example, if observing a class you might have the following coding frames:

- TT – teacher talking
- CDIS – class discussion
- AQ – asking questions
- ANSQ – answering questions
- RD – reading
- WT – writing

Note: You can als
symbols instead o
abbreviations

Coding frames can be used with other designs and make it easier to record in
table where the researcher ticks a box each category.

Time sampling

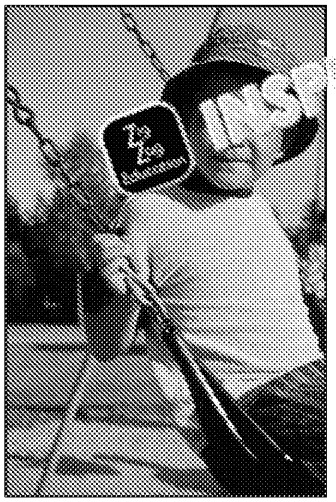
In time sampling, time is divided up into regular intervals and the researcher e
occurs in a specific time frame. It is typically simply recorded whether the be
the time. This method is not suitable for infrequent behaviours as they may n

For example, a teacher of special needs children has noticed that one of her s
has assigned them to do. She asks a researcher to come in and observe the c
on the extent of this problem. The researcher decides to have a 30-second in
minutes, during which the researcher records whether the behaviour of the s
researcher found that at nearly every interval the student was performing off

Event sampling

In event sampling, the focus is on how many times a particular behaviour (or s
suitable for both frequent and infrequent behaviour, but the difficulty lies in d
events by deciding where one event ends and the next begins. Additional dat
length or intensity of the event which provides additional information.

For example, it has been reported that Little Jimmy shows the undesirable be
the playground. The researchers are interested in if this behaviour will be alte
designed to target this behaviour. They decide to use event sampling to reco
if it changes. They observe him playing in the playground one morning and co
another child. After the intervention, they repeat the process and find that th
behaviour and judge the intervention to be effective.



1.2 [illegible]hodological issues: Researcher/observe
[illegible] problem with observing someone overtly is
behaviour because they know they are being ob
observer effect.

In the example above, if Little Jimmy is aware th
may change his behaviour. Due to the intervent
that the behaviour is undesirable and, therefore
knows the researcher is watching. However, wh
he may revert back to his old behaviour.

This same effect can happen in experiments: wh
alter behaviour (consciously or unconsciously). T

Designing self-reports

Open questions

Open questions allow the responder to provide their own answer to a questio

Examples on the topics of gender and stereotypes:

- *Why do you think that men and women often do different types of jobs?*
- *What can be done to encourage young women to pursue careers in 'male' disciplines such as science?*
- *What would you think of a male nurse?*
- *What do you know about feminism?*

This last question tests the kn[illegible] the responders. Open questions can be ben[illegible]ese cases as it reduces the risk of correctly gu
You can [illegible]av[illegible] questions regarding quantities.

For example, *'How many times do you exercise during a week?'*

This could have various answers such as:

- 'Three to four times a week'
- 'It depends on my work schedule, usually about twice a week'
- 'I alternate weeks, one week I'll exercise 4–5 times a week and other

These can often be more valid than categories for measuring quantities as the
category the behaviour should go in.

Advantages	Disa
Provides rich detail: Open questions provide large amounts of detailed information, allowing researchers to gain an accurate picture of a person's experience	**Time-consuming and effortfu** responders may be put off by expected to provide and this or incomplete responses.
Reflects accurate opinions: The responder replies with what they truly want to say about a particular topic rather than predetermined responses.	**Difficult and time-consuming** compare answers or to get an with qualitative data.
Can identify areas for furth investigation: One ... can bring to light fe... th... would be otherwise uniden...	**Requires interpretation:** The interpret the answers and not the interpretation. For examp a person live a healthy lifestyl and unhealthy behaviours and them weight.

Closed questions

Closed questions involve the responder choosing from a fixed set of answers.
'yes'/'no' questions, fixed categories such as ages 18–25, or scale responses.

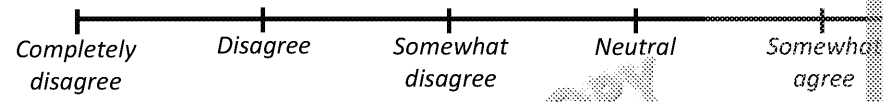
Rating scales

Rating scales are a type of closed question that are typically used to investiga
scales usually go from one extreme (e.g. strongly disagree) to the other (e.g. s
scored; for example, the 'strongly disagree' might receive a score of 1 and 'str
allows the researcher to produce quantitative data.

Likert rating scale

Closed questions often employ the use of Likert scales; the responder is show
which of the identified points best match their attitude.

For example:
To what extent do you agree that happiness is determined by the individual th



In order for scales to be effectiv... must cover the whole possible range o
that participants may ha... ...ned if they had been given an open questio

There is ...te on how many points are optimum on a Likert scale. There i
length w... ...ales ranging from just two points, indicating just positive or nega
number of points allows a finer distinction and may more closely match a resp
too many divisions may reduce clarity and agreement on what each point rea
(2010) reviewed available studies and concluded that a seven-point Likert sca
after which distinctions become more difficult.

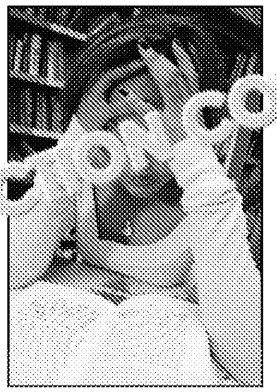
There is a further debate on whether there should be a middle or 'neutral' po
example above. These middle points allow responders to choose an option th
negative attitude.

The problem with neutral points is that they may encourage responders to ch
are not motivated to respond accurately or when they want to avoid a negati
bias). This will result in inaccurate information as the data provided will not r
contrasting side, forcing someone who truly has a 'neutral' to choose a positiv
inaccuracies. O'Muircheartaigh et al. (1999) concluded that a midpoint was d
reliability because would-be neutral responders did not randomly choose a si

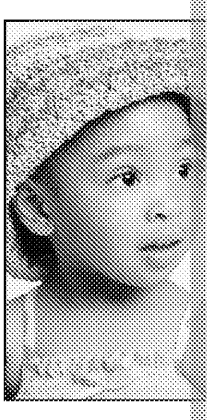
Semantic differential rating scale

Many words have particular connotations to them which are not part of their

Loyal and obedient



Difficult and boring



Innocent

There are also differences between whether the connotation is positive or neg
For example: '*a stingy person*' has a negative connotation but '*a thrifty perso*

In the semantic differential rating scale, the participant rates their attitude to
opposite adjectives. For example, the opposite of '*cheap*' is '*expensive*' and t
In this rating system, the participant is applying their own connotations to the
interested in whether the connotations are positive or negative.

The developers of this rating system, Osgood et al. (1957), found that if you e
there were three different factors:

- Evaluation: Connotations about worth or value
  - Interesting – boring
  - Enjoyable – unenjoyable
  - Useful – useless
- Potency: Connotations about strength or power
  - Strong – weak
  - Masculine – feminine
  - Decisive – indecisive
- Activity: Connotations about movem[illegible]y and actions
  - Active – passive
  - Excitable – c[illegible]
  - Fast – s[illegible]

The scal[illegible]ritten up as below:

Instructions: Tick the appropriate space below.

Interesting	_____:_____:✓:_____:_____:_____:_____	Boring
Enjoyable	_____:_____:_____:_____:_____:_____:_____	Unenjoyable

To analyse, each space is given a number. The first space is given a 1, the sec
calculated by averaging the numbers. A high score indicates a negative conno

A disadvantage of the semantic differential rating scale is that it requires the
language and as such it is not suitable for children.

Advantages	
Quick and easy to answer: Answering closed questions is not taxing and is fairly quick. These factors increase the likelihood that someone will agree to do the questionnaire.	**Does not allow ow** that they are not a their 'true' opinion questions.
Easy to analyse: Closed questionnaires tend to provide quantitative (numerical) data which is easy to analyse. For example, it is easy to work out the percentage of 'yes' answers out of the total number of answers (yes and no).	**May overlook key** limited amount of gnore relevant que or the research qu

Task 2.2: Design a questionnaire!

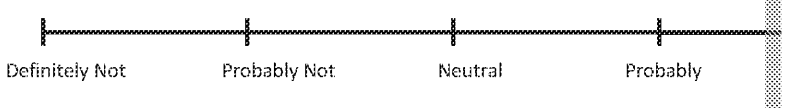
In grou vo choose a topic of which you want to learn opinions or

Some suggestions include:

- Whether it is important to learn about history in schools
- Whether legal drinking age should be changed
- Whether animal testing is acceptable for medical research

Once you have decided on a topic, have one member of the group desig
closed questions and the other member design a questionnaire with fou

Don't forget that closed questions do not have to be 'yes'/'no'; you coul
this one below:



To what extent do you agree with the following statement?
Animals deserve the same basic rights as humans

After you've finished designing, swap with your partner and have them
compare the kind of data you receive and what you like and don't like

1.3 Methodological issues: Ethical considerations

The British Psychological Society (BPS) is an organisation that acts to represent within the UK. One of its primary concerns is to promote that research is cond acceptable manner. The BPS published a 'Code of Ethics and Conduct' in 2009 research should be conducted. They identified four ethical principles that psy

1. **Respect** – psychologists should respect others' dignity and rights (inclu
2. **Competence** – psychologists should be aware of ethical guidelines and decision-making; they should acknowledge the boundaries of their ab
3. **Responsibility** – psychologists have a responsibility towards their clie psychology and to public perception
4. **Integrity** – psychologists should be honest with clients and within thei represent themselves in terms of experience and qualifications)

Ethical issues

Some of the main ethical issues have been identified below:

Deception: Deception occurs when a participant has been misled about what the researchers are really investigating. The most common reason for deception is that participants would change their behaviour if they knew what was being studied, which makes it difficult to accurately study their behaviour.

Debriefing: Debriefing refers to the process of providing participants with info purpose and results of the study after their participation. It promotes transpa autonomy, and safeguards their well-being. Failing to debrief can lead to parti undermines trust in the research process.

Protection from harm: Participants should be protected from experiencing ps lasts beyond the confines of the study. Psychologists should take suitable pre follow-up care if they believe harm may have been caused.

Right to withdraw: Participants should be offered the right to leave the study findings removed from the results.

Informed consent: Participants should agree to participate in the study while important components. In studies that use deception but still have participant only collects 'consent' rather than informed consent.

Confidentiality: It is important for participants' results to remain anonymous, sensitive or unique nature. Failure to do so affects an individual's right to priv

A few thoughts on ethics…

Ethical issues are not always straightforward, which is why the BPS published to conduct studies. The psychologist is often faced with a choice between the the researcher, and the best way to conduct the study for the participants. Th in that the behaviour is the most likely to be changed if obviously observed participants found it most distressing to be deceived about.

These days, before studies are conducted they are usually reviewed by an Eth or make suggestions for improvements before a study can be carried out. The research was conducted before there was a formalised procedure for ethical

It is also worth bearing in mind that now we have a much deeper understandi affect a person and how long-lasting these effects can be, and this was not as of psychology.

1.3 Methodological issues: Ethical considerations

In this table, we consider how we can overcome and prevent ethical issues i

Ethical issue	Design and conduct in psychological studies	D
Deception	Deception is frequently a requirement when the participants may act differently if they know exactly what is being studied. Participants may agree to take part in the research without knowing what is really being studied or may not be aware of the research at all.	If possible, th the true natu then careful c participant is by finding ou researchers c can have the they wish.
Debriefing	Debriefing should be planned in advance as an integral part of the study design. The debriefing session should explain the nature and purpose of the study and provide a clear overview of the objectives, hypotheses and procedures. It should allow participants' concerns to be addressed and offer support to participants. This process should be documented, including what was discussed.	Priority shou consent to e thorough un before they a concerns ari researchers s empathy and concerns and Reassurance actions shoul ethical stand
Protection from harm	It cannot always be accurately predicted how people will react to the experimental conditions. For example, no one predicted that such a large majority would show extreme obedience behaviours in Milgram's shock experiment. However, in most cases it is clear which studies may cause harm to an individual.	If the study i psychological be required t If it is clear th distress to se researcher's event that fi observer ma study should
Right to withdraw	Before the study the participant should be informed that they have the right to leave the study at any point. Participants also have the right to withdraw their data from the researcher's findings. Although told that they have the right to withdraw, participants often 'forget' this during the actual study. Additionally, although a paid study may encourage participant sign-ups, it may lead to the feeling that they are obligated to continue the study.	If the study i wise to reite wish. If the st payment is i research or p Participants s form that th removed if th
Informed consent	Before the study begins, participants should be provided with detailed information about the study's nature and consent to participate (informed consent). In cases where deception is used, only consent rather than informed consent is obtained as participants do not know exactly what they are agreeing to participate in.	Not all indivi consent as th what is happ surgery to cu form new me studied by ps Psychologists details of the participate. F debriefing th the offer of w findings shou
Confidentiality	Researchers should take measures to ensure that the identity of the participant is not detectable from the findings. This becomes highly important if the nature of the study is sensitive.	This typically with number and storing i location as th compromise should conse

Chapter 2 Activities

Check your understanding!

Q1. What might be wrong with the question 'Did being treated that
angry?' Reword the question so that this problem is no longer a

Q2. Identify and explain one advantage of using a Likert scale. (3 m

Q3. Identify three differences between closed and open questions. (

Q4. Identify three differences between structured and unstructured

Q5. Write a closed question and then reword it as an open question.

Q6. Identify and explain two factors that should be considered when

Q7. Identify and explain two limitations of structured interviews. (6

Q8. Identify and explain two strengths of the questionnaire techniq

Practice questions

Consider the scenario below:

A researcher was interested in the relationship between fruit and vege
attitudes towards exercise. He used a correlational analysis to investig
sample of 15 adult participants.

Each participant completed a fruit and vegetable diary for a week in w
different fruits and vegetables they ate during each day. The total num
produce a score on fruit and vegetable consumption.

Participants' attitudes to exercise were assessed through a questionna
attitudes towards exercise which were assessed on a five point Likert s
Disagree (1) to Strongly Agree (5). Their answers were added together
attitudes to exercise. A higher score indicated a more positive attitude

Q1. The research hypothesis predicted a significant positive corr
Explain what the researcher was expecting his results t

Q2. Write a Likert scale question that could have been used to assess
(1 mark)

Q3. a) Describe one strength of using a questionnaire to study atti

b) Describe one weakness of using a questionnaire to study att

Chapter 3: Data recording, analysis and

Overview

In this chapter we will learn about different types of data and the ways in which we can use them. We will also look at descriptive and inferential statistics which are carried out after the study is complete to learn more about your findings. Finally, we will consider methodological issues that need to be considered when designing and evaluating research.

Learning outc

After studying this chapter

- ❑ Understand and use
  data
- ❑ Understand and use
- ❑ Know the criteria for
  understand the use
- ❑ Identify relevant met
  evaluate research de

Key T s

Bar charts	A way of representing frequency informatio per category
Correlation coefficient	A number that describes the strength and d
Critical value	The observed value is compared with this v
Descriptive statistics	Numerical ways of describing the data by id
Fractions	A way of displaying numbers which are not
Histograms	A graph that shows frequency data that ha
Inferential statistics	Statistics that can be used to make inferenc population
Interval data	Equally spaced data
Line graph	A graph used to show trends, especially acr
Mean	An average that is calculated by adding tog number of values there are. This measure t
Measures of central tendency	Measures that aim to find the central value
Median	An average that is calculated by ordering th middle value
Meta-analysis	A type of secondary data, where informatio together to find out what the overall result
Mode	An average that is calculated by ordering th occurs most often
Negative correlation	As one va e i eases, the other variabl
Nominal data	ric ype data
Non-parametric test	ess powerful inferential test which is use assumptions required for a parametric test
Norma ut	A bell-shaped curve where the peak is the m either side of the peak
Observed value	The output of an inferential statistical test
Ordinal data	Ordered or ranked data that may not have sequences
Parametric test	An inferential test that should only be used assumptions
Percentages	A number that compares an amount to the

Key Terms

Pie chart	A visual method of presenting frequency da can be easily compared to the whole
Positive correlation	As one variable increases, the other variabl
Primary data	Data that is collected by the researchers to
Qualitative data	Data of a more in-depth nature which prov to analyse
Quantitative data	Data of a numerical nature which can be ea
Range	A measure of spread that is calculated by s greatest value
Ratio	A way of pres ng the data so that it show
Scatter diagram	A that shows correlational data where
Secondary data	Data that is created from looking at primary
Significant figures	A way of rounding a number so that only a present
Skewed distribution	A bell-shaped curve that is skewed towards mean
Standard deviation	A measure of spread that uses every point
Standard form	An alternative way of writing very large or
Tables	A way of easily organising data using colum
Tally chart	A type of frequency table in which the freq lines
Type I error	When we reject the null hypothesis when w
Type II error	When we accept the null hypothesis when
Variance	A measure of dispersion that looks at how
Zero correlation	Points are dispersed randomly and there is variables

Symbols

Throughout this chapter you may come across certain mathematical symbol forget what they mean.

= the two numbers are **equivalent** to each other
< one number is **less than** the other
<< one number is **much less than** the other
>> one number is **much greater** than the other
> one number is **greater** than the other
∝ one number is **proportional** to the other
~ one number is **approximately equivalent** to the other

Raw data

Raw data are the results that have been collected from the participants. Dep
could look quite different. For example, they might be scores on a test, frequ
transcript of an interview. Raw data has not yet had any analysis applied to it

Designing and using raw data recording tables

Researchers often collate their data into one place, usually a table, before ana
into a table makes it easier to access the information the researcher needs an
the study's findings.

The data collection table will look different depending on the design of the stu

The table below might be appropriate for a correlational study investigating w
between reading and writing ability.

Partici... numb...	Reading score	Writing score
1		
2		
3		
4		
5		

The table below could be used for a laboratory experiment, which uses an ind
effects of caffeine on concentration.

Control condition No caffeine		**Experimental condition** 100 mg of caffeine	
Participant number	Concentration score	Participant number	Concentration score
1		6	
2		7	
3		8	
4		9	
5		10	

Or, this table might be appropriate for a questionnaire study:

Participant number	Gender	Age	Q1	Q2	Q3
1					
2					
3					
4					
5					

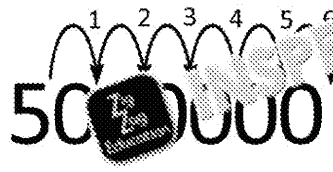
Standard form

Standard form is a different way of writing very big or very small numbers. It
want to write a number that has lots of zeros at the beginning or the end.

Writing large numbers in standard form

1. Start by identifying the first digit at the beginning of your number (thi
   placing a decimal point after this number.
2. Now using your finger or tip of your pen, go from this point and count
   the decimal point to the right until you reach the end of your number
3. Write the first digit and the decimal point, then follow it with all the o
   any zeros at the end – you should forget those.
4. Then write a 'x' sign and $10^{\text{number from step 2}}$

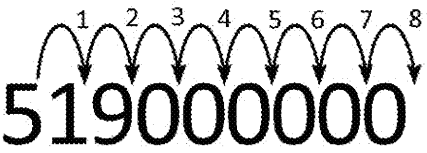
Example 1: *Write 5,000,000 in standard form*



$5{,}000{,}000 = 5 \times 10^{6}$

Start after 5 and count the number of places to the right. Six places to the right so 5×10^{6}

Example 2: Write 519,000,000 in standard form



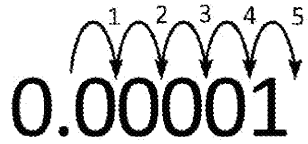
519,000,000 = 5.19

Start after 5 and count the number of places to the right. Eight places to the right so 5.19×10^{8}

Writing very small numbers in small form

1. Start at the decimal point. You want to count how many times you ca
   right until after the first non-zero digit. Remember how many times.
2. Write the first non-zero digit and put a decimal point after it. Then w
   If there are any zeros at the very end then knock them off.
3. Then write a '×' sign and $10^{-\text{number from step 1}}$

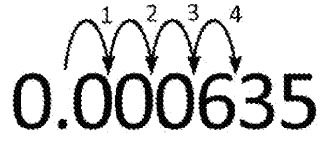
Example 1*: Convert 0.00001 into standard form*



$0.00001 = 1 \times 10^{-5}$

Start at the decimal point and count the number of places to the right until the first non-zero digit. Five places to the right so 1×10^{-5}.

Example 2*: Convert 0.000635 into standard form*



0.000635 = 6.35 ×

Start at the decimal point and count the number of places to the right until after the first non-zero digit. Four places to the right so 6.35×10^{-4}.

Decimal form

Decimal form is a more typical way of writing numbers that are a mixture of w
common use of decimals in real life is when using money.

Decimals are also used in psychology, for example, we might have a response t
score of 36.59.

You can learn more about what a decimal means if you think about its place v

Tens	Units	.	Tenths (1/10)	Hundredth
3	6	.	5	
30	6	.	5/	9/

So the number 0.5 is worth $\frac{5}{10}$, or $\frac{1}{2}$ if you cancel it down. So 0.5 is worth one h

Signific fi

Decimals metimes be very long and so we round them so that they are s

Rounding a number to a certain number of significant figures is a way of chan
precise but also easier to work with. There are often times when we do not n
example, 24.28194) and can get our point across using a less accurate rounde

Here are some examples to illustrate how numbers can be rounded to a certa

Example 1: Round 20.453 to 3 significant figures

This means that the first 3 numbers are significant...

not significant

20.453

significant

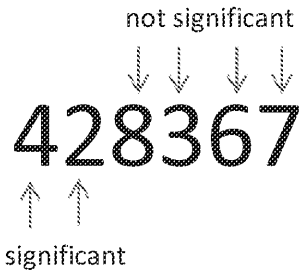
We are only interested in 20.4

BUT we look at the next number (the first non-significant number) to decide w
keep it the same. If it is a 5 or greater then we round up.

It is a 5, so we round up 20.4 to 20.5.

Answer: 20.5

Example 2: Round 428367 to two significant figures



In the previous example, the numbers that were non-significant were after th
were simply dropped. In example 2, we change our non-significant numbers t

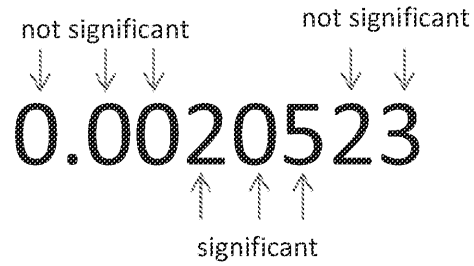
We are interested in 420,000 BUT we look at the first non-significant number
430,000 or to keep it the same.

We will round up to 430,000 because 8 is greater than 5.

Answer: 430,000

Example 3: Round 0.0020523 to 3 significant figures

When a number begins with one or more zeros, they do not count as significa
Later zeros, after an above-zero number (e.g. 1) do count as significant.



We are interested in 0.00205 and then we must decide whether to round our
We do this by looking at our first non-significant number.

This number is a 2, so we keep it the same.

Answer: 0.00205

Make estimations from data collected

In some situations, the researcher might want to use an estimate rather than t
the researcher might want to estimate the mean of grouped data.

Example: *A researcher times how long it takes participants to solve a logic pro
time range they fall into. He wants to calculate the mean time but he does no
every participant. Therefore, he cannot calculate an accurate mean, but he ca
mean.*

Here is his data:

Time taken in minutes (m)	Frequency
$0 < m \leq 10$	3
$10 < m \leq 20$	
$20 < m \leq 30$	11
$30 < m <$	9
$m \leq 50$	9

What we do is assume that people take the middle amount of time, also calle
between 0 and 10 is 5.

Time taken in minutes (m)	Frequency	Midpoint
$0 < m \leq 10$	3	5
$10 < m \leq 20$	8	15
$20 < m \leq 30$	11	25
$30 < m \leq 40$	9	35
$40 < m \leq 50$	9	45

Next, if you imagine we were calculating the mean normally, we'd have a list.
5 minutes, 5 minutes, 5 minutes, 8 minutes, 8 minutes,... etc.

To save us writing out the whole list, what we do is multiply the frequency by

Time taken in minutes (m)	Frequency	Midpoint	
$0 < m \leq 10$	3	5	
$10 < m \leq 20$	8	15	
$20 < m \leq 30$	11	25	
$30 < m \leq 40$	9	35	
$40 < m \leq 50$	9	45	

Just like when we normally calculate the mean ... add up our list:
15 + 120 + 275 + 315 + 405 = 1,130

Then we divide our answer by our total frequency (add up all the frequencies)
1,130 ÷ 40 = 28.25 minutes
Mean estimate = 28.25 minutes

This is only an estimate which means it is very unlikely to be accurate. It migh
the top amount in each category which means our estimate would be too sm
provide useful information about the time it took for participants to complete

Check your understanding! Raw data

Q1. A psychologist wants to research the effects of calming music on participants solve a logic problem. She uses an independent me two conditions: calming music and no music. Design a raw dat could use to record her data.

Q2. A researcher has recorded the time it takes her participants to re appears on a screen. The answers are given in milliseconds. Ro significant figures.

Participant number	in milliseconds
1	3258
2	1985
3	2495
4	3921
5	1240

Q3. A researcher is looking at a census for three different cities. Wri standard form.

City	Population
City 1	428,100
City 2	341,000
City 3	1,101,000

Levels and types of data

Data can be categorised into different types based on its characteristics.

Levels of data

Nominal level data

- Data that is split into categories
- Measurement is by counting the frequency of each category
- For example, you could count the number of each of the answers to a

Ordinal level data

- Data is ordered or ranked
- Distance between the data may not be equal
- For example, a list of your favourite subjects may be in a ranked orde subject and the ex might vary

Interval data

- Scale that has equally spaced data
- For example, temperature is equally spaced, the space between 29 an is equal

Quantitative data

Quantitative data is of a numerical nature, for example, quantity, distance, sp
used to quantify a particular attitude, belief, or behaviour. All of these types o
makes them easy to compare and analyse. If one participant takes 45 second
participant takes 32 seconds, it is clear who is faster. Measurement of quanti
because the numbers themselves cannot be influenced by the researcher's in

Quantitative data-collection techniques

- Experiments: Experiments, particularly laboratory experiments, are designed so that change can be measured, which means that they oft seek to generate quantitative data
- Well-defined observation: When behaviours a[illegible]learly defined, the frequency and duration of a behaviou[illegible]can b[illegible]ecorded from observa
- Closed questions and scale[illegible]qu[illegible]ns that only allow a limited numb responses can be q[illegible]antifie[illegible]by counting their frequency or rate of occurrence
- [illegible]nal[illegible]ses (secondary data): Using quantitative data that has bee g[illegible]ted from other studies, can allow for an analysis of all of the da generate new data itself

Qualitative data

Qualitative data is of a descriptive nature and cannot be measured in the sam often looks at less defined issues, such as self-esteem, which are difficult to a data is used to gain understanding into a particular topic by providing highly d researcher may provide a rich description of someone's eating behaviour bas Measurement of qualitative data is said to be subjective because the research

Qualitative data-collection techniques

- Observations: More general observations are descriptions of what is h may involve the researcher selectively identifying which behaviours a
- Interviews: Most interviews are concerned with opinions, attitudes a to give rich detail
- Questionnaires with open questions: Questionnaires that use open-e person to record their own response can generate relevant detailed in
- Case studies: An in-depth analysis of a single person or groups of pers qualitative data from many methods. Given that usually the understa researchers seek to gain as much data as possible using qualitative m
- Reviews (secondary data): Reviewing other studies can create qualita conclusion

Key tip to remember which is which –

The first half of each of the ter[illegible]t[illegible]e to what it measures.

- **Quantit**ative r[illegible]**quantity**
- **Q**[illegible]at[illegible]es to **quality**

Primary data

Primary data is when a person or researcher collects their own data to resear
example, if you want to know which month is the most popular to have a birth
short questionnaire and ask your classmates.

Advantages	Dis
• Researcher gets exactly the information they need • The research is conducted how the experimenter desires, e.g. the number of participants, which measures are used, etc.	• Takes the researcher ti research • Conducting the researc • Researcher has to find be difficult if what they ar cular type of brain participants

Secondary data

Secondary data i , ou use data that someone else has collected that ma
purpose or example, if you want to know how many 18–25-year-olds
conducti research yourself, you might look at the most recent census.

Advantages	Dis
• The data has already been provided, which reduces the time and effort on the part of the experimenter • Compared to primary data it is an inexpensive option	• The researcher cannot • The research may not b • The research may be di researcher, e.g. too few

Meta-analysis

A meta-analysis is a specific type of secondary data, in which data is collected
analysed to see if there is an overall effect. For example, if you want to look a
on health you might look at all the different studies of different health effects
greater amounts of stress, and conclude that a gambling addiction does have

Advantages	Disad
• Allows the researcher to look at more general trends and identify gaps in research • Can combine the findings from different types of studies • Findings of several studies combined is likely to be more generalisable than a single study	• It can be difficult to find all th searching through articles in analyses studying the same t the same studies) • They may accidentally (or inte support their predictions • Th iit of the studies incl • I ding studies that are old theory are constantly changin

Task 3.1: True or false

Identify if the statement is true or false

Statement
Secondary data is useful because the researcher gets exactly what they nee any of the work
A meta-analysis collects a lot of other research and then reviews it for its a and disadvantages
Questionnaires can collect both quantitative and qualitative data
Researchers cannot always find all the participants they need to conduct re that produces primary data
When qualitative research is c[illegible]er carefully it is objective
One problem with [illegible]-analyses is that the researcher cannot control for t of the [illegible]rc
Qualitative data tends to produce rich in-depth information about a particu
Quantitative data is easier to analyse than qualitative data
Case studies often integrate different methods of qualitative data
Secondary data can reduce the time spent researching
Open-ended questions include the use of scales

Check your understanding! Levels and types of data

Q1. Explain the difference between interval and ordinal level data. (

Q2. Identify two differences between quantitative and qualitative da

Q3. How might observations be conducted differently to obtain qua (2 marks)

Q4. Identify and briefly explain one advantage of quantitative data.

Q5. Identify and briefly explain one [illegible]d an[illegible]e of qualitative data. (

Q6. Distinguish bet[illegible]n primary and secondary data. (2 marks)

Q7. [illegible] explain why a meta-analysis is a type of secondary data.

Descriptive statistics

Descriptive statistics are used to describe data. For example, instead of looki
researcher can provide an average score, and this will give the reader an idea
meaningful way.

Measures of central tendency

Measures of central tendency look at what the central value of the data set is
the mean, median and mode.

Mode

The mode is the value that occurs most frequently in the data set. This can be
each value occurs.

For example, the mode of 14, 1 , , 23, 14, 7 and 99 would be found by:

Noti ha is one of each number, except 14 where there are two

Sometimes there is more than one mode, for example, in the set: 18, 28, 17, 4

In this case, both 18 and 17 occur twice so they are both the modes, this

When all the numbers only occur once then we say there is 'no mode'.

The advantages of the mode are that it is easy to calculate and it can be useful
limited options to choose from. The mode can also be used for qualitative da
questionnaire where people can rate that they 'agree', 'don't know' or 'disag
the most common response.

The disadvantages of the mode are that sometimes there is no mode, it is not
the mode is not based on all the values. If given the data set: 18, 17, 12, 9, 28,
mode would be 95 which is quite different from the rest of the data set.

Median

The median is where the middle point of the data. This is calculated by rearra
order and then identifying the middle.

For example, the median of 14, 18, 9, 23, 14, 7 and 99 would be found by

First rearranging it in order: 7, 9, 14, 14, 18, 23, 99
Then you consider that there are seven numbers and 14 is in the middle,

In other cases, there may be an even number of scores and so this means the
middle. In situations like this you simply the two middle numbers, add them
median.

For e, the median of 18, 47, 83, 172, 19, 27 would be found by:

First rearranging it in order: 18, 19, 27, 47, 83, 172

Then you consider that 27 and 47 are in the middle:

$$\frac{(27+47)}{2} = \frac{74}{2} = 37$$

So our median is 37.

The advantage of median is that it ignores outliers and so in a data set where
more realistic central value than the mean.

The disadvantage of the median is that it does not take into account all of the
are no outliers, the mean might be better to use.

Mean

The mean is the most used measure of central tendency. It is found by addin
and dividing by the number of values there are.

For example, the mean of 14, 18, 9, 23, 14, 7 and 99 would be found by d

$$\frac{(14+18+9+23+14+7+99)}{7} = \frac{184}{7} = 26.3$$

The advantage of the m[illegible] it takes into account all the values of the da
piece of inf[illegible]ed.

The disad[illegible]age of the mean is that it also takes into account outliers, pieces
large or small, which can distort the overall average. In the example above, 26
because the 99 makes the average a lot larger.

Measures of dispersion

Measures of dispersion look at how spread out the data is. For example, in th
might say that it is not very spread out because all the values are quite simila
39, 89, 6 is much more spread out.

Variance

Variance is one measure of dispersion. It looks at how the scores vary from th

To calculate the variance you:

1. Calculate the mean score
2. Find the deviation of each score from the mean (subtract the mean f
3. Square the deviation scores
4. Add all the squared deviation scores together (the sum)
5. Divide the sum by how many scores there are

Example, our data set is: 12, 30, 45, 29 and 18

1. Mean = 26.8
2. Deviation for
   12 is -14.8
   30 is 3.2
   45 is 18.2
   29 is 2.2
   18 is -8.8
3. [illegible]ed:
   -14.8 squared = 219.04
   3.2 squared = 10.24
   18.2 squared = 331.24
   2.2 squared = 4.84
   -8.8 squared = 77.44
4. Sum of the squares = 642.8
5. Variance = 642.8 ÷ 5 = 128.56

An advantage of this method is that the mean takes into account every point. method is that the variance is not in the same units as your scores are: they a our data, the points are clearly not 128.56 apart!

Range

A simple measure of dispersion that uses the highest and lowest values of the subtracting the lowest value from the highest value.

For example, finding the range of 14, 18, 9, 23, 14, 7 and 99 is found by:

Subtracting the lowest from the highest value: $99 - 7 = 92$

The advantage of the range is that is simple to calculate and can be useful wh measures such as the mean and standard deviation.

The disadvantage of the range is that it does not look at the spread of all the v Additionally, it will be affected by outliers, if the highest and lowest value the data.

Standard deviation

A more accurate measure of dispersion that uses all of the values in the data s to know how to calculate standard deviation as it looks at how far each value value deviates from the average. A smaller spread will mean the average is m group, while a larger spread will mean the average does not represent the en

The standard deviation of 14, 18, 9, 23, 14, 7 and 99 is 32.5

A simple method to calculate the standard deviation involves the following st

1. Calculate the mean of the data set.
2. Find the variance by subtracting the mean from each data point.
3. Square the results of these calculations.
4. Add the squared numbers together to find the sum of squares (sigma
5. Divide the sum of squares by (n – 1), where 'n' is the number of data p
6. Take the square root of the result from step 5 (variance) to obtain the

The standard deviation formula looks like this:

$$s = \sqrt{\frac{\sum(x - \bar{x})^2}{n - 1}}$$

... where:

- S = standard deviation
- ∑ = sum of the values
- x = each data point in the data
- x̄ = mean of the data s
- n = number of data points in the data set
- variance

If you'd like, grab a calculator and see if you can get the right answer using th

In your exam you are permitted to use a scientific or graphical calculator to h (mathematical requirements for Component 01 – D.1.6)

The advantage of standard deviation is that it takes the spread of all the value affected by outliers than the range.

The disadvantage of standard deviation is that it is still affected by outliers as

Ratio

Ratio is a way of comparing data. For example, if the number of males to fem
males there are five females.

Ratio is usually written in the simplest form which means using the lowest nu

For example: The number of participants in Group A is 36 and the number of
What is the ratio?
Initially we can write it as 36 : 24
Then we look for the biggest number that divides exactly into both numbers.
This gives us a ratio of 3 : 2

Percentages

It can be useful to work out how m[illegible] represents out of all the data.

Percentages can b[illegible]d out by dividing the value by whole amount and m

For exam[illegible] work out what percentage 64 is out of 80 we do the calculati

$$\frac{64}{80} \times 100 = 80\%$$

A more complicated example: As part of a geography project Naomi needs to
classmates have been on holiday to this year.

Country	Number of classmate
USA	4
Australia	5
France	6
Greece	2
Italy	3
Malta	1
Spain	5
Did not go abroad	6

She needs to work out the percentages of the least and most popular destina
who did not go abroad.

Least popular: Malta
Work out how many classmates there are in total by a[illegible] up all the scores
$\frac{1}{30} \times 100 = 3.3\%$

Most po[illegible] Fi[illegible]
$\frac{6}{30} \times 10$[illegible]%

Did not go abroad
$\frac{6}{30} \times 100 = 20\%$

Fractions

A fraction is one way of writing a number that is not a whole number. The bo
denominator) represents the total, and the top number (also called the nume
total.

Cancelling down fractions

Sometimes the numbers in a fraction are larger than they need to be. We ca
form using a process called **cancelling down** (or simplifying).

To cancel down, you look for a number that goes into both the top and botto
You then divide **both** the top and bottom number by that number.

Depending on the numbers you choose, you may find out that you can cancel
until you have the smallest numbers possible. This will happen when you can
by 1.

Example via

$$\frac{85}{105} \xrightarrow{\div 5} \frac{17}{21}$$

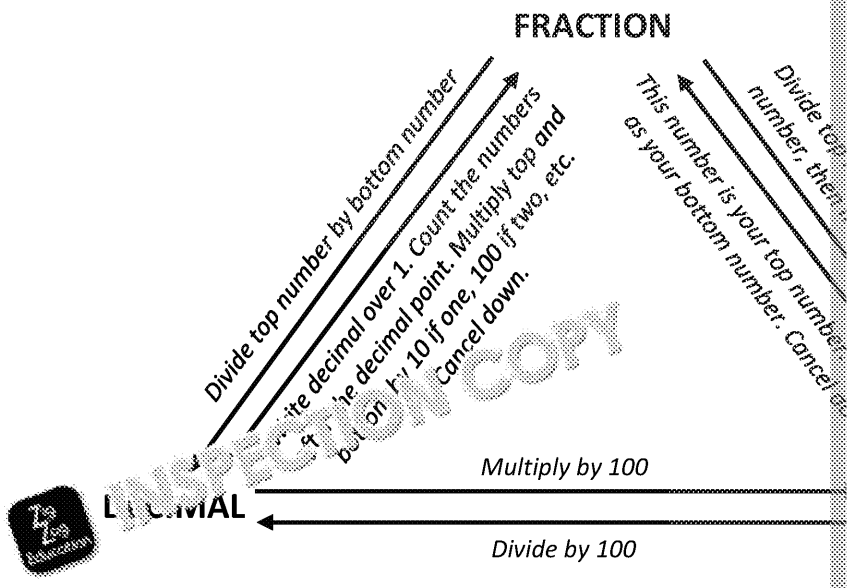
Example 2: Divide by

$$\frac{36}{48} \xrightarrow{\div 6} \frac{6}{8} \xrightarrow{\div 2}$$

Converting between fractions, decimals and percentages

A fraction can also be written as a decimal or percentage, or vice versa. They
a whole.

The diagram below shows you how to convert between the different types of



For example, the fraction $\frac{3}{5}$

- Convert to a decimal: 3 ÷ 5 = 0.6
- Convert to a percentage: 3 ÷ 5 = 0.6, then 0.6 × 100 = 60%

Tally charts and frequency tables

Tally charts are a way of representing frequency. They can be particularly use
the researcher can record the frequency as it changes.

Tallies are represented by short vertical lines where each line represents a fre
four lines, with a fifth line through them to represent a group of five.

When the tally is complete, a third column is often added to the table in whic
numerical form.

This tally chart shows the number of times a group of researchers observed p
a café:

Number of times mobile phone is checked in an ho	Tally	Frequency
0 to 5	𝍸 𝍸 ||	12
6–10 times	𝍸 ||	7
More than 10 times	|	1

Tables are useful as they are an effective way to present and organise large a
can be difficult to see relationships or trends in the data and to interpret wha

Participant	Task score
1	36
2	54
3	62
4	33
5	12
6	35
7	23
8	45

For example, given the table on the left you
participant's score was '33' but it is difficult
other scores. This might be better understo
bar chart.

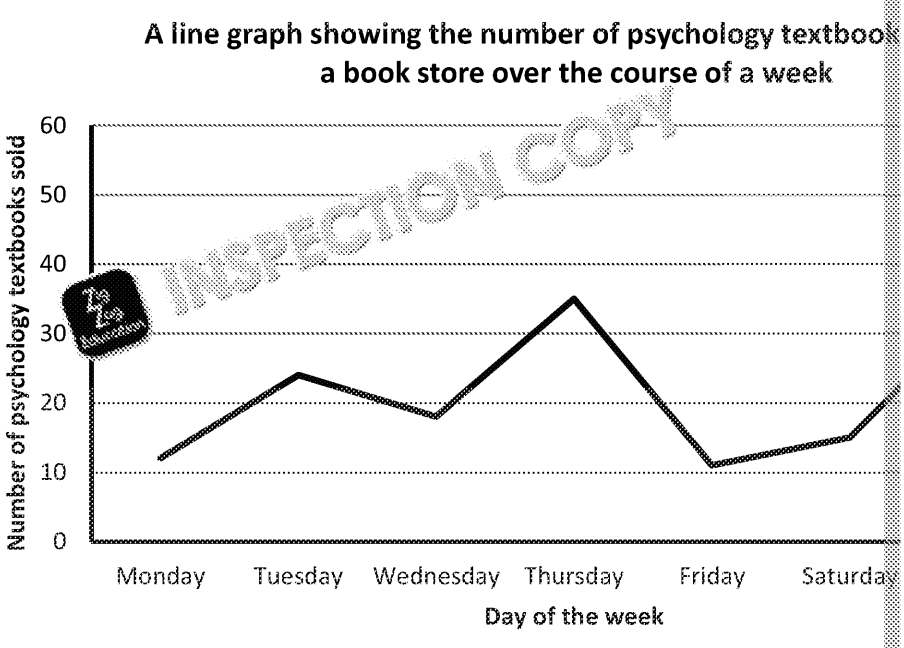
In the exam you need to be able to read tab
information.

HELPFUL TIP: In the exam you may not ge
information from a table but the informati
work out descriptive statistics is likely to b

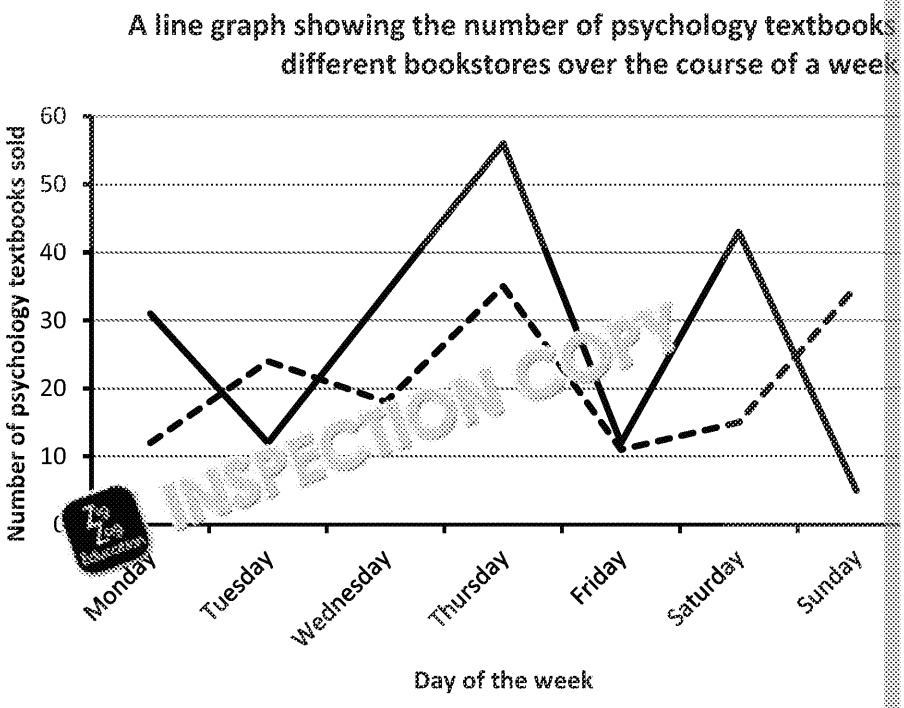
Line graphs

A line graph is a type of graph that is often used to show trends over time. Ea
has a value and they form a point on the graph. The points are joined up to s
across time.

An advantage of line graphs is that you can easily compare different points an
across time.



You can plot more than one variable on the same graph. The example below s
vary in the number of books they sell:



A disadvantage of line graphs is that if you have too few categories then you c

Pie charts

Pie charts are a visual representation of frequency information. Pie charts ar
compare the frequencies of different categories and also visualise what propo
category makes up. One disadvantage is that many pie charts do not allow yo
category.

How to draw a pie chart

Consider the table below:

Age of participants	Frequency
7– 9 years	14
10–12 years	8
13–15 years	33
16–18 years	17

Here we have frequency infor
our partici ants.

To draw a pie chart yo ork out the angle for each sector of your cir

➪ **Step** late the number of degrees for 1 person

$$Degrees\ for\ 1\ person = 360 \div total\ number\ of\ people$$

For our example:

$$Degrees\ for\ 1\ person = 360 \div 72 = 5°$$

➪ **Step 2**: Add an extra column on your table and calculate your angles

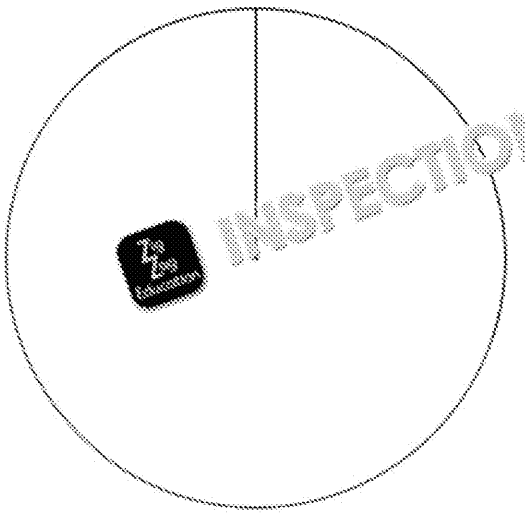
If 1 person = 5° then 14 people will be:

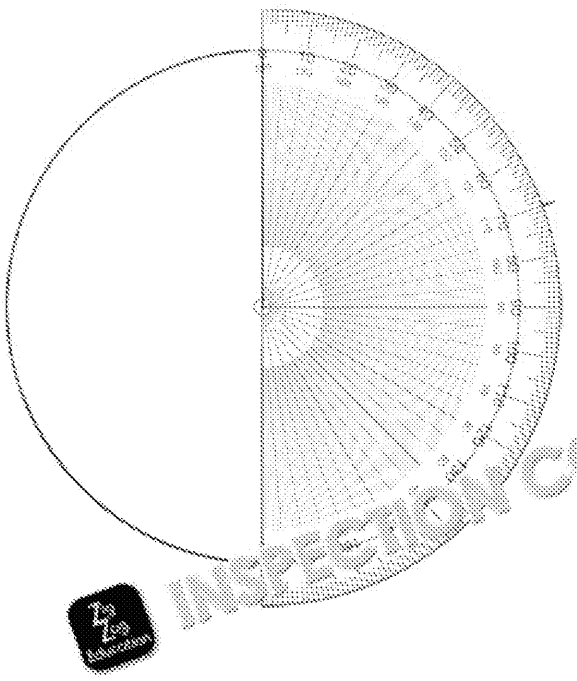
$$14 \times 5° = 70°$$

Follow this method for each of your categories:

Age of participants	Frequency	Angle
7– 9 years	14	$14 \times 5° = 70°$
10–12 years	8	$8 \times 5° = 40°$
13–15 years	33	$33 \times 5° = 165°$
16–18 years	17	$17 \times 5° = 85°$

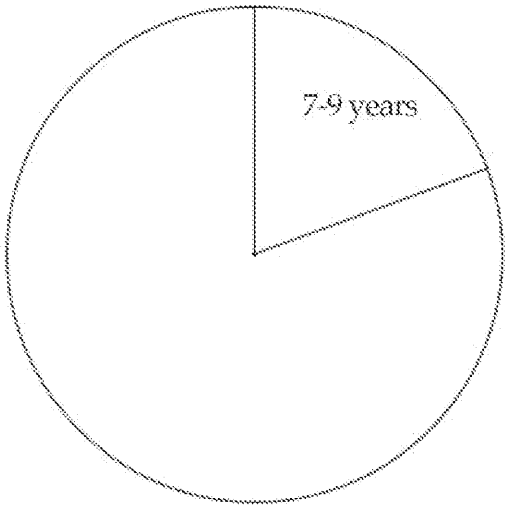
➪ **Step 3: Set up your blank pie c**
Use a compass to draw a circle.
was d a small dot to mark t
en o the edge of the circle





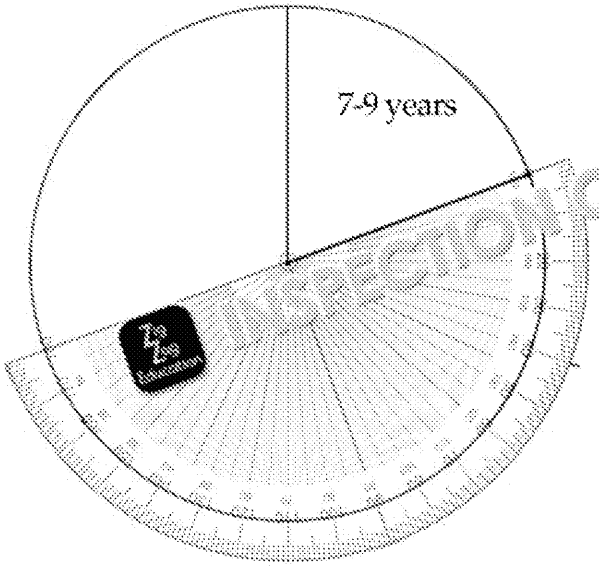
⇨ **Step 4: Drawing your**
Take a protractor and
drawn line. The centr
up with the centre of

Our first sector is 70 d
going on the outside o
Put a small dash next



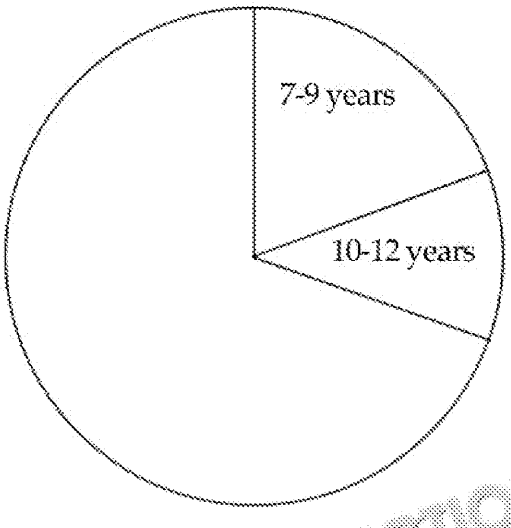
Line your ruler (or the
so that it connects the
at 70 degrees. Draw a
your circle. If your da

Write the name of the
you've just drawn.



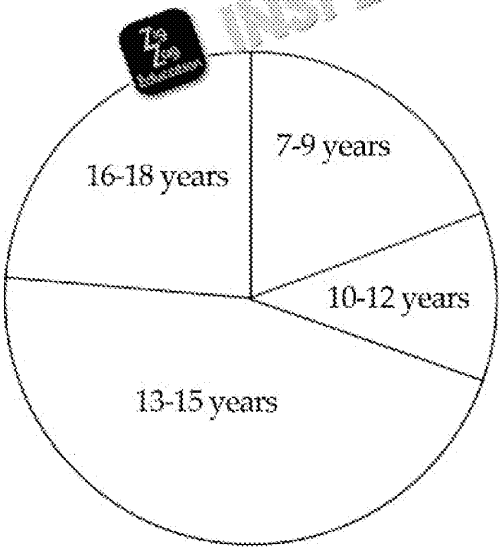
⇨ **Step 5: Drawing the n**
Take your protractor a
have just drawn.
should match up with

Starting from 0 and go
for your next angle siz
with a small dash.



As before, line your ruler up an
new dash. Rub out the dash if i
category name.

Repeat this same method until



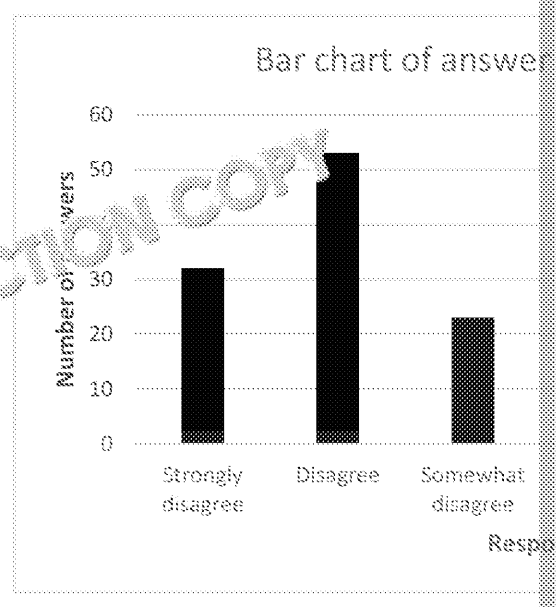
⇨ **Step 6: Your finished pie chart**
Now that your pie chart is finish
explaining what it represents.

Figure 1. Pie chart showing the age distribution of a sample of 72 participants

Bar charts

Bar charts are useful to represent frequency information in a way that it can be interpreted easily. A single bar tends to represent a category and its height determines the freq

This bar shows how many participants gave each answer. Assuming one participant per answer, you can work out the total number of participants in the study by adding up all the frequencies.



Answer	Number of answers
Strongly disagree	32
Disagree	53
Somewhat disagree	23
Somewhat agree	55
Agree	12
Strongly agree	23

Can you see how the above cha
information? Each row represe

For this qualification you need to be able to construct a bar chart from a table

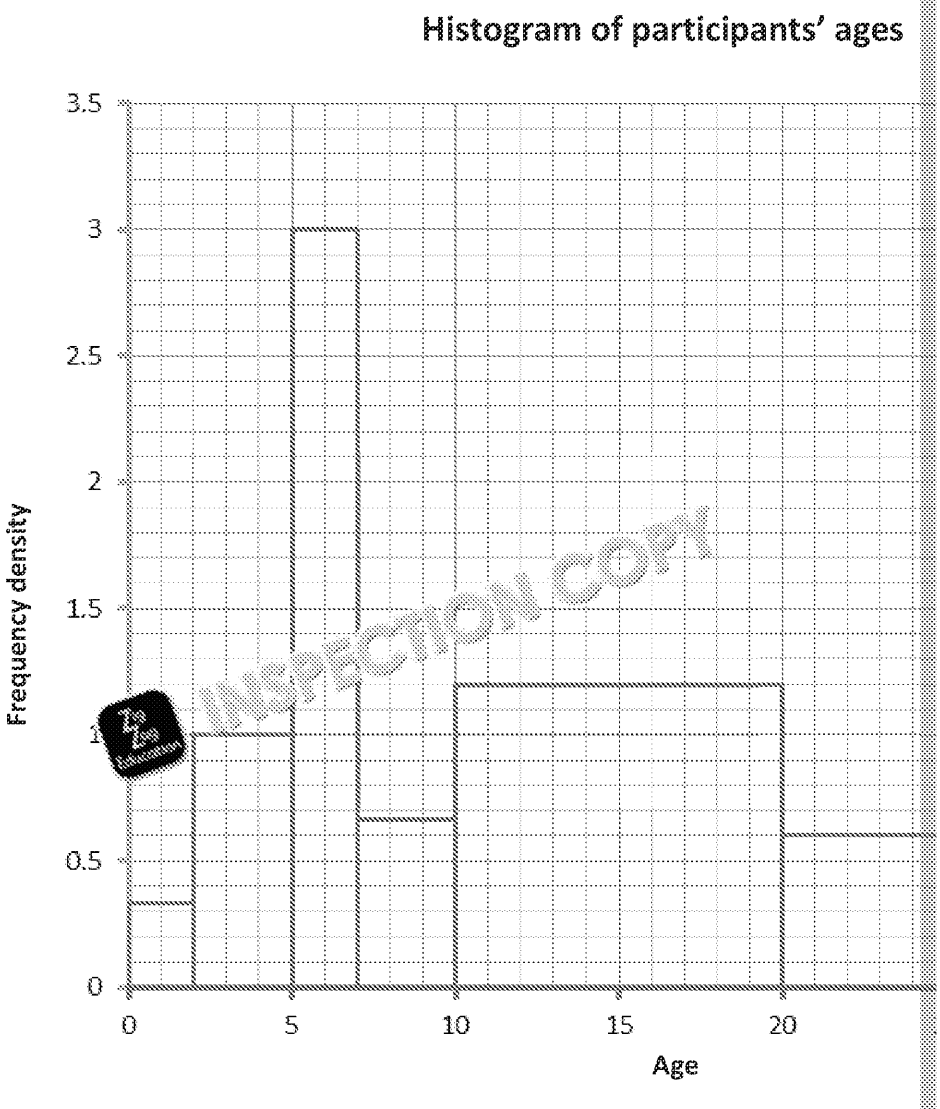
The main advantage of bar charts is that we ca si compare different freq
interpretation of the data much easie th re g a table.

However, a disadvant s n precise information is less accessible. Lookin
see whet he of participants who gave the answer 'disagree' was

Histograms

Histograms allow you to present frequency data that has been grouped into c
might split up the data of your participant ages in ranges of 0–20, 21–25, 26–
Note that the ranges do not need to be equal and therefore, the widths of the

In histograms, the frequency is denoted by the area of the bar rather than the
incorrect to label the y-axis frequency. It is instead called frequency density.



To work out the frequency of a bar, you need to multiply the width of the bar
You need to be able to work out the frequency of each bar, remember this is

So to find the frequency of the 10–20 bar we multiply the width (10) by the he

Unlike a bar chart, the widths of the bars are not equal, which means that you
each bar

Task 3.2: Working out frequencies using a histogram

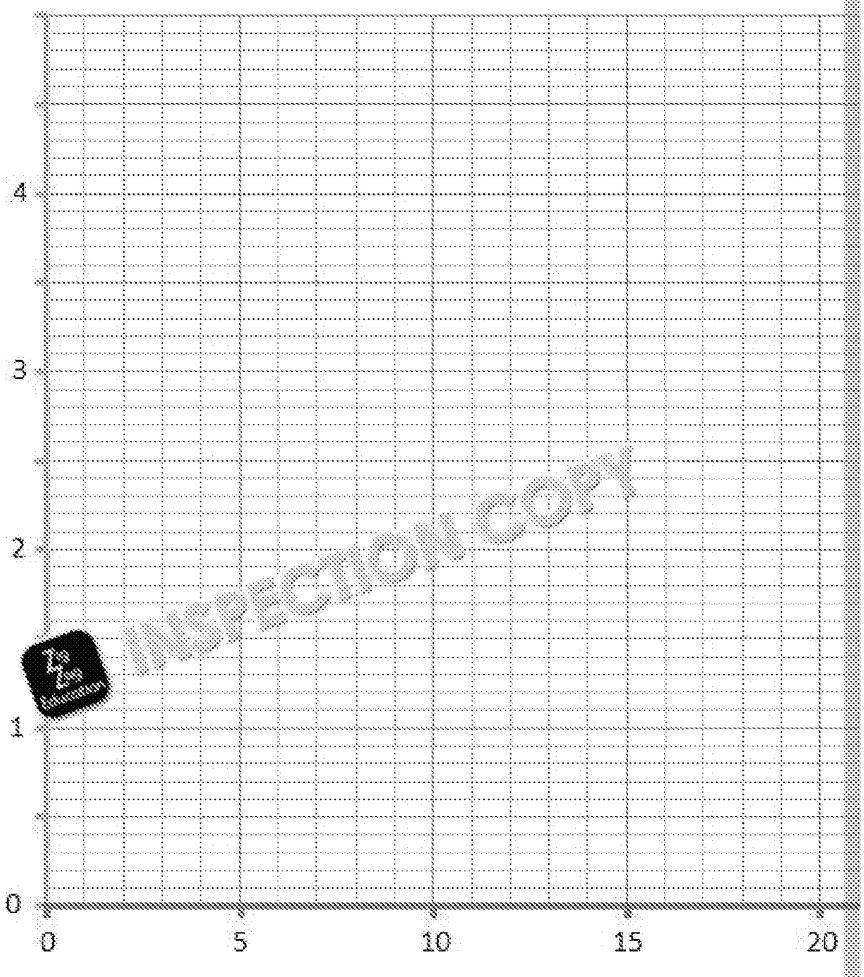
Work out the frequency of the bar 20–25

Task 3.3: Draw a histogram

Here is data on the frequency of test scores (marked out of 30):

Range	Frequency
0–10	35
10–15	15
15–20	20
20–25	8
25–30	6

Use the formula: $Frequency\ density = \frac{Frequency}{Bar\ width}$



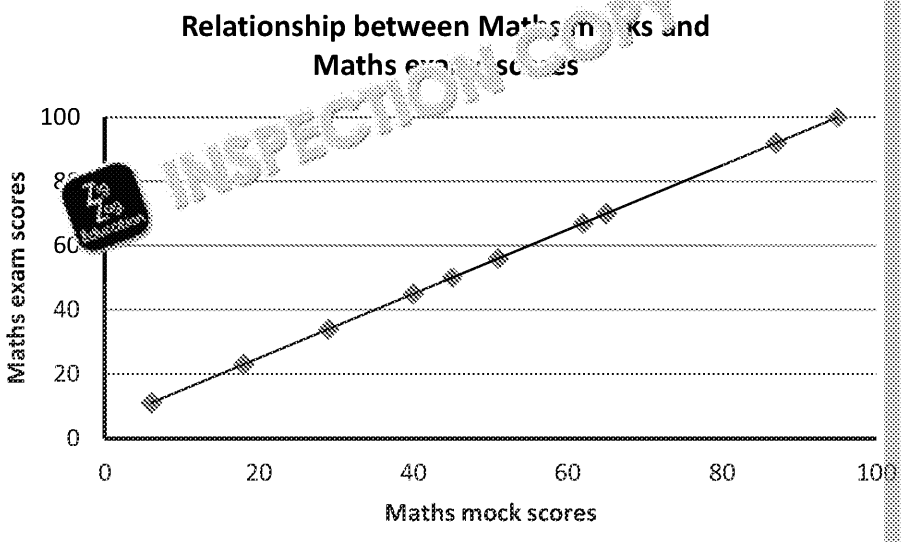
Scatter diagram

Scatter diagrams are used to show the association between two variables and point represents two scores and all of the points combined show the relations relationship is termed a correlation.

Correlations can be divided into three types depending on what the scatter di a negative correlation or zero correlation.

A positive correlation

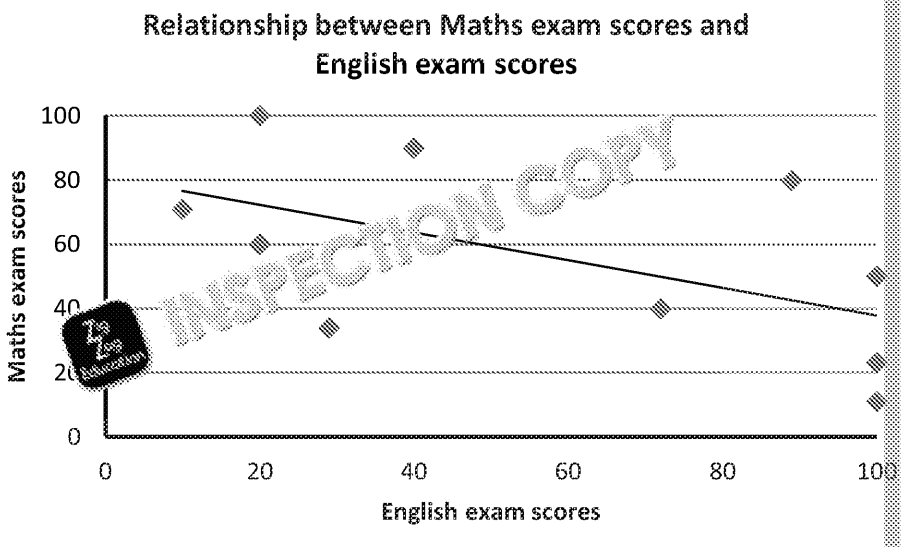
Here is a scatter diagram of a perfect positive correlation:



In a positive correlation, as one value increases, the other also increases. In th score increases, the Maths exam score also increases.

A perfect correlation means that by knowing the value of a Maths mock score value of their Maths exam score. Most of the time the points will be scattered

A negative correlation



In a negative correlation, as one value increases, the other value decreases. In increase, maths scores decrease.

Correlation strength
How strong the association is between the two variables can be worked out by
to a line of best fit.

Zero correlations
Sometimes there is no relationship between the two variables; we call this a z
points of the data seem to be entirely random and you cannot see any kind of

For example, it is unlikely that there will be a relationship between the likeliho
the likelihood of buying a sofa.

That being said, many seemingly unrelated events can be found to be correlat
variable between them. Buying toothpaste and buying a sofa might be related
having money.

For this qualification you will need to be able to plot and interpret scatter diagram
Here are some things to keep in mind for plotting scatter diagrams:

- If you are not given axis labels then it does not matter which way rou
- Each point represents two pieces of information (usually two scores f
- Remember to give your graph a heading; these usually start 'The rela

Check your understanding! Descriptive statistics

Q1. Chris is interested in whether temperature affects the time it tak
finish a task.

He has half of his participants do the task in a hot room then a c
the task in a cold room and then a hot room (to minimise order e
room remained the same for all of the participants and the resul

	P1	P2	P3	P4	P5	P6	P
Hot	63	75	69	59	83	54	6
Cold	49	54	60	57	84	45	7

Calculate the mean, median, mode and range for the hot room a

Do you think that temperature does affect speed? Back up your

Q2. Mr Johnston wants to know if his class needs to have revision cl
month. He decides to set his class a short test on the topics and
determine if the class needs extra help.

In his class there were 15 students and the test was marked as a

	Scores for each class member (in per
	70	29	75	60	43	85	38	6

He is thinking that an average below 60% indicates that the clas

Calculate the mean, median, mode and range for the class.

Looking at the results, what kind of recommendation can you m
more useful or important than others?

Q3. A psychologist is interest in the common attitudes to free will. H
one of the questions is 'To what extent do you agree that we hav

Response options are:
1 = 'completely agree' 2 = 'somewhat agree'
4 = 'somewhat disagree' 5 = 'completely disagree'

Scores for each participant								
1	1	2	4	5	2	3	1	4
3	3	1	1	4	1	4	2	4
2	2	5	5	4	3	2	1	2

Calculate the mean, media[illegible]e and range for the participant

Q4. One of the fi[illegible]t [illegible]ions in a questionnaire of 150 people was 'A

[illegible]ate the percentage of each response, giving your answers

Response	Number of responders	Pe
Male	70	
Female	67	
Did not answer	13	

Q5. A company publishing psychology textbooks in London wants t
are in the UK. They collected together records of their sales fro

Work out percentage for each area:

Area	Sales (in 1,000s)	Percen
London	32	
South West	18	
South East	27	
East of England	26	
Other	68	

Q6. Participants performed an unsolvable task and the researcher w
tended to give up.

The results below are the times (in minutes) taken by participan
that the problem could not be done:

[illegible]	10.3	9.7	4.7	3.2	18.1	23.6	12
14.6	6.3	11.1	11.9	24.4	23.4	14.7	9
12.4	11.8	21.0	19.3	16.4	12.1	11.3	13

Time	Number of participants	Per
$x < 10$		
$10 \leq x < 15$		
$15 \leq x < 20$		
$20 \leq x < 25$		
$x \geq 25$		

Q7. A researcher is interested in the age ranges of the individuals w
composes the following table:

Age range	Number of participant
$x < 20$	10
$20 \leq x < 30$	45
$30 \leq x < 40$	23
$40 \leq x < 50$	34
$x \geq 50$	13

a) How many participants are 30 to 39 years old?
b) How many participants are 40 or o
c) Can we tell how many parti ip nt are 35 years old?

Q8. A researcher is ted in the basic demographic information
c ue able:

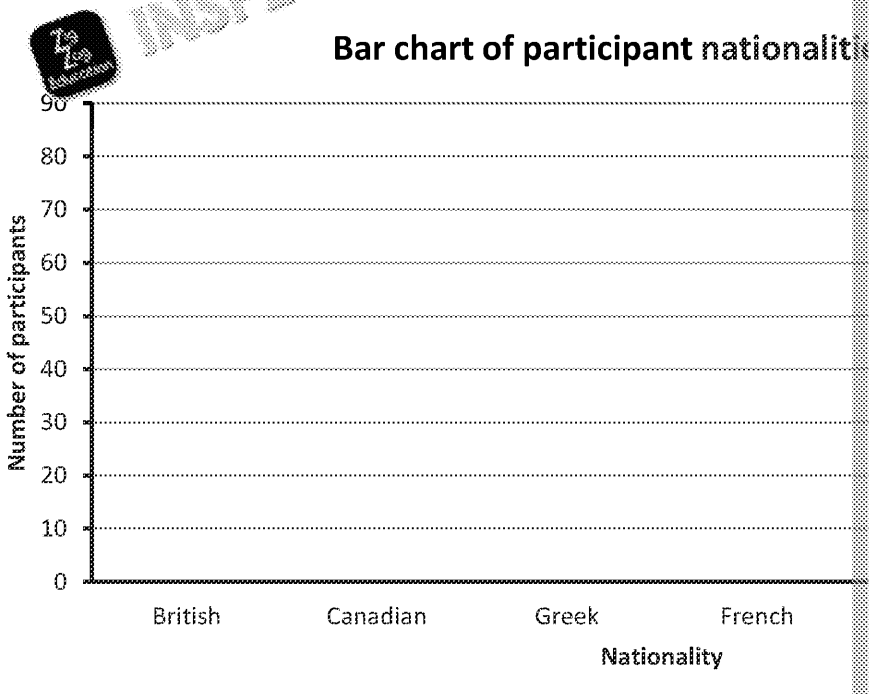
Participant	Age	Gender	Location
1	21	Male	London
2	46	Female	Bristol
3	54	Female	Cardiff
4	26	Male	London
5	19	Male	Bristol
6	34	Female	Swansea
7	25	Male	London
8	23	Female	Plymouth
9	22	Female	Southampton
10	36	Female	Cardiff
11	32	Male	Oxford
12	34	Male	Exeter
13	24	Female	Bristol
14	56	Male	Bristol
15	16	Female	Cardiff

a) What age was the oldest participant?
b) How many females were there in the
c) Which was the most common l ca
d) How many partici s that their highest level of edu
e) What was th h level of qualification reported in Card

Q9. A psychologist was interested in the nationality of his participa
table from the data that has been provided for him:

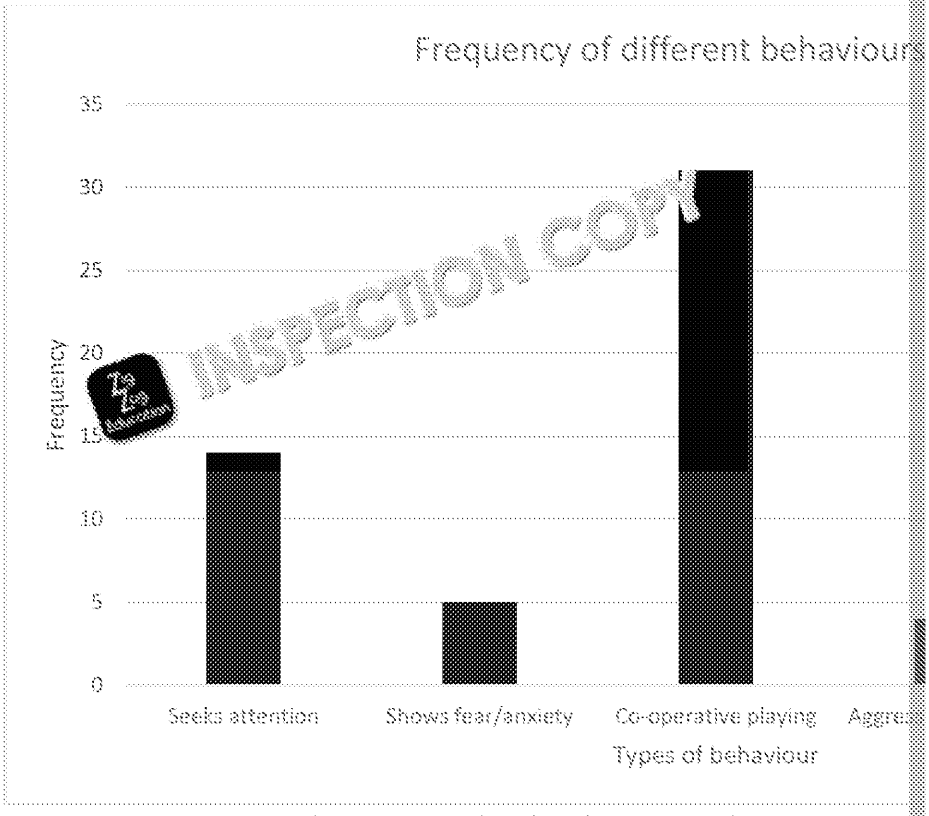
Nationality	No. of participants
British	80
Canadian	12
Greek	6
French	4
Polish	23
Spanish	10

He wants you to create a ba[illegible] of the nationality data so tha
numbers of particip[illegible] nationality.



Q10. A child was observed for 15 minutes in the playground. The ob
categories every 15 seconds to record his behaviour. The observ
different types of behaviour.

Here are the observer's results:



a) How many observations did the observer make?
b) Which is the least frequent type of behaviour?
c) How does attention-seeking behaviour compare to aggressi
d) How many observations did the observer record as coopera
e) How many observations did the observer record as either '

Q11. A psychologist is investigating the relationship between self-est
He gives each participant a questionnaire measuring self-esteem
measuring extraversion. He produces the following scatter diag

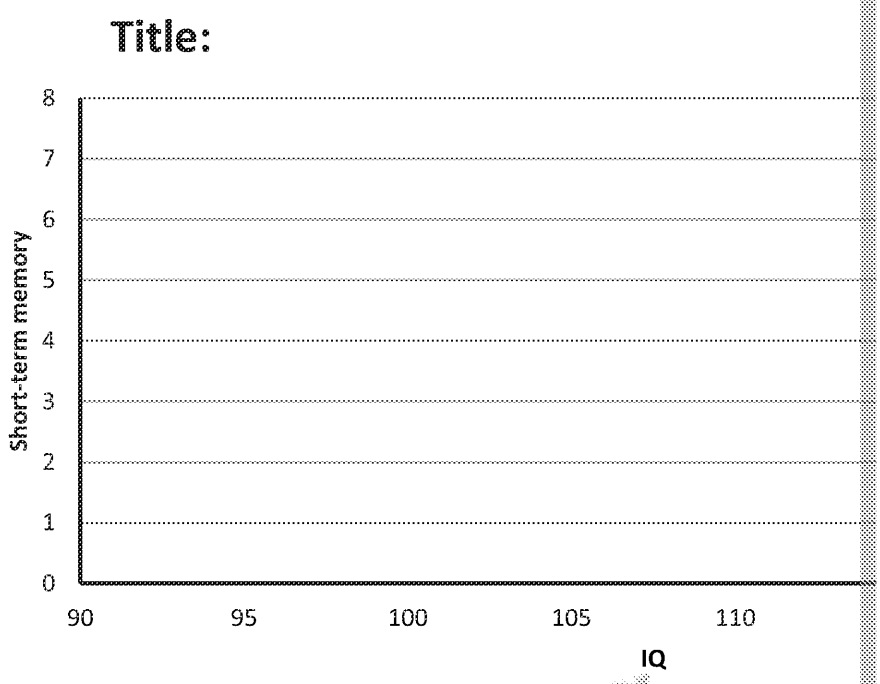
a) What can the psychologist infer about the relationship betw
b) What type of correlation is this?

HELPFUL TIP: In part b) it asks for the type of correlation, w
you usually need to say if it is:
1) Strong/moderate/weak
2) Positive/negative/zero

Q12. A psychologist is studying the relationship between IQ and sho
participants an IQ test and a then a short-term memory task in w
words and have to recall as many as possible afterwards. Here i

Participant	IQ	Memory
P1	95	4
P2	101	5
P3	115	5
P4	112	4
P5	119	5
P6	121	6
P7	113	5
P8	99	4
P9	110	5
P10	122	7

Create a scatter diagram of the data on the axes below:



a) What can the psycholo... ...fer about the relationship betw...
b) What type of co...rel...t...s this?

Inferential statistics

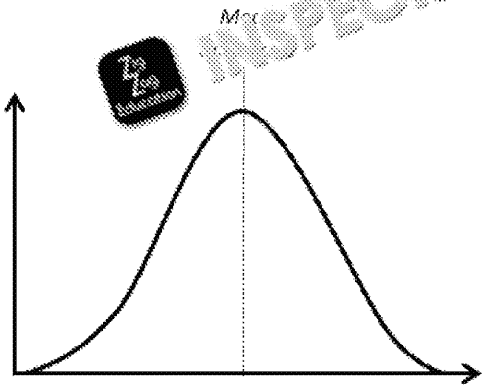
Inferential statistics use the information you have gathered from a sample to
you are interested in.

Normal distribution curves

How the data is spread across the group is referred to as its distribution. For
grades, the possible grades are: A*, A, B, C, D, E and U. If you want to know t
examine how many people have got each grade and then compare the grade

The normal distribution is the most common type of distribution and it occurs
normal distribution has the shape of a bell curve, and this shape indicates tha
middle range and the frequency of the data on either side of the curve decrea

Here is a normal distribution curve:

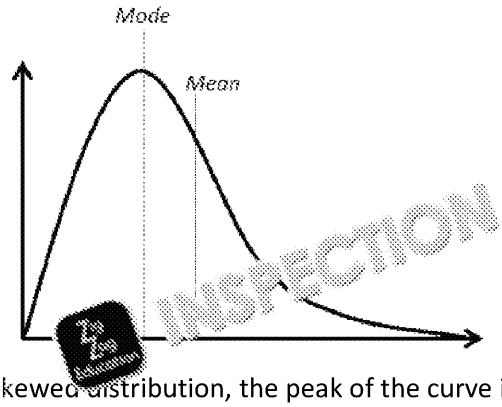


The precise shape of the normal distribution curve is determined by the mean
The mean determines the peak of the curve and a short and wide curve is a re
deviation (the data is very spread out), whereas a tall and narrow curve is a re
deviation (the data is similar).

Note that most data only fits the curve approximately rather than exactly.

Skewed distribution curves

Quite often in data we get skewed distribution, where the peak of the curve is



In this skewed distrib
data is at the left-han
the centre of the gra

In skewed distribution, the peak of the curve is not represented by the mean
with the normal distribution curve where the mode and the mean are both at

Why is it important?

It is important to know the type of distribution as this will affect which statist
of statistical tests (parametric tests) require data to have a normal distributio
concerned with comparing with the mean. When using the mean it is import
values is small because outliers will affect the results.

Probability

Probability tells us how likely something is to happen. In some cases this coul
likelihood of getting a head on a fair coin is 50% (or 0.5). In inferential statisti
about when we should accept and reject our null hypothesis.

The most common reason for statistical testing is that we want to know if our
What this essentially means, is how sure we can be that any effect found was
and not just a chance event or an error. In statistics, data can be said to be st
lower than the significance level.

The p-value represents the probability of observing an effect assuming that th
alpha-value (α) is the probability of rejecting the null hypothesis, and this is us
which we test against the observed p-value. Both values can be used to judge
science, a significance level will most likely be set before the data is gathered,
is 5% or often written as 0.05, so a p-value 0.05. What this means is that if the
assumed that the effect was due to the experimental factors and not a rando

Significance levels

For most research conducted you use a significance level of 0.05. This means
is not due to chance. When it is very important that the result is not due to ch
as their level of significance. This means that they are 99% sure that the resul
it can be important to make sure that medicines are reducing symptom severi
not simply due to chance.

Using statistical tables of critical values

When a researcher uses an inferential statistical test they are trying to determ
do this they must consult tables of critical values.

When an inferential test is conducted it produces a number called the **observe**
to another number from the table called the **critical value**.

The critical value is found by looking at the critical value table. Below is the c
called Spearman's rho:

Level of significance for a one-tailed test					
	0.05	0.025	0.01	0.005	0.0025
Level of significance for a two-tailed test					
N	0.10	0.05	0.025	0.01	0.005
5	0.900	1.000	1.000	1.000	1.000
6	0.829	0.886	0.943	1.000	1.000
7	0.714	0.786	0.893	0.929	0.964
8	0.643	0.738	0.833	0.881	0.905
9	0.600	0.700	0.783	0.833	0.867
10	0.564	0.648	0.745	0.794	0.830
11	0.536	0.618	0.709	0.755	0.800
12	0.503	0.587	0.678	0.727	0.769
13	0.484	0.560	0.648	0.703	0.747
14	0.464	0.538	0.626	0.679	0.723
15	0.446	0.521	0.604	0.654	0.700
16	0.429	0.503	0.582	0.635	0.679
17	0.414	0.485	0.566	0.615	0.662
18	0.401	0.472	0.550	0.600	0.643
19	0.391	0.460	0.535	0.584	0.628
20	0.380	0.447	0.520	0.570	0.612
21	0.370	0.435	0.508	0.556	0.599
22	0.361	0.425	0.496	0.544	0.586
23	0.353	0.415	0.486	0.532	0.573
24	0.344	0.406	0.476	0.521	0.562
25	0.337	0.398	0.466	0.511	0.551
26	0.331	0.390	0.457	0.501	0.541
27	0.324	0.382	0.448	0.491	0.531
28	0.317	0.375	0.440	0.483	0.522
29	0.312	0.368	0.433	0.475	0.513
30	0.306	0.362	0.425	0.467	0.504

Once you have this information it is simple as finding the critical value.

For example: I need a two-tailed test (because I have a non-directional hypoth
and I ha[illegible] 10 participants.

What is my critical value? **0.648**

Note: You will see critical value tables in action, in the section: **Understanding influential tests**

Criteria for using a parametric test

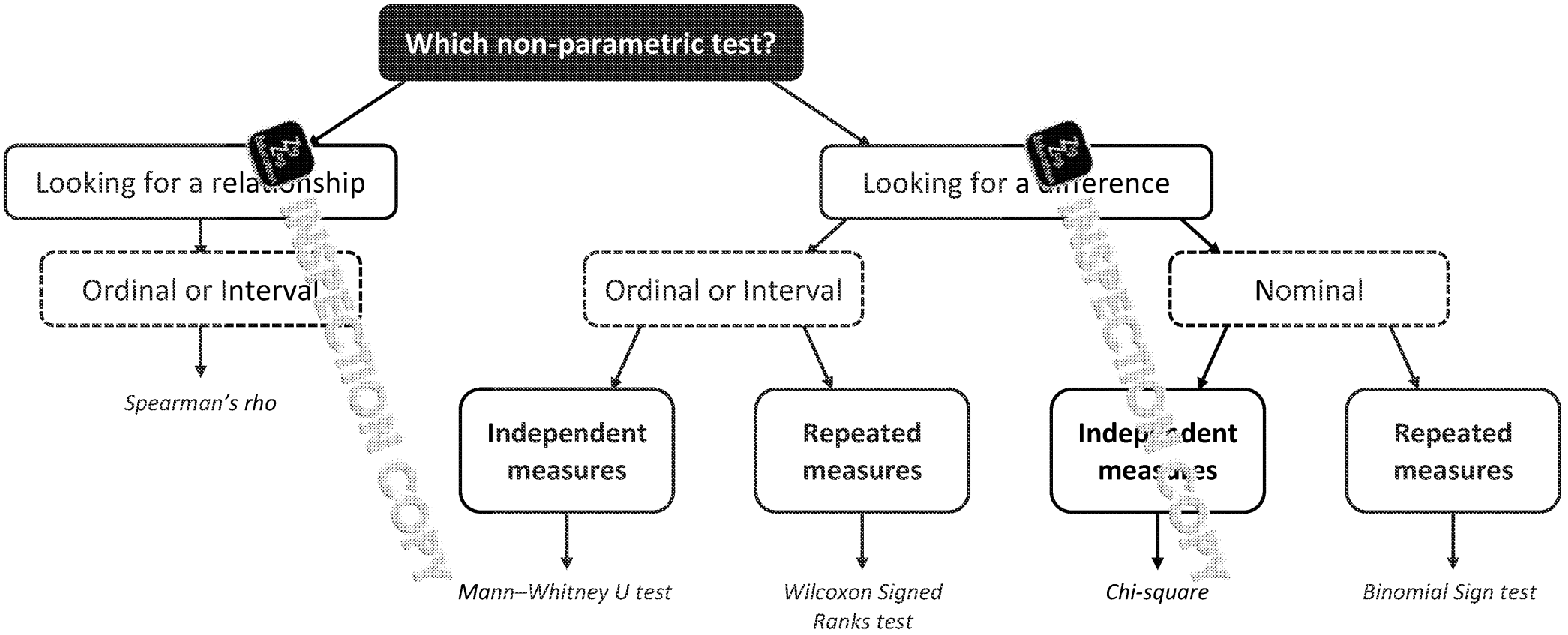
The inferential tests we are going to describe fall into two categories: parametric or non-parametric. For a parametric test to be used, the data should satisfy certain assumptions. The main assumption is that the distribution of the data is normal. Other assumptions include that population variance should be roughly equal, there should be no extreme scores (outliers) and the data should be at least at interval or ratio level (usually interval).

Parametric tests are considered more powerful which means you are more lik
should reject your null hypothesis and accept your alternative hypothesis. Ho
assumptions above are met.

Criteria for using non-parametric inferential tests

In contrast, non-parametric tests do not have to satisfy certain assumptions.
need to be normally distributed so this they are sometimes called 'distribution-free te

	Use when	Type of data
Mann–Whitney U test	To see if there is a significant difference between the results of two independent groups (by comparing the medians)	Ordinal or interval
Wilcoxon Signed Ranks test	To see if there is a significant difference between the results of two related groups (by comparing the medians)	Ordinal or interval
Chi-square	To see if the number of people (as measured by frequency) in each category differs significantly from what is expected	Nominal
Binomial Sign test	To see if the number of people (as measured by frequency) in each category differs significantly	Nominal
Spearman's rho	To see if there is a significant relationship between two variables (a correlation) in ranked data	Ordinal or interval



Understanding the use of non-parametric inf

Using Mann–Whitney U

The Mann–Whitney U test is a test of significant differences between two gro

Use the Mann–Whitney U when:

- Your data is ordinal or interval
- You have an independent measures design
- You want to work out if there is a significant difference between two

Here is an example scenario that follows the test process.

Scenario: Research has shown th[illegible] types of words are remembered better than [illegible]ers in short-term memory. A researcher wants to investi[illegible]ether or not acoustically similar words (words that so[illegible]mi[illegible]) are remembered better than words that are acousti[illegible]issimilar (words that do not sound similar). They form the hypothesis: A greater number of acoustically dissimilar words will be recalled than acoustically similar words.

The researcher creates two lists of words: one with 10 acoustically similar words and another with 10 acoustically dissimilar words. Twenty participants are randomly assigned to either the Acoustically Similar condition or the Acoustically Dissimilar condition. Each participant only sees one of these lists. The words were individually presented on a PowerPoint presentation, with each word staying there for 3 seconds before moving on to the next, afterwards the participants wrote down as many words as they could recall from the list.

These were the results:

Acoustically similar words		Acoustically
Participant	Number of words recalled (max = 10)	Participant
1	6	1
2	4	2
3	5	3
4	4	4
5	6	5
6	3	6
7	4	7
8	7	8
9	4	9
10	5	10

⇨ **Step 1: Rank your results**

Create a column for each of your groups and title them 'Rank'. You rank a
of which group they come from. The smallest number of words recalled is
smallest will be given a rank of 2, and so on.

In some cases, several participants have recalled the same number of wor
up all the ranks they would assume and then divide by the number of part

For example, below we have four participants who recalled 4 words. This
recalled, so these four participants would assume the ranks 1, 2, 3 and 4.

We calculate 1 + 2 + 3 + 4 = 10 and then divide this answer by 4 because th
score.

$10 \div 4 = 2.5$

All of our participants who recalled 4 words are given a score of 2.5.

Whe ng out the next ranking remember the ranks that have already
partic nts who recalled 5 words. Remember that we have already filled
who have recalled 5 words fill the ranks 5, 6, 7 and 8.

$5 + 6 + 7 + 8 = 26$ and $26 \div 4 = 6.5$

Acoustically similar words			Acou
Participant	Number of words recalled (max = 10)	Rank	Participant
1	6	10	1
2	4	2.5	2
3	5	6.5	3
4	4	2.5	4
5	6	10	5
6	8	15.5	6
7	4	2.5	7
8	7	13	8
9	4	2.5	9
10	5	6.5	10

⇨ **Step 2: Add up all of the ranks for your first group**

Add up the ranks for acoustically similar words to get $\sum R_{a\,(similar)}$

$$\sum R_{a\,(similar)} = 10 + 2.5 + 6.5 + 2.5 + 10 + 15.5 + 2.5 +$$

⇨ **Step 3: Add up all of the ranks for your second group**

Add up the ranks for acoustically dissimilar words to get $\sum R_{b(dissimilar)}$

$$\sum R_{b(dissimilar)} = 15.5 + 18 + 13 + 18 + 10 + 13 + 18 +$$

⇨ **Step 4: Work out n_a and n_b**

n_a is the number of participants in your first group

$n_a = 10$

n_b is the number of participants in your second group

$n_b = 10$

⇨ Step 5: Work out U_a

The provided formula for U_b is:

$$U_a = n_a n_b + \frac{n_a(n_a+1)}{2} - \sum R_a$$

Substituting in our values this gives us:

$$U_a = 10 \times 10 + \frac{10(10+1)}{2} - 71.5$$

$$U_a = 100 + \frac{10(11)}{2} - 71.5$$

$$U_a = 100 + \frac{110}{2} - 71.5$$

$$U_a = 100 + 55 - 71.5$$

$$U_a = 100 + 55 - 71.5 = 83.5$$

$$U_a = 83.5$$

⇨ Step 6: Work out U_b

The provided formula for U_a is:

$$U_b = n_a n_b + \frac{n_b(n_b+1)}{2} - \sum R_b$$

$$U_b = 10 \times 10 + \frac{10(10+1)}{2} - 138.5$$

$$U_b = 100 + \frac{10(11)}{2} - 138.5$$

$$U_b = 100 + \frac{110}{2} - 138.5$$

$$U_b = 100 + 55 - 138.5$$

$$U_b = 100 + 55 - 138.5 = 16.5$$

$$U_b = 16.5$$

⇨ Step 7: Work out *U*

U is the smaller of U_a and U_b

Our $U_a = 83.5$ and $U_b = 16.5$

So our $U = 16.5$

⇨ **Step 8: Use critical value tables**

To be significant, our calculated value of U has to be **equal to or less** than t
To use a critical value table we need to know our N_a and our N_b and wheth
a two-tailed test. From Step 4 our N_a =10 and our N_b = 10.

We have a directional hypothesis so we will be doing a one-tailed test.

Our critical value for a one-tailed test at p≤0.05 is 27:

						N_b				
	5	6	7	8	9	10	11	12	13	14
N_a **p≤0.05 (one-tailed), p≤0.10 (two-tailed)**										
5	4	5	6	8	9	1	[illegible]	13	15	16
6	5	7	8	10	[illegible]	14	16	17	19	21
7	6	8	[illegible]	1	15	17	19	21	24	26
8	8	[illegible]	1	15	18	20	23	26	28	31
9	[illegible]	[illegible]	15	18	21	24	27	30	33	36
[illegible]	[illegible]	14	17	20	24	**27**	31	34	37	41
11	12	16	19	23	27	31	34	38	42	46
12	13	17	21	26	30	34	38	42	47	51
13	15	19	24	28	33	37	42	47	51	56
14	16	21	26	31	36	41	46	51	56	61
15	18	23	28	33	39	44	50	55	61	66
16	19	25	30	36	42	48	54	60	65	71
17	20	26	33	39	45	51	57	64	70	77
18	22	28	35	41	48	55	61	68	75	82
19	23	30	37	44	51	58	65	72	80	87
20	25	32	39	47	54	62	69	77	84	92

⇨ **Step 9: Determine significance**

Look at the Mann–Whitney U critical values tables above.

Write down the critical values for your test and the significance level
Critical value at p≤0.05 = 27
U value = 16.5

If your U value is **less than or equal** to the critical value then the result is s

You choose your significance level, typically it will be 0.05. However, if yo
value (e.g. 0.01) this is even better. You want the lowest critical value tha
Significance at p≤0.01 is better than significance at p≤0.05.

Our result is significant at p≤0.05 because our U value (16.5) is less than o
supports the experimental hypothesis that more acoustically dissimilar wo
similar words.

Signi[illegible]more acoustically dissimilar words were recalled than acousti

Using Wilcoxon Signed Ranks test

The Wilcoxon Signed Ranks test is used when you want to see if there is a sign
conditions.

Use the Wilcoxon Signed Ranks test when:

- Your data is ordinal or interval
- You have a repeated measures design
- You want to work out if there is a significant difference between two

Scenario: A researcher wants to investigate whether attention to visual deta
better in the morning or afternoon. Each participant is shown two identical
photographs but with one photo altered subtly. Participants have one minut
spot the ten differences. Half of the participants complete this first at 10am
morning and half of participants complete this in the afternoon. A week later, with
different photographs the same participants return to do the other time co

Previous research has found that in the afternoon we experience a cognitive
and have lower energy levels and alertness compared to other times in the
The researcher's hypothesis is that more differences will be identified in the
morning condition than the afternoon condition.

Ten participants completed the study and produced the following results:

Table 1. Number of differences participants identified in the morning and a

Participant	Morning condition	After
1	7	
2	6	
3	8	
4	5	
5	4	
6	8	
7	5	
8	10	
9	7	
10	9	

Follow the steps below to learn how to conduct the Wilcoxon Signed Ranks te

⇨ Step 1: Calculate the difference of each pair

Create a column and label it 'Difference'. Calculate the difference between

We did this by subtracting the afternoon condition from the morning cond
this the opposite way around but make sure you use the same method for

Participant	Morning condition	Afternoon conditio
1	7	5
2	6	4
3	8	3
4	5	5
5	4	7
6	8	7
7	5	4
8	10	9
9	7	5
10	9	8

⇨ **Step 2: Rank the differences**

Create a new column in your table and title it 'Rank'. If any of your differe

Ignore the signs and look for the smallest difference (other than 0) and giv
difference a rank of 2, and so on.

If some of your differences are the same, then work out the ranks they wo
number of differences.

In the data below we have four differences of 1. These scores would assu
We work out 1 + 2 + 3 + 4 = 10 and then divide this answer by the number

10 ÷ 4 = 2.5. A rank of 2.5 is given to all the differences of 1.

We also have three differences of 3. Remember that 1 is taking up the ran
is the next highest so it will take up the rank of 5.

There are three differences of 2, so this will be ranks 5, 6 and 7.

We work out the rank by working out 5 + 6 + 7 = 18 and then dividing this
18 ÷ 3 = 6. A rank of 6 is given to all the differences of 2.

Participant	Morning condition	Afternoon condition	D
1	7	5	
2	6	4	
3	8	3	
4	5	5	
5	4	7	
6	8	7	
7	5	4	
8	10	9	
9	7	5	
10	9	8	

⇨ **Step 3: Add together all the ranks that belong to positive scores**

Positive scores: 6 + 6 + 9 + 2.5 + 2.5 + 2.5 + 6 + 2.5 = 37

⇨ **Step 4: Add together all the ranks that belong to negative scores**

Negatives scores: 8

⇨ **Step 5: Find the value of W (W stands for Wilcoxon)**

The smaller answer to Step 3 and Step 4 is the value of W.

W = 8

⇨ **Step 6: Find the value of N**

Our value for N is the number of differences (we ignore any that gave us a

There are 9 differences (because we omitted one)

N = 9

⇨ **Step 7: Find the critical value**

Look at the critical Wilcoxon values.

	Level of significance for a one-tailed test		
	0.05	0.025	0.01
	Level of significance for a two-tailed test		
n	0.1	0.05	0.02
N=5	0	-	-
6	2	0	-
7	3	2	0
8	5	3	1
9	8	5	3
10	11	8	5
11	13	10	7
12	17	13	9

Use your N va

For r ud is important that they are significant at a level of 0.05. S
resea ed to be significant at a level of 0.01 because it is very importa
A level of 0.01 reduces the odds of false positives (detecting a difference w

⇨ **Step 8: Determine significance**

We use the table above and our W value to determine whether our finding

We have a directional hypothesis so we use a one-tailed test. (If you have
you use a two-tailed test.)

Looking at the table above for a one-tailed test:
Critical value at p≤0.05 = 8

W value = 8

You choose your significance level, typically it will be 0.05. However, if you
value (e.g. 0.01) this is even better. If your W value is **less than or equal** to
significant.

You want the lowest critical value that your result is still significant for. Sig
significance at p≤0.05.

Our result is significant at p≤0.05 because our W value (8) is equal to our c
supports our experimental hypothesis that more differences will be identifi
the afternoon condition.

Using chi-square

Chi-square analysis is a statistical tool employed when working with nominal d
frequency data associated with those categories. It is particularly useful when
there is a significant difference between two or more categories within your d

Use the chi-square when:

- **Your data is nominal**, i.e. when data consists of categories or labels, r
- You have an independent groups design, i.e. your data is organised in
  categories.
- You want to assess significant differences – chi-square helps you eval
  frequencies within your categories significantly differ from what you

Example:

Consider the following data repres[illegible] preferences of students for two
different explanations (A and B):

	Explanation A	Explanation B
Girls	17	3
Boys	2	10

⇨ Step 1: Construct a table and add the totals for each column and row

The results are below:

	Explanation A	Explanation B
Girls	17	3
Boys	2	10
Column total	19	13

These values represent the **observed frequencies** – the actual preferences re

In a chi-square analysis, we compare these observed frequencies to **the expe**
frequencies are what we would theoretically anticipate if there were no differ
case, the researcher assumes that both explanations (A and B) are equally pre
number of students should, in theory, choose each definition.

By applying chi-square analysis, we can determine whether the observed pref
this expected equal distribution, helping us make informed conclusions about
the two explanations. Chi-square analysis quantifies the extent of this deviati
significance.

Chi-square is a test of whether the observed frequencies differ significantly fr
they do, this suggests that the definitions were not equal after all. This type o
Goodness of Fit.

⇨ Step 2: Construct a new table [illegible] the observed and expected freq

The first step is to cr[illegible] table. Each of your conditions should get a colu
observed and [illegible] frequencies for each cell. Your expected frequenc
the f[illegible]

$$\frac{\text{Row total} \times \text{Column total}}{\text{Overall total}}$$

	Explanation A	Explanation
Girls	17 (observed) 20 × 19 / 32 = 11.875 (expected)	3 (observe 20 × 13 / 32 = 8.125
Boys	2 (observed) 12 × 19 / 32 = 7.125 (expected)	10 (observe 12 × 13 / 32 = 4.875
Column total	19	13

⇨ **Step 3: Calculate O – E**

Create a new row for each group and calculate the observed frequency mi
worry if some of your answers are negative and others are positive.

	Explanation A	Explanation
Girls	17 (observed) 20 × 19 / 32 = 11.875 (expected)	3 (observe 20 × 13 / 32 = 8.125
	O – E = 5.125	O – E = -5.1
Boys	2 (observed) 12 × 19 / 32 = 7.125 (expected)	10 (observe 12 × 13 / 32 = 4.875
	O – E = -5.125	O – E = 5.1
Column total	19	13

⇨ **Step 4: Calculate $(O – E)^2$**

Add another row to your table for each group and take your previous answ
Remember that when you multiply two negative numbers together the an
answer you should be positive.

	Explanation A	Explanation
Girls	17 (observed) 20 × 19 / 32 = 11.875 (expected)	3 (observe 20 × 13 / 32 = 8.125
	O – E = 5.125	O – E = -5.1
	$(O – E)^2$ = 26.27	$(O – E)^2$ = 26
Boys	2 (observed) 12 × 19 / 32 = 7.125 (expected)	10 (observe 12 × 13 / 32 = 4.875
	O – E = -5.125	O – E = 5.1
	$(O – E)^2$ = 26.27	$(O – E)^2$ = 26
Column total	19	13

⇨ **Step 5: Calculate $(O – E)^2 / E$**

For each column, take your answer from your previous step and divide it b
symbol means divide.

	Explanation A	Explanation
Girls	17 (observed) 20 × 19 / 32 = 11.875 (expected)	3 (observe 20 × 13 / 32 = 8.125
	O – E = 5.125	O – E = -5.1
	$(O – E)^2$ = 26.27	$(O – E)^2$ = 26
	$(O – E)^2 / E$ = 2.212	$(O – E)^2 / E$ = 3
Boys	2 (observed) 12 × 19 / 32 = 7.125 (expected)	10 (observe 12 × 13 / 32 = 4.875
	O – E = -5.125	O – E = 5.1
	$(O – E)^2$ = 26.27	$(O – E)^2$ = 26
	$(O – E)^2 / E$ = 3.686	$(O – E)^2 / E$ = 5
Column total	19	13

⇨ **Step 6: Calculate χ^2**

This symbol means chi-square. To calculate chi-square we take all our nu
group and add them.

$$\chi^2 = \sum[\frac{(O-E)^2}{E}] = 2.212 + 3.233 + 3.686 + 5.388 = 14.519$$

⇨ **Step 7: Calculate your degrees of freedom (df)**

$$(df) = (Number\ of\ rows - 1)\ x\ (Number\ of\ Columns - 1)$$

E.g. (2-1) x (2-1) = 1

⇨ **Step 8: Using the critical value tables**

df	p≤0.05	p≤0.01
1	3.84	6.64
2	5.99	9.21
3	**7.81**	11.34
4	9.49	13.28
5	11.07	15.09
6	12.59	16.81
7	14.07	18.48
8	15.51	20.09
9	16.92	21.67
10	18.31	23.21
11	19.68	24.72
12	21.03	6.
13	22.36	27.69
14	23	29.14
	25.00	30.58

Our df = 1

We are going to choo
To be significant our v
equal to or greater th

Our critical value is 3.8
r value of chi-squa

Therefore, there is a s
our expected and obs
definitions are not eq

Using Binomial Sign test

A binomial sign test is used when we want to see if there is a significant differ

Use the binomial sign test when:

- Your data is nominal
- You have a repeated measures design
- You want to work out if there is a significant difference between each condition

A student wants to know if a person would be more likely to listen to a close friend talking about a problem related to mental illness than listen to a stranger talk about a problem related to mental illness. She hypothesised that people would be more likely to listen to the close friend.

She carried out a questionnaire study and got the following results:

Table 1. Showing disposition to listen to someone talk about a prob

Participant	Listen to close friend Condition A	Listen to s Condit
1		ye
2	o	ye
3	no	ye
4	yes	ye
5	yes	no
6	yes	no
7	yes	ye
8	yes	no
9	yes	no
10	yes	no

⇨ **Step 1: Calculate the flow of direction**

If condition A is no and condition B is yes then you get a minus -

If condition A is yes and condition B is no then you get a plus +

If both conditions are the same then you ignore them

Participant	Listen to close friend Condition A	Listen to stranger Condition B
1	no	yes
2	no	yes
3	no	yes
4	yes	yes
5	yes	no
6	[illegible]	no
7	yes	yes
8	yes	no
9	yes	no
10	yes	no

⇨ **Step 2: Count how many positive and negative signs there are**

\+ total = 5

\- total = 3

⇨ **Step 3: The smaller total score is your observed binomial sign test result**

Observed value = 3

⇨ **Step 4: Find your critical value**

Here is the critical value table for the binomial sign test:

N	p≤0.05	p≤0.01
5	0	
6	0	0
7	0	0
8	1	0
9	1	1
10	1	1
11	2	1
12	2	2
13	3	2
14	3	2
15	3	3

N = number of participants with a [illegible] their score (ignore those w

N = 8

We a[illegible] a significance level of 0.05

So ou[illegible] **value = 1**

⇨ **Step 5: Is your result significant?**

Our observed value = 3

Our critical value = 1

To be significant, the observed value has to be **less than or equal to** the cr

In our example, the observed value is greater than the critical value and is

This means that there is not a significant difference between how willing p

or to listen to a stranger.

Using Spearman's rho

Spearman's rho is used to analyse for correlations.

Use Spearman's rho when:

- Your data is ordinal or interval
- You have a correlational design
- You want to work out if there is a significant relationship between tw

Here is an example scenario that follows the test process.

Scenario: A researcher is interested in whether there is a relationship between happiness and height. A questionnaire is de[illegible]d to assess self-rated happiness. The minimum score is 0 and the maximum score is 25. The participants also stated their ne[illegible] and heights were all converted to centimetres for ease of comparison.

Ten part[illegible]s took part in the study and these were their results:

Participant data on height and overall self-rated hap

Participant	Happiness score	Height
1	9	172
2	2	160
3	4	171
4	11	168
5	1	170
6	16	179
7	8	169
8	15	180
9	8	175
10	24	187

Note. Minimum happiness score is 0; maximum

⇨ **Step 1**: Set up a table, such as the one below:

Participant	Happiness score	Rank 1	Height (in cm)	Rank 2
1	9		172	
2	2		160	
3	4		171	
4	11		168	
5	1		170	
6	16		179	
7	8		169	
8	15		180	
9	8		175	
10	24		187	

Rank 1 is our column for our ranking of self-rated happiness

Rank 2 is our column for our ranking of height

d is our difference (Rank 2 – Rank 1)

d^2 is our difference squared

Next we are going to rank our data.

⇨ **Step 2**: To rank your scores, start with the lowest number and give that a r
so on.

Participant	Happiness score	Rank 1	Height (in cm)	Rank 2
1	9	6	172	6
2	2	2	160	1
3	4	3	171	5
4	11	7	168	2
5	1	1	170	4
6	16	9	179	8
7	8	4.5	169	3
8	15	8	180	9
9	8	4.5	175	7
10	24	10	187	10

If two of your results are the same you give a joint ranking. We have two 8
4 and 8 we give them both a ranking of 4.5. The next lowest score will

Note: multiple joint rankings, especially in a small sample size, decreases t

⇨ **Step 3**: To work out d (the difference) we subtract our rank 1 scores from t

Rank 2 – Rank 1 = difference

Participant	Happiness score	Rank 1	Height (in cm)	Rank 2
1	9	6	172	6
2	2	2	160	1
3	4	3	171	5
4	11	7	168	2
5	1	1	170	4
6	16	9	179	8
7	8	4.5	169	3
8	15	8	180	9
9	8	4.5	175	7
10	24	10	187	10

So work out d^2 (difference squared) we simply square our d result.

Remember that you are squaring the sign too $(-5)^2 = 25$
A negative multiplied by a negative gives us a positive.

All of our answers should be positive.

⇨ **Step 4**: Calculate $\sum d^2$

$\sum d^2$ is the 'sum of' all of our d^2 results. To do this we have to add th

$$\sum d^2 = 0 + 1 + 4 + 25 + 9 + 1 + 2.25 + 1 + 6.25 + 0$$

$$\sum d^2 = 49.5$$

➪ **Step 5**: Work out *N*=

Your N value is your number of participants.

$N = 10$

➪ **Step 6**: Put the information in the formula

Here is the formula for Spearman's rho:

$$r_s = 1 - \frac{6\sum d^2}{n(n^2-1)}$$

Remember that $\sum d^2 = 49.5$ and n=10

$$r_s = 1 - \frac{6 \times 49.5}{10(10^2 - 1)}$$

$$r_s = 1 - \frac{297}{990}$$

$r_s = 0.7$ (2 d.p.)

0.7 is our **observed value**

Here are the critical values for Spearman's rho:

Level of significance for a one-tailed test					
	0.05	**0.025**	**0.01**	**0.005**	**0.0025**
Level of significance for a two-tailed test					
N	**0.10**	**0.05**	**0.025**	**0.01**	**0.005**
5	0.900	1.000	1.000	1.000	1.000
6	0.829	0.886	0.943	1.000	1.000
7	0.714	0.786	0.893	0.929	0.964
8	0.643	0.738	0.833	0.881	0.905
9	0.600	0.700	0.783	0.833	0.867
10	0.564	**0.648**	0.745	0.794	0.830
11	0.536	0.618	0.709	0.755	0.800
12	0.503	0.587	0.678	0.727	0.769
13	0.484	0.560	0.648	0.703	0.747
14	0.464	0.538	0.626	[illegible]9	0.723
15	0.446	0.521	0.60[illegible]	[illegible].654	0.700
16	0.429	0.503	[illegible].82	0.635	0.679
17	0.414	[illegible].485	0.566	0.615	0.662
18	0.4[illegible]	[illegible].472	0.550	0.600	0.643
19	[illegible]	0.460	0.535	0.584	0.628
20	0.380	0.447	0.520	0.570	0.612

The calculated value must be **equal to or exceed** the critical value in this ta

Our value was 0.7, which is greater than 0.648. Therefore, our result is sig

This means that we can **reject our null hypothesis** that there would be no happiness. Therefore, we can **accept our alternate hypothesis** that there and happiness.

Type 1 errors

The alpha level is the probability that we will make a type I error. A type I err hypothesis but we shouldn't have. In this type of error we believe that there fact there is not. When alpha is 0.05 we are saying that there is a 5% chance confident that we are correct in rejecting our null hypothesis.

Although it is common to use $\alpha = 0.05$, researchers also sometimes use other value is $\alpha = 0.01$, which says that there is just a 1% chance of a type I error. T particularly important not to make a type I error (when it would be very bad t our data). For example, in the final stages of a drug trial, it would be bad prac when it is not.

Type 2 errors

A type II error is the opposite. In this case we accept our null hypothesis when believed there was no difference between our results but actually there was. detect a change. The smaller we make our alpha level, the more likely we are because we are making it more difficult to reject our null hypothesis.

A real-life application is a pregnancy test:

- A type I error occurs when the test says that a woman is pregnant but she change but there was no change)
- A type II error occurs when the test says that a woman is not pregnant b detect the change)

Chapter 3 Activities

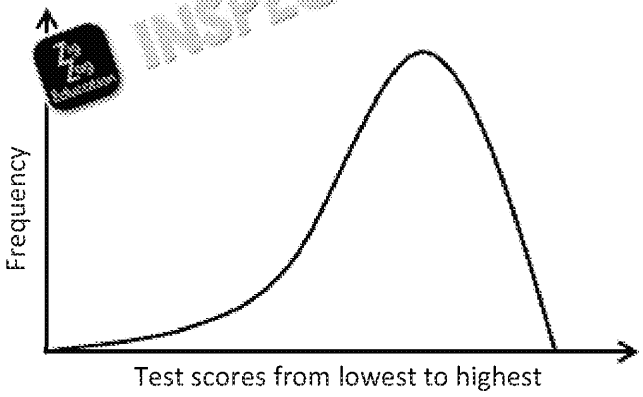
Check your understanding! Inferential statistics

Q1. The relationship between stress and attention is of normal distri
curve to represent this relationship. Include labels and where th

Q2. Which two factors determine the shape of a normal distribution

Q3. What will a large standard deviation look like on a normal distri

Q4. Examine the curve below:



a) What type of distribution is this?
b) What does the curve say about test scores?
c) Label the mean on the curve.
d) Label the mode on the curve.
e) Explain why the mean and mode are labelled this way.

Q5. Explain why it is important to know the distribution of the data

Q6. What is the main assumption of parametric tests?

Q7. A researcher has conducted a study into the relationship betwee
happiness. She totals how many cigarettes are smoked by the p
and their happiness score based on a questionnaire.

The researcher wants to conduct an inferential test to investigate
Which inferential test should she use and why?

Q8. A psychologist has carried out an experiment into short-term m
two conditions. In the first condition a group of participants are
list very briefly and all of the words are in alphabetical order. I
condition, another group of participants are shown the same list
The number of words recalled in each condition is recorded.

The researcher wants to conduct an inferential test to investigate
significant difference between the two conditions. Which infere
use and why?

Practice questions

A psychologist carried out a study into the relationship between happi
hours worked each week.

Participants completed a questionnaire containing ten questions on hap
written on a five-point Likert scale, where 1 = strongly disagree to 5 = s
score was 10 and the maximum score was 50. A higher score indicated

An eleventh question on the questionnaire asked the participant how m
typical week. The question specified to give their answer as a whole nu

The psychologist wrote her results in the table:

Participant	Happiness score	Hours worked per week
2	15	37
	46	15
3	32	30
4	35	40
5	47	20
6	24	36
7	44	25
8	32	35
9	15	48
10	34	40
Mean	32.4	32.6
Standard deviation	11.6	10.1

Q1. Outline how a mean is calculated. (2 marks)

Q2. Draw a scatter diagram to show the relationship between happi
per week. (4 marks)

Q3. What fraction of the participants' happiness scores is over 25? (1

a) $\frac{3}{4}$

b) $\frac{4}{5}$

c)

d) $\frac{7}{10}$

Overview

In this chapter we will learn about how research is presented in a practical report and understand the purpose of each of the report sections. We will also look at why research needs to be referenced and to undergo peer review.

Learni

After studyin
able to:

- ❑ Unders
  and sub
  report
- ❑ Be famil
  system
- ❑ Unders

Key

Abstract	A brief overview of your research; read by o to determine whether they want to read th
Appendices	A section at the end of the report in which placed so that it does not disrupt the flow o
Design	A subsection of the methods section in whi research design (e.g. independent groups, c
Discussion	A section considering the meaning of the fi research and the study's strengths and wea
In-text citation	When a study is referred to in the text the a written next to it
Introduction	Provides a rationale for the research by loo unknown
Materials/apparatus	A subsection of the methods section of a re the things he or she needed to conduct the
Method	A section of a report which describes, in de
Peer review	A process by which research is evaluated by meets certain standards
Procedure	A subsection of the methods section of a re study was conducted
Reference	Providing information about the author of t
Results	A description of the study's findings in term explain the findin
Sample/participants	A subsection of the methods section of a re de ed

Sections and subsections of a practical repor

After conducting research, the researchers will typically write up their findings in a psychological journal. The majority of research is published in psychologi Cognitive Neuroscience. Each journal tends be centred on a particular domai journal articles from this domain, and competition for publication in prestigio

Note: Journal articles are much more likely to be published if their findings ar This creates a skewed understanding of the topic because many relevant findi researchers to access.

Abstract

The abstract is a short summary of the rese ar w i ncludes key features s the hypothesis was and whether th n s supported this hypothesis. The researchers to see if they w to e a the whole article.

Abstrac er useful for researchers who want to conduct a meta-analysis research mines all the studies relevant to their research question and co compare them. The abstracts can be used to help the researcher work out if meta-analysis.

An abstract is often set out in a similar way so that it is really easy for other researchers to find the information they are looking for.

Very briefly, and in this order, researchers try to answer these questions:

1. What background research is there to our topic?
2. What topic did we investigate?
3. What research method did we use?
4. What were our variables and how did we measure them?
5. What were our main findings?
6. What was our main conclusion?

Although some researchers may include more information than this, all abstr information covered.

Introduction

The introduction is arguably one of the most important sections of the whole researcher discusses the reason for deciding to conduct their research. This i research. The researcher starts with more general information on the topic a research that is very relevant to their research question. The researcher iden how the researcher aims to remedy this. The intro or concludes with the researcher.

Method

This section disc the researcher conducted the research. The metho as the id at another researcher could repeat the study exactly using the method. sually split up into:

Design

The experimental design is briefly described, including whether the study use an independent measures design or a matched participants design, or whethe such as observations and self-reports. This includes information on how the p conditions. Alternatively, if the researcher used a correlational design, the co be described.

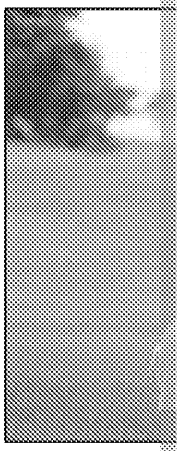
Sample/participants
This includes details of how many participants, the distribution of their gende
they were drawn from and the method of selection, and whether or not they
If any participants were excluded from the sample for any reason, or if partici
attrition) this will also be included.

Materials/apparatus
This gives details of any materials or equipment used in the study. For examp
questionnaire this would include information about how the questionnaire w
questions were included. If the design involved a computerised task, it may i
graphical abilities and the size and resolution of the monitor screen.

Procedure
The procedure section is a detailed description of how the study was carried o
so that another researcher could repeat the study. It should include what ins
any measures taken to reduce order effects and how long the parti

1.6 How Science works: Replicability
When a researcher conducts their study they should try to design it so that another psychologist can replicate it. To do this it needs to be very clearly described and carefully standardised. The other psychologist should get the same result. In science, if research is replicated exactly then it should produce the same results.

If both studies get the same result then this suggests that the finding is reliable.



Results
The results section first begins with describing the data using descriptive stati
scores. It then moves on to show the results of any statistical or qualitative a
what their statistical significance is.

This section is very fact-based as the researcher does not apply any kind of int
results section should be completely objective and when reporting the statist
influenced by expectations or beliefs.

Discussion
The discussion is an important section where the researcher gives meaning to
the researcher reiterating the statistical findings and linking them to the rese
concludes on whether they support or contradict the predictions of their stud

The results are discussed in terms of the past research that was identifie
whether the new results fit in with past data. If the research does not fit in
researcher considers why this might be. The researcher may argue that the o
account of these new findings, or that some methodological issue might have

The discussion also requires the researcher to evaluate their own research an
most serious limitations will be considered, such as variables that might have
generalisability is very limited.

Finally, the researcher considers what research still needs to be done and wh are.

References

It is very important that the writer of the article credits other researchers' wo to prevent the reader from believing that these ideas are the author's origina someone else.

Appendices

At the back of the report are the appendices. Appendices are important to th main body of text because it would disrupt the flow of information. Informat appendices includes raw data, analyses, additional tables and diagrams, ethic information sheets and debrief forms.

Appendices are cited in the text when the text refers to something that has be

Example:

- *Participants were thanked for their time and given a debrief shee ... the study.*

This allows the reader to go and examine the information if they are intereste necessary to consult the appendices to understand the report. However, for reader wishes to replicate the study then the appendices can be a valuable so

Citing academic references

As mentioned, references are essential when acknowledging the work of othe about the originality of the ideas discussed. Additionally, it can be an excelle surround a topic of interest and encourage further reading and understandin

Harvard system of referencing

There are several different systems of referencing which vary slightly in how t you need to know about is the Harvard system of referencing.

There are two different types of references:

In-text citations

When you directly refer to, quote or paraphrase a study you should give an in

Examples:

- *Milgram (1963) found that the majority of his participants obeyed an*
- *Research by Loftus and Palmer (1974) ... the danger of using le*
- *Some research into bystander ... that in a naturalistic setting behaviour (e.g. Piliavin ... Piliavin, 1969)*
- *Many studies ... to the context dependent nature of memo ... 01, ... ey et al., 2013)*

Notice that there are two slightly different methods. When talking about a sp the author(s) surname(s) in the text and the date in brackets. Then when talk listing several studies that point to the same conclusion, the author(s) and the

When three or more authors are mentioned, the surname of the first author i replaced by 'et al.' and then the date. Readers can find the full list of authors

Reference list

The reference list is a complete list of all authors you have cited in the text. It precisely where you retrieved the information from. The most commons sou

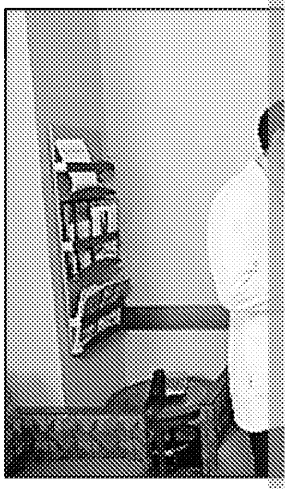
Referencing books:
Surname, Initial(s). (Year). *Book title*. (Edition if not the first). Place: Publish
Gross, D. (2015). *Psychology: The Science of Mind and Behaviour*. (7th ed). Lo

Referencing journal articles:
Surname, Initial(s). (Year) Article title. *Journal name*, Volume(Issue number),
Piliavin, I. M., Rodin, J. A. & Piliavin, J. (1969) Good Samaritianism: An underg
Psychology and Social Psychology, 13, (4), 289–99.

In a completed reference list, the refe arranged in alphabetical ord locate the reference they are in.

Peer ic

Journal a les are given a higher status if they are published in peer-reviewed journals. A peered-review article is one that has been evaluated by other researchers in a similar field to check if it meets certain standards. When an article is submitted for publication the copy is sent to be reviewed and the author's identity is made anonymous so that the reviewers are not influenced by the author's identity. The idea is that the work can be assessed for its quality by impartial reviewers before it can be published.



Being reviewed by a published in a respect when a peer may no research

Peer-reviewing is important for the development of psychology as a science as it ensures that the work being produced is to a high quality and of good accuracy. Without peer review there is a danger of poor-quality research being published that may draw incorrect conclusions or base its conclusions on flawed methodology. Along with damaging the field of psychology this co the groups being studied. For example, prior to peer-review systems early re that African Americans had lower IQs than whites based on poor IQ test desig practices against African Americans.

However, there are problems within peer-revi ic s the fact that the rev as psychologists often have strong op ab which approaches they fav

Since journal articles t meet the requirements are not published, p 'best of t st psychological research. There are databases dedicated to articles others you can filter out journal articles that have not been p and PsycARTICLES.

Discussion point – Open Access journals
There is a continuing debate whether there should be a greater shift toward provide unrestricted access to scientific journals. Do you think open access t good thing?

Chapter 4 Activities

Check your understanding!

Q1. Identify one way in which the abstract is used. (1 mark)

Q2. Briefly describe how the results section and the discussion sectio

Q3. Identify and explain two reasons why the discussion is an impo report. (6 marks)

Q4. Identify two differences between in-text citations and a referenc

Q5. Briefly describe the purpose of peer review. (3 marks)

Practice questions

Q1. Outline the purpose of referencing in psychological research. (3

Q2. Outline the purpose of the results section in a scientific journal a

Chapter 5: Practical activities

Overview

In this chapter we will apply the knowledge that we have acquired so far to a number of practical activities. These practical activities will involve you designing and conducting your own research studies based around a research scenario. Each scenario will be accompanied by a guided example of one way the research could be conducted.

Learni

After studying
able to:

- ❑ Apply kn
  and tech
- ❑ Design a

Key Terms

Correla esearch	A type of study looking at the association b
Experim	A type of study that uses manipulation of th measures of control to try to establish caus
Observation	A research methods technique in which dat behaviour
Self-report	Research methods that gather data by aski topic of interest

Practical activities

Throughout the previous four chapters we have covered some of the method
when they conduct research. In this chapter, you will have the opportunity to
on what you have learnt.

Designing and conducting your own research will give you a better understand
the strengths and weaknesses of different research methods. In this chapter,
different research scenarios, and hints and tips to help you design and condu

In addition to this, there will also be a guided example for each scenario which
conducting this research. If you do not intend to condu our own research,
the guided examples to learn more about how to op your knowledge of res
research scenario.

Self-r

Researc cenario

How do people view mental illness?

*You are tasked with designing a self-report study to investigate attitudes towa
mental illness. You should use a questionnaire design that includes both open
closed questions.*

*You should think carefully about how you design your questionnaire and why
to design it that way.*

Task chapter 5.1: Designing and conducting a self-report study

Answer the questions below to help you write up your self-report stud
above. The questions should also help to guide you through the plann
you an idea of the things you need to consider before beginning.

1. What is your research question?

   .....

   .....

   .....

2. What sampling id you choose and how many participa

   .....

   .....

   .....

3. Write your questionnaire. Remember to use at least one open ques

Hint! Remember that your whole questionnaire should focus on the con
mental illness.

4. Describe two points you considered when you were designing you
they affected your questionnaire.

Point 1: .....

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Poin.....

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5. Suggest one way you will try to account for ethical issues in your s

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6. In detail, describe the procedure of your study. You should includ
else could replicate your study.

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7. For one of your closed questions, calculate the mean, median and m
participants. Present this information in a table.

Hint! Gather all of their scores for this question together first. You could

8. Suggest one conclusion you could draw from your mean score for

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9. Consider one way you could analyse your open question(s) and try

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10. Briefly discuss whether using an interview instead of a questionnai improvement.

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Hint! It ... p to write a brief list of the pros and cons of both research me more developed discussion of the two.

11. Identify two strengths and two weaknesses of your questionnaire a
affected your findings.

Strength 1: .....

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Strength 2: .....

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Weakness 1: .....

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Weakness 2: .....

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Guided example...

Here is a guided example of **one way** you could design and conduct your self-

1. **What is your research question?**
   How do people view mental illness?

2. **What sampling technique did you choose and how many participants d**
   An opportunity sample of ten participants was recruited by asking friend

3. **Write your questionnaire. Remember to use at least one open questio**

INSTRUCTIONS:
For Q1–6 please fill in the circle that m ost re esents your attitude t

Q1. People with ent illnesses are dangerous.

Strongly		*Somewhat*		*Somew*
Agr	*Disagree*	*Disagree*	*Neutral*	*Agre*
○	○	○	○	○

Q2. People with mental illnesses are to blame for their illne

Strongly		*Somewhat*		*Somew*
Disagree	*Disagree*	*Disagree*	*Neutral*	*Agre*
○	○	○	○	○

Q3. People with mental illnesses should not be allowed to w

Strongly		*Somewhat*		*Somew*
Disagree	*Disagree*	*Disagree*	*Neutral*	*Agre*
○	○	○	○	○

Q4. People with mental illnesses should be kept away from o

Strongly		*Somewhat*		*Somew*
Disagree	*Disagree*	*Disagree*	*Neutral*	*Agre*
○	○	○	○	○

Q5. People with mental illnesses are a burden on others.

Strongly		*Somewhat*		*Somew*
Disagree	*Disagree*	*Disagree*	*Neutral*	*Agre*
○	○	○	○	○

Q6. People with mental illnesses just want attention.

Strongly		*Somewhat*		*Somew*
Disagree	*Disagree*	*Disagree*	*Neutral*	*Agre*
○	○	○	○	○

For this next questio , plea write your answer in the box below. Plea
Q7. What w ou do if a close friend told you they had a mental ill

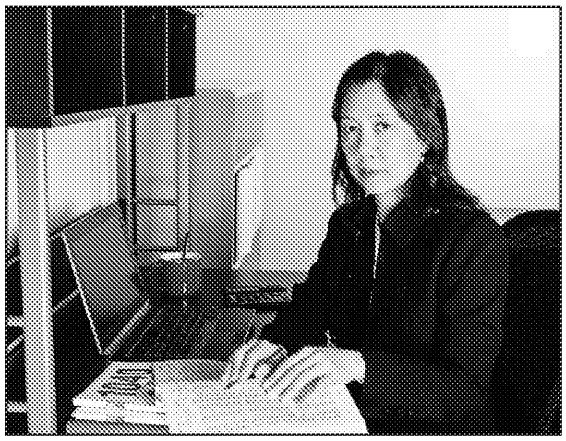
4. **Describe two points you considered when you were designing your que affected your questionnaire.**

   1. **The number of questions:** It was decided that less than 10 questions should be used to minimise fatigue or boredom in the participants and therefore minimise guessing. Our questionnaire has seven questions.
   2. **The ratio of closed questions to open questions:** It was decided that the majority of the questions should be closed because these are quick for the participant to answer and easy to analyse. Our questionnaire has six closed questions and one open question.

5. **Suggest one way you will try to account fo[illegible] issues in your study.**
   Participants will be given full details [illegible] study prior to taking part to a

Note: This method of de[illegible] ethical issues (such as deception or informe studies. H[illegible] case it will be very clear to the participant that the r towards [illegible] health.

6. **In detail, describe the procedure of your study. You should include enc could replicate your study.**



The participant's answers may feel less anonymous with the researcher in the room.

Participants were given a full details of the study a agreeing to take part. Th would be anonymous an were given the question participant to let them k answering the question researcher left the room participants' answers we way. It was felt that if th participants may be mo answers. All participant within 10 minutes. Parti and given a debrief shee they could have their da

7. **For one of your closed questions, calculate the mean, median and mod Present this information in a table.**

Our data was: 7, 2, 4, 5, 4, 5, 2, 5, 4, 5

Mean

Mean = (7 + 2 + 4 + 5 + 4 + 5 + 2 + 5 + 4 + 5) ÷

Median

Rearrange the data: 2, 2, 4, 4, 4, 5, 5, 5,
Our middle number is between 4 and
Median = 4.5

Mode

Our most common number is 5.
Mode = 5

Table 1. Measures of central tendency for question 3 a

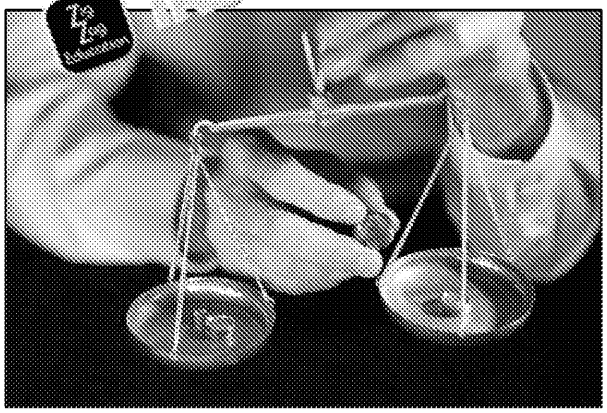
Mean	Median	Mode
4.3	4.5	5

8. **Suggest one conclusion you could draw from your mean score for that**
On average, participants had a more positive rather than negative attitud
that question.

9. **Consider one way you could analyse your open question(s) and try to m**
Each sentence the person writes could be rated for whether there would
towards the person, a negative change, or no/mixed change. A positive
negative changed a -1 and no/mixed change 0. The total score for their a
above zero then they have a positive attitude towards mental illness, if it
negative attitude towards mental illness.

Interpreting the type of behaviour change could aff the objectivity. H
straightforward.

10. **Briefly discuss whether u e erview instead of a questionnaire to
improvement.**



Those having an inte
because mental illne
questionnaire provid
which means that pa
However, a talented
rapport with the inte
lowering of barriers
questionnaire design
time-consuming, cos
of the interviewer, a
be studied using a qu
inexperience of the
a questionnaire met

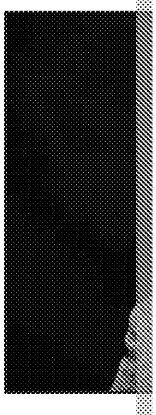
11. **Identify two strengths and two weaknesses of your questionnaire and e
affected your findings.**

Strengths:

- ✓ One strength of using a questionnaire is that participants may be mo
questions than they would be answering the same questions in an int
may be more honest and valid.
- ✓ A second strength is that questionnaires are quick and easy for that p
recruitment easier. In contrast, a person may be less willing to take p
attitudes towards mental illness. A greater number of participants im
findings.

Weaknesses:

- The sensitive nature of th ic eans that the participants may li en nswering in order to appear better (so ra ility bias). In a questionnaire it s orten easy to work out which is the ' ' or desirable answer. This would reduce the validity of the findings because the participants have been dishonest about their attitudes to mental illness.
- Participants may not want to write detailed information for the open question because it places a higher demand on the participant. This may mean that participants leave out this question or give incomplete answers, which will affect later analysis.



Some

Observation

Research scenario

How frequently are environmentally friendly behaviours performed in public?

*You are tasked with designing an observational study to investigate the frequen of performing an **environmentally friendly behaviour of your choice. The behaviour** investigated should be observed in a public place and you should conduct your observation covertly. Your observation needs to produce frequen data.*

Hint! Environmentally friendly behaviours could i[illegible] picking up litter, usin shopping bags or taking the bus.

Task chapter 5.2: [illegible] and conducting an observational study

Answer[illegible]estions below to help you write up your observational st scenario above. The questions should also help to guide you through th and give you an idea of the things you need to consider before beginnin

1. What is the aim of your investigation?

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2. What is your research question?

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3. What sampling technique did you choose and how many participa

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4. Which obs[illegible] method are you using (behavioural categories / or [illegible]ampling)? Describe how this will be achieved.

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5. Describe your materials.

6. Suggest one way you will try to account for ethical issues in your s

Hint! Observational research can have some serious ethical issues because p watched without their knowledge. What could you do about this?

7. In detail, describe the procedure of your study. You should includ else could replicate your study.

8. Display your results in an appropriate way (e.g. table, chart or gra

Hint! *Give your table, chart or graph a title so that the reader knows ex*

9. Using your results, suggest one possible conclusion. Does the conc

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10. Suggest an appropriate inferential test you could use on your findi
significance. Explain why it is an appropri[illegible]ice.

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11. Identify two strengths and two weaknesses of your study design a
affected your findings.

Strength 1: .....

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Strength 2: .....

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Weakness 1: .....

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Weakness 2: .....

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12. Suggest one way the study could be improved. Explain why it is a

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Hint! You can easily identify which areas need to be improved by looking at y
what changes you could make to ameliorate the weakness.

Guided example...

Here is a guided example of **one way** you could design and conduct your expe

1. **What is the aim of your investigation?**
   To investigate carrier bag usage in a supermarket.

2. **What is your research question?**
   How frequently do people reuse their own carrier bags as opposed to using new bags?

3. **What sampling technique did you choose and how many participants did you have?**
   An opportunity sample was used. The pa ici a ts were simply whoever used a checkout near t e s archer. A total of 42 participants were obse v d.

4. **Wh se a on method are you using (behavioural categories / co ames or time sampling or event sampling)? Describe how this will be achieved.**
   A behavioural categories method was used.
   The discrete categories were:
   - Used own bags
   - Used new carriers
   - Carried items by hand
   - Used a mixture of the other three methods

   Each time the behaviour was shown it was tallied in just one behavioura

5. **Describe your materials.**
   This tally chart has been designed to record the frequency of the behavio a separate column.

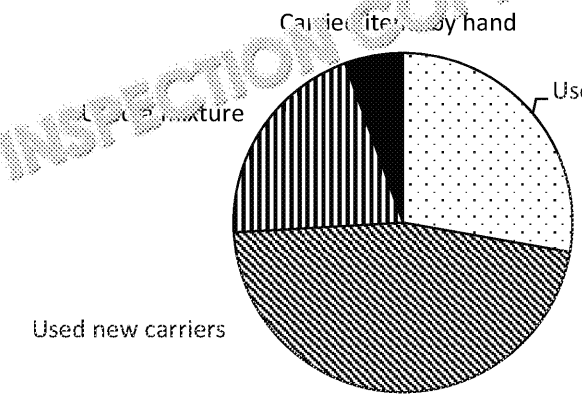
Frequency of behaviour		
Used own bags	Used new carriers	Carried items b

6. **Suggest one way you t ! try t account for ethical issues in your study.**
   Prior to the st d in place, a group of 10 people were asked how they obs th carrier bag usage. Out of this group, 9 out of 10 agreed th obs The tenth participant said they would be uncomfortable but a protect the environment would be beneficial.

7. **In detail, describe the procedure of your study. You should include enough could replicate your study.**
The researcher went to a popular local supermarket at 7pm on a Thursday researcher sat down on a bench in the waiting area at the end of the check researcher's viewpoint, three checkouts could be seen clearly. The researc these three checkouts. For the next hour, the recorder wrote a tally mark behavioural category for each shop. If shoppers were in a group, this only shop and one tally mark was recorded. After the hour, the researcher left

8. **Display your results in an appropriate way (e.g. table, chart or graph).**

A pie chart illustrating carrier bag usage



9. **Using your results, suggest one possible conclusion. Does the conclusion**
A relatively high frequency of new carrier bags are being used which sugg when shopping.

10. **Suggest an appropriate inferential test you could use on your findings to Explain why it is an appropriate choice.**
The findings could be analysed with chi-square. This is an appropriate tes independent measures and uses frequency data.

11. **Identify two strengths and two weaknesses of your study design and exp your findings.**

Strengths:

- ✓ The study used a covert approach which means that the behaviour st to be **natural and valid**.
- ✓ The findings have **important implications** because they show that a of people are still using new carrier bags.

Weaknesses:

- The findings may **not be generalisable** because only one supermarket investigated a particular time and day. It may be, for example, that more middle-class supermarkets are more environmentally
- The study captures frequency data which does not reveal anything a motivations of the shoppers. This **limits the usefulness of the resear** because we do not know if those who used their own bags have stro beliefs about protecting the environment.

12. **Suggest one way the study could be improved. Explain why it is an impr**
The study could be conducted on a wider scale and involve several super of the week. This would improve the generalisability of the research and replicable.

Experiment

Research scenario

Do energy drinks improve concentration?

You are tasked with designing and conducting an experiment to investigate whether consuming an energy drink will result in improved concentration. You should manipulate whether or not the participant has consumed an energy drink or not. You will need to design a measure of concentration that will produce quantitative data.

Task chapter 5.3: Designing and conducting an experiment

Answer the questions below to help you write up your experimental st
scenario above. The questions should also help to guide you through th
and give you an idea of things you need to consider before beginnin

1. Wh our research question?

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2. What are your experimental/alternate hypothesis and your null hy

Experimental/alternate hypothesis: .....

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Null hypothesis: .....

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Hint! Remember that you should refer to both your independent variable and types of hypothesis.

3. How are you going to operationalise your variables?

Independent variable: .....

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Dependent variable: .....

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4. How did you recruit your participants and how many were there?

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5. Were there any qualities your participants had to have or criteria th your study? Explain why.

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Hint! Think about how certain participants may respond differently due to a consumed.

6. What is your experimental design? What conditions were there an assigned to them?

Experimental design:.....

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The conditions were:.....

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Ass t:.....

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7. What materials/apparatus did you use? Describe them accurately.

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8. How will you uphold the ethical guidelines set out by the BPS?

Ethical issue	I will...
Informed consent	
Deception	
Right to withdraw	
Confidentiality	
Protection from harm	

9. In detail, describe the procedure of your study. You should includ
else could replicate your study.

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10. How will you score your measure of concentration?

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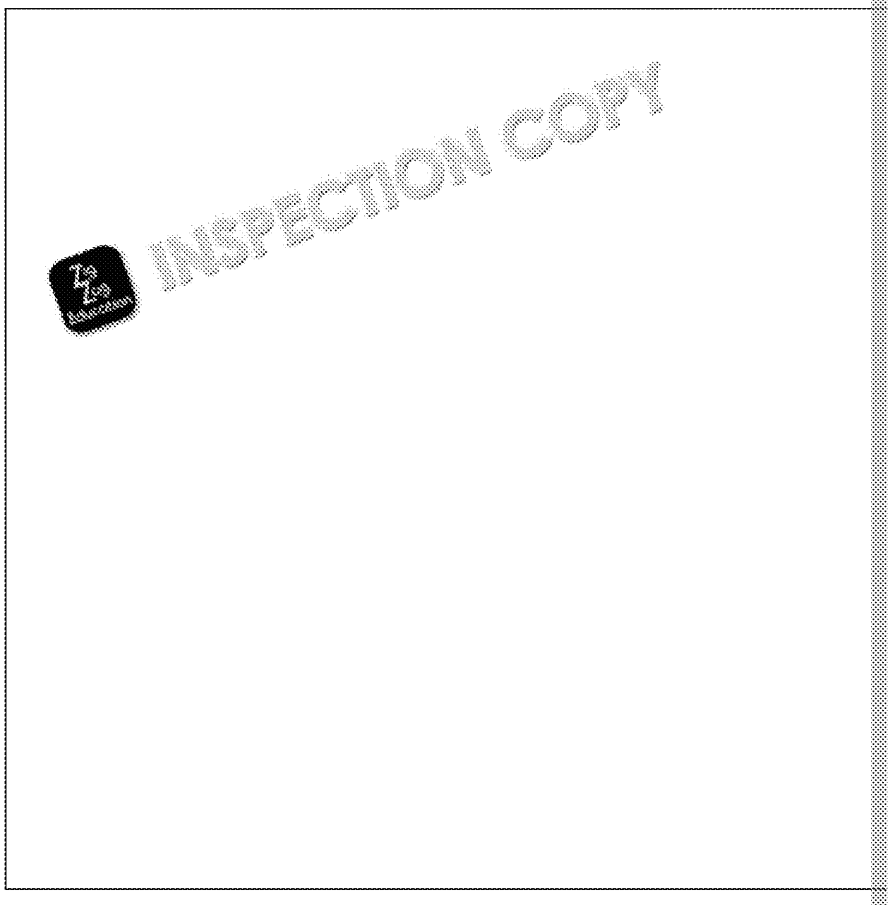
11. Display your results in an appropriate way (e.g. table, chart or gra



12. Using your results, suggest one possible conclusion. Does the con

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13. Su n ppropriate inferential test you could use on your findi
sig ce. Explain why it is an appropriate choice.

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14. Identify two strengths and two weaknesses of your study design a
affected your findings.

Strength 1: .....

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Strength 2: .....

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Weakness 1: .....

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Weakness 2: .....

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Hint! Try to choose only the most important weaknes s, he ones that woul

15. Suggest one way the t udy could be improved. Explain why it is a

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Guided example...

Here is a guided example of **one way** you could design and conduct your expe

1. **What is your research question?**
   Does drinking energy drinks improve concentration?

2. **What are your experimental/alternate hypothesis and your null hypoth**

   Experimental/alternate hypothesis: Participants who drink an energy dr
   measure of concentration, in comparison to control participants who did

   Null hypothesis: There will be no effect of drinking an energy drink on th

Note: Our experimental hypothesis is one-tail d (directional). To choose a on
good reason to believe that the study w s ow this effect. Energy drinks use
System (CNS) stimulant. CNS stim l nts increase the activity of the brain, incl
reasonable to assu h t energy drinks should increase concentration.

3. **How ou going to operationalise your variables?**

   Independent variable: Our IV is whether or not participants have consumed an energy drink. We will use the same brand of energy drink and the same amount of drink (500 ml can). This prevents differences being due to caffeine and sugar content.

   Dependent variable: Our dependent variable will be our concentration score. We are going to measure concentration in a task where participants listen to an audio track and count the number of times the speaker uses the letter 't'.

4. **How did you recruit your participants and how many were there?**
   The participants were volunteer/self-selecting. Fliers were placed on no
   local area. In total there were 12 participants.

5. **Were there any qualities your participants had to have or criteria that w study? Explain why.**
   - ✓ **All participants had to be over 18**: for ethical reasons it is easier to
     provide informed consent.
   - ✓ **English must be their first language**: the ability to quickly process la
     knowledge of English spelling is necessary for the concentration task
   - ✓ **They should not have a disorder related to language** (e.g. dyslexia)
     language processing and affect spelling may f t the participant's
     task.
   - ✓ **They should not have a di r th known concentration proble**
     have pre-existing p ble with concentration could confuse the re
     their disor d t the effects of energy drinks on concentration
   - ✓ **sh ld not take part if consuming an energy drink could be d**
     high blood pressure): in order to protect participants from harm
     from participating.
   - ✓ **They should be excluded if their hearing is impaired:** due to the au
     task it is important that the participant can hear the speaker on the

6. **What is your experimental design? What conditions were there and ho to them?**

Experimental design: Independent measures design
The conditions were: Complete concentration task (control), consume an energy drink and then complete concentration task (experimental condition).

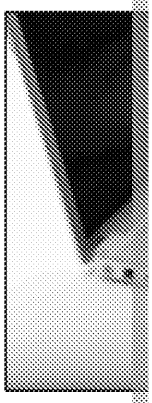
Assignment: Participants were randomly assigned to the conditions. All the names of people who had agreed to participate were placed in a hat. The first five participants were placed in the experimental condition and the remaining five in the control condition.

7. **What materials/apparatus did you use? D[illegible] them accurately.**

Energy drinks
A can of energy drink [illegible] per participant in the experimental condi
Each can was 5[illegible]

Aud[illegible]rdings
Trial audio transcript: *On this day, fifty years ago, the town hall was built. It was opened by the local mayor and quite a crowd showed up to watch.*

Experimental audio transcript: *For the newspapers in the local villages it was a front-page story. Now, of course, there are developments happening all across the town as a result of increased funding. You would hardly recognise that it was the same place if you looked at old photographs; that much has changed. Some of the older residents have argued that there is no sense of community anymore. Others have pointed out that the improvements have brought new life into the area.*



It is important recording differences in h

The audio recordings were played through headphones connected to a l

Tally chart
Participants recorded the number of 't's they heard on a tally chart on pa

Instructions: *Use this tally chart to record the number of times the speak*

	Tally
Trial run	
Actual recording	

Note: Your materials should be carefully described so that another rese exactly.

8. **How will you uphold the ethical guidelines set out by the BPS?**

Informed consent: Participants will be informed of all important informa consuming an energy drink and that they will take part in an audio task) at the end of the study via a debrief form.

Deception: There is no strong use of deception in this study. Participants will find out the complete nature of the study in the debrief form.

Right to withdraw: Participants will be told that they can leave the study at any time and reminded that their data can be destroyed at the end of the study.

Confidentiality: Participants will be informed of their confidentiality. No names were [illegible] during the study and the participant's data is [illegible] enough for them to be identified by it.

Pro[illegible] from harm: Participants who have health conditions that may [illegible] been excluded from the study. No psychological harm is expected.

9. **In detail, describe the procedure of your study. You should include enou could replicate your study.**

Participants were given a participant information sheet which described that would require them to listen to an audio recording. If the participan information sheet would also mention the need to consume an energy d the information provided they signed a consent form. Participants were and that all information they provided was confidential.

Participants in the experimental condition were given a 500 ml can of en had 15 minutes to consume the energy drink. There was then a waiting energy drink was finished before the experiment started. Participants in immediately. All participants were given a tally chart to record their resu

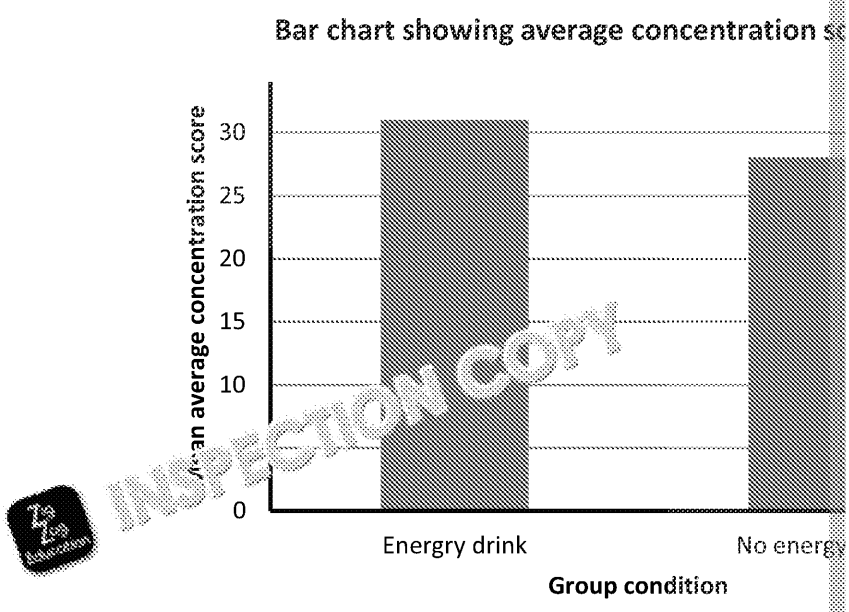
All participants were read aloud the following instructions:
In a moment we will begin. An audio recording will be played and you must listen to it carefully. Every time the speaker uses the letter 't' you should jot this down on the tally chart you have been provided with. Some words may contain more than one letter 't'; you should aim to record every time the letter 't' is used. We will begin with a trial run to check that you understand the procedure. A short audio recording will be played and you should jot down the letter 't' each time it is spoken. Afterwards, I will check that you understood the procedure and you will then listen to the real audio recording. The recordings will only be played once, please note down any 't's you hear the first time the recording is played.

Participants [illegible] the trial and then the researcher verbally checked und[illegible] the task they had just completed. The participants did not ne[illegible] num[illegible] 't's to move on to the real audio recording. The real audio rec participants counted the number of 't's they heard and recorded this dow

Participants were thanked for their time and given a debrief sheet. The nature of the study. They were informed that they could have their findi to withdraw).

10. **How will you score your measure of concentration?**
The total number of 't's in the text is 34. The maximum score is 34. For score will be reduced by 1. The minimum score is 0.

11. **Display your results in an appropriate way (e.g. table, chart or graph).**
The mean averages were calculated and displayed in the bar chart below



12. **Using your results, suggest one possible conclusion. Does the conclusio**
On average, those who drank an energy drink had higher concentration s
supports our hypothesis that energy drinks improve concentration.

13. **Suggest an appropriate inferential test you could use on your findings t**
Explain why it is an appropriate choice.
Our findings could be analysed using the Mann–Whitney U test. This tes
whether the difference between two groups is significant. It is a non-par
distribution does not have to be normal which is an advantage as we hav
distribution is normal.

14. **Identify two strengths and two weaknesses of your study design and ex**
your findings.

Strengths:
- ✓ The study is **well standardised** which means that participants were exposed to the same experimental conditions which reduces the impact of other variables.
- ✓ The study is **replicable** and other researchers can easily repeat the study to assess the reliability of the findings.

Weaknesses:
- – The study used an **arbitrary task** to measure concentration: people do not typically have to count the number of t's in an audio recording. The findings may not tell us about real situations where it is important to concentrate, e.g. while studying or
- – The findings might be **alternatively explained** by differences in the original level of tiredness in participants. The control participants may have been more tired and this led to a difference be

15. **Suggest one way the study design could be improved. Explain why it is**
Our study could be improved by using a more meaningful measure of co
for a test, and then having the participants complete the test as a measu

.....

Correlation

Research scenario

Is there a relationship between self-rated aggression and height?

You are tasked with designing a correlational study to investigate whether there is a relationship between height and self-rated aggression. Your hypothesis/prediction should be two-tailed (non-directional) due to the absence of research in this area. Your project should use a questionnaire design and your questionnaire should consist of at least five questions. The questions should be closed in order to provide quantitative data.

Task chapter 5.4: Designing and conducting a correlational study

Answer the questions below to help you write up your correlational study scenario. The questions should also help to guide you through the and give you an idea of the things you need to consider before beginning

1. What is your research question?

.....

.....

.....

2. What are your alternate hypothesis/prediction and your null hypothesis?

Alternate hypothesis/prediction: .....

.....

.....

Null hypothesis: .....

.....

.....

3. How did you recruit your participants and how many were there?

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4. Were there any qualities your participants had to have or criteria th
your study? Explain why.

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5. What factors did you consider wh[illegible] writing your questionnaire?

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Hint! For question 5, try to put yourself in the shoes of your participant. Wou
questions shock them? Will they answer differently if the question is phrased

6. Write your questionnaire here:

7. Did you use any other materials/apparatus? If so, describe them.

.....

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8. How will you uphold the ethical guidelines set out by the BPS?

Ethical issue	How...
Informed consent	
Deception	
Right to withdraw	
Confidentiality	
Protection from harm	

9. In detail, describe the procedure of your study. You should include else could replicate your study.

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10. How will you score your self-report measure of aggression?

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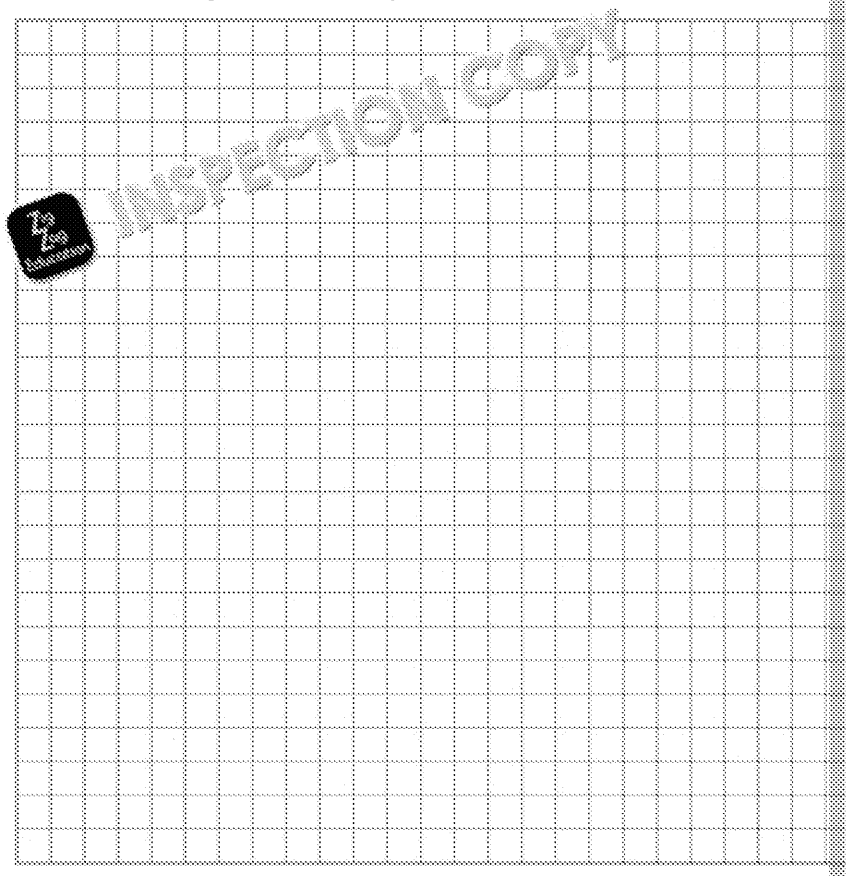
11. Draw a scatter diagram to show your correlation:



Hint! Don't forget to give your scatter diagram a title and axes titles. Your ax
your scores.

12. Describe the direction and strength of the correlation. Does it supp

.....

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13. Suggest an appropriate inferential test you could use on your findi
significance. Explain why it is an appropriate choice.

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14. Identify two strengths and two weaknesses of your study design a
affected your findings.

Strength 1: .....

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Strength 2: .....

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Weakness 1: .....

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Weakness 2: .....

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15. Suggest one possible implication of the findings.

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Guided example...

Here is a guided example of **one way** you could design and conduct your corr

1. **What is your research question?**
   Is there a relationship between height and self-rated aggression?

2. **What are your alternate hypothesis/prediction and your null hypothesis**

   Alternate hypothesis prediction: There will be a correlation between hei

   Note: When forming our alternate hypothesis, we have to decide whet
   non-directional. There has been little researc[illegible] o[illegible] he relationship bet
   Some research has focused on our p[illegible]ys[illegible]cal [illegible]ts, for example, previous
   width-to-height ratio was r[illegible]l[illegible]te[illegible]d [illegible]ggression. This suggests that there
   between physical tra[illegible]s[illegible]uc[illegible]s height, and aggression. However, there
   to state the d[illegible]r[illegible]ction of the correlation. We don't know if shorter peop
   ta[illegible]op[illegible] might be more aggressive.

   Null hypothesis: There will be no relationship between height and self-ra

3. **How did you recruit your participants and how many were there?**
   An **opportunity sample** was used. An opportunity sample is often the ea
   not expect the topic we are studying to vary within the population.
   Ten participants

4. **Were there any qualities your participants had to have or criteria that w**
   study? Explain why.
   In choosing our participants, we have chosen three important criteria:
   - ✓ **Participants are all males**: Some past research has found that differe
     females aggress and/or their levels of aggression. Therefore, this st
     the potential confounding variable of gender on our results.
   - ✓ **Participants have not been diagnosed with a disorder that is associ**
     (e.g. antisocial personality disorder, autism, substance-related disor
     disorder with a known connection to aggression this could be a cont
     aggression scores may be the result of the disorder rather than heig
   - ✓ **Participants must be over 18**: Participants younger than 18 require p
     consideration because they are a vulnerable group. For this reason, w
     participants. Additionally, it is likely that children and teenagers agg
     physical playing could be confused with a[illegible]gr[illegible]ssion. Finally, at age 18
     their maximum height. This may be [illegible]m[illegible] important biological ma
     changing, height of a chi[illegible]d [illegible]t [illegible]nger.

5. **What factors did you consider when writing your questionnaire?**
Considerations when we designed our questionnaire:

- **Number of questions**: 10 questions can provide us with detail on ou topic, but it is not so long that people lose interest and choose rand
- **Likert scale**: Likert scales provide more detail than yes/no questions people are more likely to say that they have 'rarely' or 'sometimes' aggressively than 'yes' they have.
- **Considered variety of different types of aggression**: Aggression is n physical and we accounted for different types of aggressive behavio physical, verbal and indirect) by having questions that target each ty
- **Specified time frame**: A week is not so long th people might forge their aggressive behaviour but long e gh at some aggression m occurred.

6. **Write your quest re:**
Inst ns ch question tick the option that best describes your b resp are confidential and it will not be possible to identify you from

	In the last 7 days I have:	Never	Rarely	Som
1	Physically hurt someone with the intent to harm them (e.g. slapping, pushing)	○	○	
2	Deliberately caused physical injury to someone (e.g. bruising, cuts)	○	○	
3	Verbally threatened someone with violence	○	○	
4	Verbally threatened someone with damage to their reputation	○	○	
5	Called someone names or harshly teased them with the aim of hurting them	○	○	
6	Used sarcasm to ridicule someone	○	○	
7	Deliberately ignored or excluded someone		○	
8	Spread malicious r mors/stories about some	○	○	
9	ouraged others to dislike someone	○	○	
10	Encouraged others to ignore or exclude someone	○	○	
11	How tall are you?			

7. **Did you use any other materials/apparatus? If so, describe them.**
No other materials/apparatus. If a participant did not know their height was not necessary.

8. **How will you uphold the ethical guidelines set out by the BPS?**
   - ✓ **Informed consent:** Participants will be given general information about the study and that it involves filling in a questionnaire about aggression. More detailed information will be provided afterwards that will inform the participants of the full nature of the study.
   - ✓ **Deception:** Extreme forms of deception will not be used. Participants will be given general information about the study and that it involves filling in a questionnaire about aggression. More detailed information will be provided afterwards that informs participants about the true nature of the study.
   - ✓ **Right to withdraw:** Participants will be told they have the right to withdraw before taking part in the study and will be provided at the end of the study that they can have their results destroyed at the end.
   - ✓ **Confidentiality:** The questionnaire will not contain any identifying information such as the names or addresses of participants. The questions themselves are not specific enough to identify the participants.
   - ✓ **Protection from harm:** Aggression is a sensitive topic and it is possible painful memories of either being the victim of aggression or hurting are reminded that they can leave at any time and have their results experience distress, a follow-up can be arranged to check that no lo

9. **In detail, describe the procedure of your study. You should include enough could replicate your study.**
Participants were provided with a participant information sheet that info interested in aggression and they would need to answer a questionnaire information then they signed a confirmation form. They are informed th confidential and that they have the right to withdraw at any time.

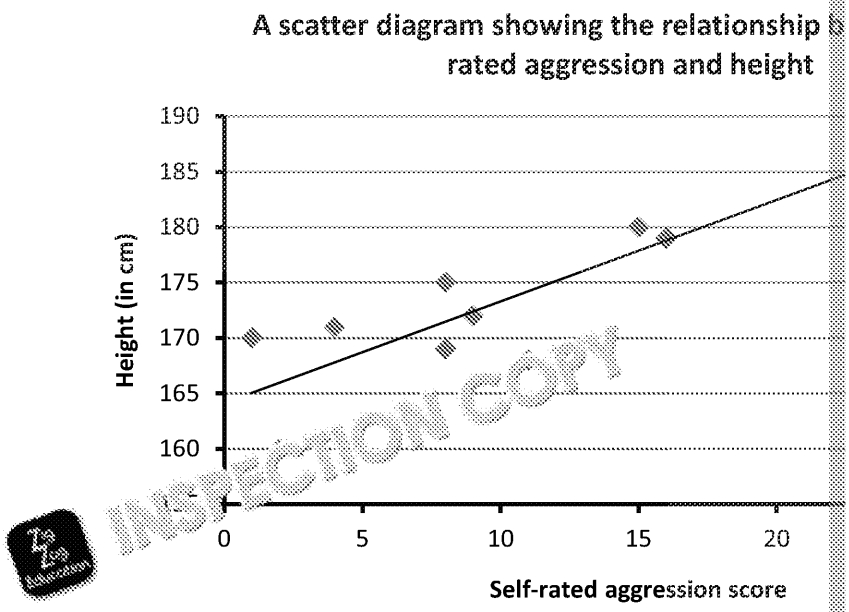
The participants were given the questionnaire and asked to complete ev time limit but all participants took less than five minutes to complete it. back to the researcher.

Participants were thanked for their time and given a debrief form that ex investigating the relationship between self-reported aggression and height. have their findings destroyed if they wish.

10. **How will you score the self-report measure of aggression?**
A response of never will receive a score of 0, rarely 1, etc. A score of 0 w no self-reported aggression, whereas a score of 40 will be the maximum

(Also, all heights will be converted into the nearest whole centimetre so

11. **Draw a scatter diagram to show your correlation:**



12. **Describe the direction and strength of the correlation. Does it support y**
The scatter diagram shows a moderate to strong positive correlation whi
being a relationship between self-rated aggression and height.

13. **Suggest an appropriate inferential test you could use on your findings to
Explain why it is an appropriate choice.**
We could use Spearman's rho to analyse our results as this test measures
correlations. Our data meets the requirements of being ordinal or interv

14. **Identify two strengths and two weaknesses of your study design and ex
your findings.**

Strengths:

- ✓ The study may be affected by **social desirability bias** because aggres
This would result in lower self-rated aggression scores as people do
aggression.
- ✓ All participants answered the same questions (**standardised**). This m
analyse the data.

Weaknesses:

- – This study only used men which **limits the gener lisability** of the find
generalised to women and there may be no relationship between he
women.
- – The study is **retrospective** – it relies on the participant accurately re
Research has found that memories are not always accurate.

15. **Sug e possible implication of the findings.**
Our research adds to the growing body of evidence that suggests that
aggression is related to biology. This has important implications for our
criminal justice system which views aggression as choice.

Practice question

Q1. You have been asked to investigate whether the colour of paper
on affects performance on the test.

Explain how you would conduct an experiment to study if the c
or not. As part of your explanation, you need to justify your de

You need to refer to:

- laboratory or field
- your choic
- factors you would control

U your own experience of conducting an experiment to assist

* A Level practice questions

A researcher conducted an experiment into the effect of small amounts
times. Reaction times were assessed using a computerised task. Partic
button when they saw a triangle, but not any other shape. The comput
participants to press the button.

Thirty participants were randomly allocated into two conditions. Cond
drank 2 units of alcohol, 20 minutes before the study. Condition B: The
drank a similar tasting drink with no alcohol. Both conditions complet

He presented some of his findings in this tabl

	Mean reaction time (in milliseconds)	Median reaction tim (in milliseconds)
Co n A l	986.1	990
Condition B: No alcohol	754.5	700

Q1. Identify two findings from the table. (2 marks)

Q2. Explain why a table is appropriate for presenting this data. (2 m

Q3. Name and briefly describe the study's experimental design. (2 m

Q4. Explain how the researcher could have randomly allocated his p
condition. (2 marks)

Q5. Identify three ethical issues that should be considered when con

Q6. The researcher analysed his data using the Mann–Whitney U te
choosing this test with reference to his investigation. (4 marks)

Q7. The Mann–Whitney U test gave an observed value of 70.

Levels of signi ce for a one-tailed t

Sig l level	0.05	0.025	
ical value	72	64	

he critical values above, explain whether or not the psyc
significant. (4 marks)

Q8. Outline each of the features of science below and state how they
experiment into reaction times.

a) Cause and effect. (3 marks)
b) Manipulation of variables. (3 marks)

Q9. Explain how you would conduct an observation into the differe
school library compared to a public library. As part of your exp
design choices.

You need to refer to:

- participant or non-participant observation
- structured or unstructured observation
- event or time sampling
- method of collecting data

Use your own experience of conducting an experiment to assist y

Chapter 1

Check your understanding! Experiments

Q1. A quasi-experiment uses a naturally occurring independent variable, while a field variable (1).

1 mark for relevant difference, full explanation not required but it should be clea

Q2. The results of a study are partly the product of their environment and an artifici (1). This means that the findings may suffer from low mundane realism and the real-life settings (1).

2 marks for explanation, ref... artificial environment

Q3. Operationalisation of the variables concerns the precise way the variables are d This can lead to demand characteristics if the way the variables are operationali experiments of the experiment (1). For example, a participant may think that it people give an obviously wrong answer and assume that the researcher is intere wrong answer, which leads them to alter their response (1).

3 marks for explanation, must include reference to operationalisation and dema

Q4. Investigating this type of variation can be useful as it allows us to investigate are manipulate (1). For example, to study whether bullying affects the bullied child's manipulate whether or not the child is bullied, but not unethical to compare the who has not experienced bullying (1). This allows the researcher to surpass the and practicality and study areas that otherwise would not be researched (1).

1 mark for identification
2 marks for explanation

Q5. One ethical implication of field studies is the lack of informed consent (1). Field not aware they are taking part in the study and so have not agreed to take part individuals may feel that their right to privacy is being invaded (1).

1 mark for identifying, relevant to field study
2 marks for explanation

Check your understanding! Observation

Q1. Possible differences:

- Controlled observations are standardised and, therefore, replicable, natura non-replicable
- Controlled observations have higher internal validity as there are fewer ext the behaviour
- Controlled observations may be more likely to suffer from demand charact person is being observed
- Naturalistic observations have higher mundane realism as they are based o observations involve artificial settings

2 marks for two of the above or other valid differences, may require minor elabo score a mark)

Q2. Possible differences:

- Covert observation allows the study of almost all groups, overt is limited to
- Covert observation requires greater planning and time as the researcher m
- Covert observation is more unethical as the subjects are being deceived; th
- Overt observation suffers more from observer effect as the person or grou covert observation they are likely unaware
- Overt observation encourages trust; covert observation can result in distru being studied

2 marks for two of the above or other valid differences, may require minor elabo a mark)

Q3. Non-participant observation is when the researcher m ns a distance from t and spends little or no time interacting with th (1) articipant observation i and interacting with the person or pers th e observing (1).

1 mark per short defi

Q4. Cov erv on may be regarded as unethical because subjects do not know have ovided informed consent agreeing to take part in the research and h (1). This may be particularly problematic when the individual would be likely to being observed in a situation when they do not expect to be observed and woul embarrassment if they found out they were observed (1). However, covert obse example, if the subject expects to be observed (e.g. in a public place), then the a they have been observed should be minimal (1).

Marks: Identification of covert observation as unethical; good use of terms infor withdrawal and explanation of their significance; could use specific examples of observed

Q5. Participant observation may not be an accurate reflection of how participants n part of the environment (1). For example, DeWalt and DeWalt (2002) found tha dependent on gender, which suggests that the researcher may have access to o depending on their gender (1). Additionally, there is the problem that the resea they are fully immersed in a group (1). The researcher may start to consider the rather than as an outsider and may not report or interpret events objectively (1) information collected (1), for example, a behaviour that might be fairly normal w outside of the group may not be identified (1).

1 mark per identification of limitation (up to 2) (e.g. time-consuming, difficult to observer may affect information available, ethical implications of covert observa will successfully become part of the group)

4 marks for further explanation of these factors (ideally 2 marks per factor)

Q6. Covert observation can be beneficial as it allows you to study groups that would overt observation due to the closed nature of the group (1). For example, politi outside of the media in case the researcher observes them behaving poorly (1). planning and time to integrate into groups, especially the groups that are typica worthwhile as there is a reduced effect of the observer being present, which me naturally, leading to greater accuracy of the findings (1).

4 marks for evaluation, possible points include: Lack of consent, requires planni contribute to general feelings of distrust towards psychology profession, can gai likely to be accurate

Q7. One advantage of controlled observations over naturalistic observations is that t This means that there are fewer extraneous variables which could interfere with rather than the causal agent (1). The advantage of fewer extraneous variables is higher level of internal validity (1). This means that in a controlled observation, result of the causal agent rather than a confounding variable (1). A further adva observations are standardised, it allows the observation to be replicated (1). Th repeat the experiment and then compare the results which is not possible in na

6 m consideration of the advantages of controlled observation over a na inclu greater control reduces influence of extraneous variables, the exact sam times to test reliability of findings, high internal validity due to reduced extraneo

Check your understanding! Correlations

Q1. A perfect correlation is when you can predict the result of one variable from ano

1 mark for definition

Q2. Three things:

- It is a negative correlation
- It is a moderately strong correlation
- There is a relationship between these variables

1 mark for each

Q3. One difference between correlations and causations is the extent to which we c independent variable (1). In correlational data it is impossible to attribute causa extraneous variables, whereas in an experimental design the opposite is true (1

1 mark for identify, 1 mark for explain

Q4. One advantage of self-report techniques is that they are inexpensive for the res data from a much larger sample of participants than they would be able to affor A large sample of participants makes the findings more generalisable to the pop

1 mark identification, 2 marks explanation

Q5. You cannot establish causation from a correlation because a correlation does no variable (1). Therefore, without a be any causing the change it cannot be sa (1). Furthermore, correlational research does not control for extraneous variabl of the research (1). For example, when examining the effects of anxiety and the you are controlling for other variables that may affect health (1).

4 marks for consideration of whether causation can be established from a correl suggests a relationship, no manipulation of independent variable, no control of t another variable (extraneous or confounding variable)

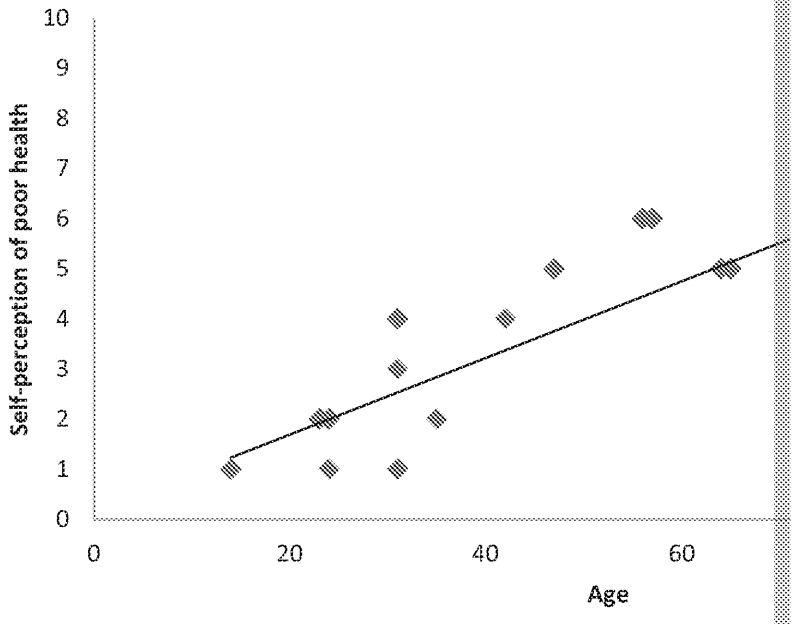
Q6. One advantage of correlational analysis is that it allows researchers to identify n correlational analysis, the relationships between many different variables would research and understanding (1). Identification of new relationships can provide research that can try to establish cause and effect (1). One disadvantage of corr how honest people are on self-report measures (1). Participants may be likely t avoid being perceived negatively (social desirability bias) and this is particularly sensitive nature (1). This can lead to distorted results which means that the con may also be incorrect (1).

1 mark for identifying an advantage (e.g. natural setting produces results that a technique is quicker and easier than experiments, identification of new relations relationships, leads to new research)
2 marks for explanation of this advantage
1 mark for identifying a disadvantage (e.g. difficult to establish direction of the r effect, self-report techniques are open to social desirability bias).
2 marks for explanation of this disadvantage

Q7. **a)** A strong positive correlation (1)

b) Look for both outliers

The relationship between age and self-perceptio



c) Causation cannot be established (1), for example, it may be that relationsh self-perception of poor health are integrated (1)

Practice questions (possible answers)

Question	Answer	Marks	Guidance
1. a)	**Outline what is meant by a structured observation** 1 mark for knowledge that a structured observation decides on behavioural categories / coding frames 1 mark for knowledge that a structured observation typically produces quantitative data / frequency data Credit other relevant responses.	2 2 AO1	
b)	**Explain why the investigation into hand-raising is an example of a structured observation** 1 mark for identifying that the researcher is counting the number of times she sees a specific behaviour; hand-raising 1 mark for explaining that the researcher is not freely looking at any other behaviours even if they are relevant to her investigation Credit other relevant responses.	2 2 AO2	
2.	**The psychologist used covert observation to collect data** **Describe how overt observation differs from covert observation** **AO1 – 2 marks** Students must show understanding and knowledge of both overt and covert observations. 1 mark for knowing that covert observations use deception to learn about behaviour without the participants' knowledge 1 mark for knowing the overt observations involve making the participants aware of what they are doing and asking for consent **AO3 – 1 mark** 1 mark for distinction which is typically evaluative, e.g. covert observation is likely to produce more valid responses than overt observation Credit other relevant points	3 2 AO1 1 AO3	Marks are not awarded for identifying implicit opposites
3. a)	**Describe one strength of using naturalistic observation in this study** 1 AO1 mark for explaining one strength of a naturalistic observation 1 AO2 mark for explaining the strength in the context of the study 1 AO2 mark for relating the strength to the context of the study e.g. One strength is that participants are likely to behave naturally (1) because this is their normal environment (1) and therefore the children are likely to raise their hands as they normally would giving the psychologists a valid measure of hand-raising (1)	3 1 AO1 2 AO2	If more than one strength is written about then use the strength that awards the highest marks

Chapter 2

Check your understanding!

Q1. The question suggests that the person might feel angry which might lead the pe
been angry (1); instead it could be reworded as 'How did that kind of treatment

1 mark for suggestion of leading question / not being neutral
1 mark for altering the question but still asking for the same / similar response

Q2. One advantage of Likert scales is that the results are easy to analyse (1). For exa
through to 'never', it is easy to work out the percentage of people who 'always'
compares to other answers (1). Easy analysis reduces the effort for the research
greater number of participants which increases the generalisability of the result

*1 mark for identification of an advantage of Likert scales (e.g. ease of analysis, p
complete, reduced effort required or the part of the participant – in comparison
2 marks for further elaboration of the advantage*

Q3. Possible differences include:

- Different types of information (1)
- Closed questions are much easier to analyse (1)
- Open questions take much longer (and more effort) to respond to (1)

1 mark for each of any of the above, or other correct differences – minor elabora

Q4. Possible differences include:

- The style of the interview is different: Structured is more formal, unstructure
- Unstructured interview is flexible and questions can be generated spontan
  set of questions (1)
- Structured interview is replicable as the questions and order are the same,
  each case (1)

1 mark for each of any of the above, or other correct differences – minor elabora

Q5. 'Did you find the meeting useful or a waste of time?' (1) 'How did you find the m

1 mark for any correct closed question, 1 mark for rewording question in a way t

Q6. One factor that should be considered is whether you want to take a structured o
interviewing (1). This should be considered as it changes the style of the intervie
formal style, whereas unstructured uses a more conversational and relaxed styl
sensitive; the interviewee may feel more comfortable talking when the situation
tone that they are not being judged, which allows them to provide more inform
considered is the wording of the questions used in the interview (1). For examp
avoid leading the interviewee to a particular answer (1). This is important as lea
the participants' responses, which results in poor validity (1).

*1 mark for each factor considered (up to 2) e.g. question order and type of re
encourage detail, neutral au... more accurate information, it should be
questions should be ... ately, questions should be worded carefully*

4 m... fu...er explanation of these factors (ideally 2 marks per factor)

Q7. One limitation of structured interviews is that the technique is inflexible as it use researcher is unable to ask follow-up questions for clarification or to develop the important as the researcher is not in control over the quality or quantity of the r opportunity to respond to the answers given and ask follow-up questions (1). A style of the approach does not develop a sense of rapport between the intervie shows a sense of mutual understanding between the two individuals and encou communication (1). A lack of rapport is a limitation as the interviewee may be u feel that the interviewer may not empathise with them and this reduces the qua

1 mark for each limitation identified (up to two) (e.g. follow-up questions cannot to get across what they truly want to, questions have to be designed carefully, ra of information, avoids possible accidental interviewer bias

4 marks for further explanation of these limitations (ideally 2 marks per factor)

Q8. One strength of the questionnaire technique is that the questions are standardi questions are exactly the same and follow the same order in every questionnair for responses to be collected and the answers easily compared, and makes the the conclusions drawn from (1). A second strength is that a large amount amount of time (1). Once the questionnaire has been designed, it can be sent to is not limited by the amount of time the researcher has as they do not need to b questionnaires a more time-efficient and less expensive option than interviews researcher does not need to be present (1).

1 mark for each strength identified (up to two) (e.g. large amount of data can be interviews and experiments, easier to recruit participants (as compared to interv which allows for repetition and testing reliability)

4 marks for further explanation of these strengths (ideally 2 marks per factor)

Practice questions (possible answers)

Question	Answer	Marks	Guidance
1	**The researcher's hypothesis predicted a significant positive correlation. By referring to the scenario, explain what the researcher was expecting his results to show.** **AO1 – 1 mark** 1 mark for showing understanding of the concept of a positive correlation, for example, that as one variable increases, the other also increases. **AO2 – 1 mark** 1 mark for applying the concept to this particular scenario. An example of a 2 mark answer: The researcher expected that participants with a high score on their fruit and vegetable consumption (1), would have a high score on their attitudes towards exercise (1) questionnaire.	2 1 AO1 1 AO2	If the answer has been related to the study, but is not clear, then restrict to 1 mark.
2	**Write a Likert scale question that could have been used to assess attitudes towards exercise.** 1 mark for a realistic example of a Likert scale question that could be used to study attitudes towards exercise. e.g. Exercise is a necessary part of life. Do you: *Strongly disagree* — *Disagree* — *Neutral* — *Agree* — *Strongly agree*	1 1 AO2	The answer should be marked based on the structure (a Likert scale) rather than accuracy of the content. However, the answer should be clearly related to studying attitudes towards exercise.
3 a)	**Describe one strength of using a questionnaire to study attitudes towards exercise.** 1 AO1 mark for explaining one strength of a questionnaire 1 AO2 mark for explaining the strength in the context of studying attitudes towards exercise 1 AO2 mark for relating the strength to studying attitudes towards exercise	3 1 AO1 2 AO2	If more than one strength is written about then use the strength that awards

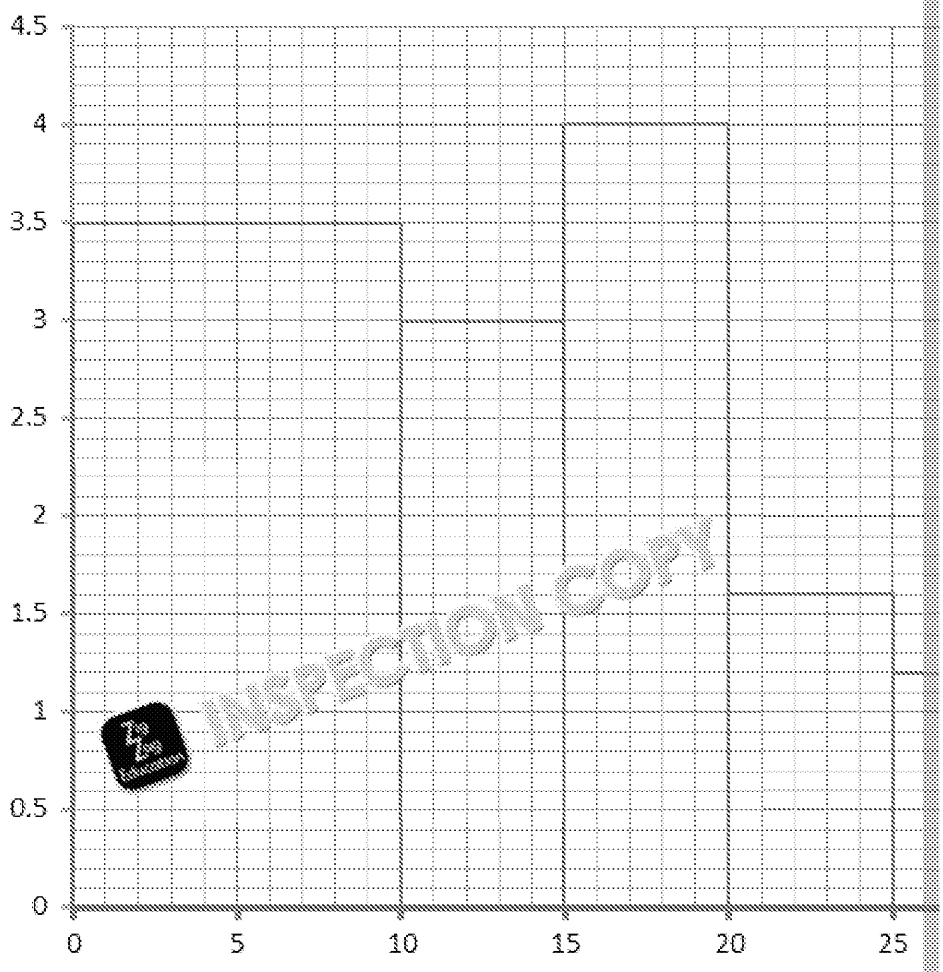
Chapter 3

Task 3.1: True or false
Identify if the statement is true or false

Statement
Secondary data is useful because the researcher gets exactly what they need witho the work
A meta-analysis collects a lot of other research and then reviews it for its advantag disadvantages
Questionnaires can collect both quantitative and qualitative data
Researchers cannot always find all the participants they need to conduct research primary data
When qualitative research is analysed carefully it is objective
One problem with meta-analyses is that the researcher cannot control for the qual research
Qualitative data tends to produce rich in-depth information about a particular topi
Quantitative data is easier to analyse than qualitative data
Case studies often integrate different methods of qualitative data
Secondary data can reduce the time spent researching
Open-ended questions include the use of scales

Task 3.2: Working out frequencies using a histogram
Frequency = 3

Task 3.3: Draw a histogram



Check your understanding! Raw data

Q1. Example table:

Condition 1: Calming music		C
Participant number	Time (in minutes)	Participant nu
1		3
2		4

Q2.

Participant number	Time in milliseconds
1	3258
2	1985
3	2495
4	3921
5	1240

Q3.

	Population
City 1	428,100
City 2	341,000
City 3	1,101,000

Check your understanding! Levels and types of data

Q1. In interval level data the scale is equally spaced, whereas in ordinal level data th

1 mark for identification of difference, typically a comment on the distance betw

Q2. Possible differences include:

- Quantitative data is numerical, qualitative data is descriptive
- Quantitative data is easier to analyse
- Qualitative data can require more effort on the part of the participant
- Quantitative data is objective, qualitative data is subjective
- Quantitative data may not reflect what the participant truly wants to say

2 marks for two relevant points

Q3. To obtain qualitative data from an observation an observer might make general see (1). In contrast, to obtain quantitative data the observer may precisely defi checklist and count the frequency of behaviours (1).

1 mark per type

Q4. One advantage of quantitative data is that it is objective (1). Numerical data ca experimenter's bias and statistical analysis clearly identifies whether the result i

1 mark identify, 1 mark explain

Q5. One advantage of qualitative data is tha[illegible]es rich descriptions of the top to gain insight that they may h[illegible]t been privy to had they used more focused

1 mark identif[illegible]e, explain

Q6. Prim[illegible]a is data collected for a specific purpose and by the researcher using seco[illegible]y data, where the researcher uses data collected by someone else for t

1 mark for providing each separate definition (total up to 2), or 1 mark for each (total up to 2)

Q7. A meta-analysis collects data from several studies and analyses the results to se studies (1). It is a type of secondary data because it uses the figures developed researching its own figures (1).

2 marks for short explanation, can include definition or short example

Check your understanding! Descriptive statistics

Q1. Hot:
Mean = 66.3
Median = 63.5
Mode = 63
Range = 29

Cold:
Mean = 60.4
Median = 58.5
Mode = 60
Range = 39.0

The mean of the cold room was slightly lower (60.4 vs 66.3, than the mean of th
room encourages faster completion. However the range is much greater in the
that the mean in the cold room is affected by outliers.

Q2. Mean = 60.2
Me 0
Mo
Range = 64

Both the mean and the median average are approximately 60%, suggesting that
However, a very large range of 64 suggests that there is considerable variation i
that some of the students would benefit from extra help and others would not.
needed, where certain students are offered extra help.

Q3. Mean = 2.7
Median = 3
Mode = 1
Range = 4

The mean average is 2.7 suggesting that people agree with free will more than t
indicates that the most common attitude towards free will is that they 'complet
that people have a tendency to agree with free will.

Q4.

Response	Number of responders	Percent
Male	70	46.7%
Female	67	44.7%
Did not answer	13	8.7%

Q5.

Area	Sales (in 1,000s)	Percent
London	32	18.7%
South West	18	10.5%
South East	27	15.8%
East of England	26	15.2%
Other	68	39.8%

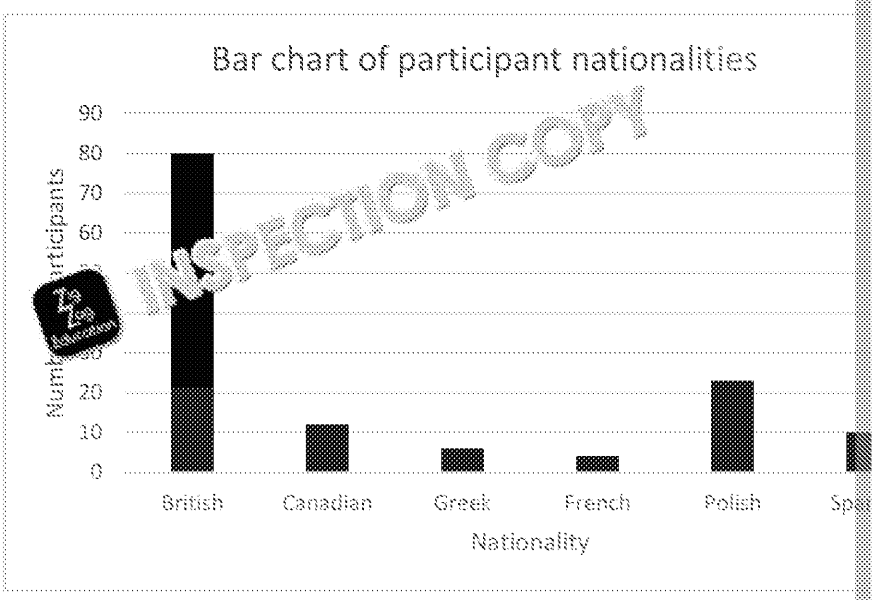
Q6.

Time	Number of participants	Percent
$x < 10$	5	16.7%
$10 \leq x < 15$	15	50.0%
$15 \leq x < 20$	5	16.7%
$20 \leq x < 25$	4	13.3%
$x \geq 25$	1	3.3%

Q7. a) 23
b) 47
c) No, we cannot see the exact numbers for any age

Q8. a) 56
b) 8 females
c) Bristol
d) 10
e) College / A Levels

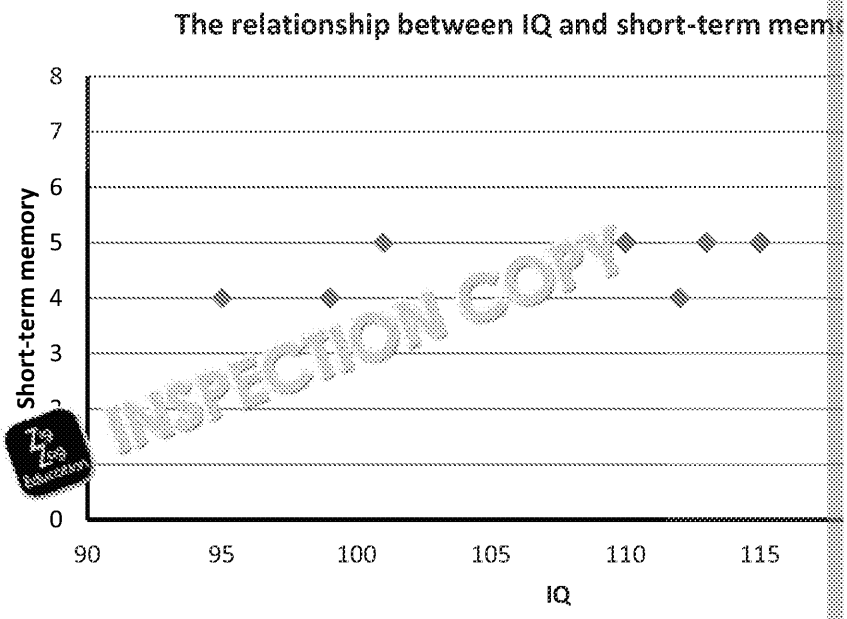
Q9.



Q10. a) 60
b) Aggressive behaviour
c) It is much more common than aggressive behaviour (14 vs 4)
d) 31
e) 11

Q11. a) The greater the self-esteem, the greater the score on extraversion (or vice
b) Strong positive correlation

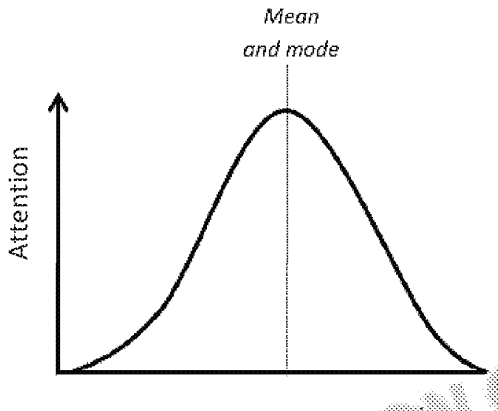
Q12.



a) The greater the IQ, the greater the short-term memory (or vice versa)
b) Strong positive correlation

Check your understanding! Inferential statistics

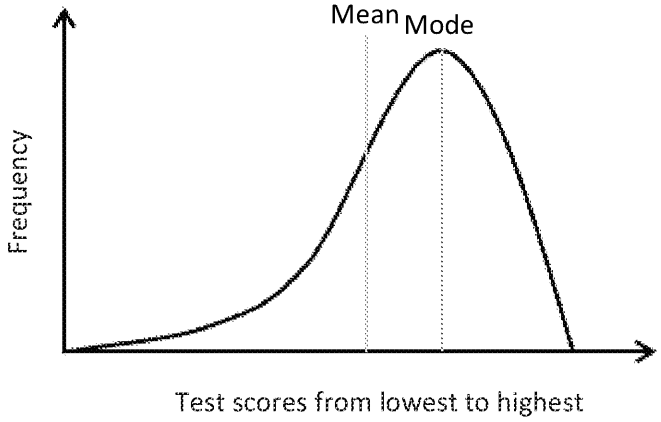
Q1. Normal distribution curve of attention and stress



Q2. Mean and standard deviation

Q3. Sho vio curve

Q4. **a)** Skewed distribution curve (to the right)
b) The majority of test scores tend to be higher
c) and **d)** see below



e) The mode is the most common and so it forms the peak as that represents
average, this will be affected by the fact that the majority of values are hig
the right.

Q5. The distribution of the data changes which statistical tests you use.

Q6. That the data is normally distributed.

Q7. Spearman's rho (or Pearson's r)
- The data is ordi te val
- Sh has re onal design
- an to investigate if there is a significant relationship between two c

Q8. Mann–Whitney U (or unrelated t-test)
- The data is ordinal or interval
- The researcher has an independent measures design
- The researcher wants to know if there is a significant difference between t

Practice questions (possible answers)

Question	Answer	Marks	Guidance
1	**Outline how a mean is calculated** 1 mark for kn[illegible]ing that the sum of the data is calculated 1 mark fo[illegible]g that the answer is divided by the number of pieces of data	**2** **2 AO2**	
2	**Draw a sca[illegible]agram to show the relationship between happiness scores and the hours worked per we** Up to 2 marks for plotting the scatter diagram accurately (scales should be appropriate for the measurement). If more than two mistakes are made then no marks are awarded. 1 mark for an unambiguous title that refers to both co-variables 1 mark for correct labelling the axes	**4** **4 AO2**	Do not award the fourth mark if one or both of the axes have been mislabelled
3	1 mark for D – 7/1[illegible]	**1** **1 AO2**	

Chapter 4

Check your understanding!

Q1. The abstract is used by researchers conducting a meta-analysis to help decide w
the study in their analysis (1).

1 mark for identifying a way in which abstracts are used, possible points include:
an overview of the study; to decide whether to read a study; to decide whether to

Q2. In the results section, the researcher only reports the statistical findings, whereas
researcher considers what the findings really mean (1). By only reporting the st
more objective than the discussion section (1). The discussion section also cons
which helps the reader understand what applications [illegible] findings (e.g. genera
only states the findings themselves (1).

Up to 3 marks for discussion of [illegible] between results and discussion, possib
focuses on the statist[illegible] the discussion section focuses on the meaning o
evaluate the [illegible] the discussion section considers the impact of the researc

Q3. One [illegible] the discussion section is important in the report is because it gives r
discussion section relates the findings back to the hypothesis and the previous r
understand the study in context (1). Prior to this, the results section only presen
allow the reader to understand the contribution of the research (1).

A second reason is that the researcher identifies and discusses the study's limita
reader needs to be aware of the factors that could influence the validity and reli
reader judge the value of the findings and what situations the findings can be ge

1 mark for each reason identified (up to 2 marks)
2 marks for explanation of each reason (up to 4 marks)

Q4. One difference is that a reference list provides details about where a study or in
citation does not (1). A second difference is that a reference list is written in alp
citation is placed immediately before or after the relevant text (1).

2 marks for two differences between in-text citations and reference lists, possibl
the source of the research; reference lists include the initials of the author; refere
order and in-text citations are placed next to the research

Q5. Peer review is used to ensure that only high-quality research is published in psyc
publication of low-quality research it protects the integrity of psychology (1). Re
considerable impact on the population studied and the low-quality research cou
population (1).

Up to 3 marks for consideration of the purpose of peer review

Practice questions (possible answers)

Question	Answer	Marks	Guidance
1.	**Outline the purpose of referencing in psychological research** 1 mark for showing basic understanding and knowledge of referencing, e.g. providing precise information about who, when and where the research is from – this may be shown implicitly 1 additional mark for a short or rudimentary explanation of the purpose of referencing, e.g. acknowledge work of others; allow others to look up research; avoid claiming ideas are original Or 2 additional marks for a more complete explanation of the purpose of referencing, e.g. 'referencing gives appropriate credit to the ideas of other researchers (1) and helps to show that the researcher has a comprehensive knowledge of the present topic (1) Credit other relevant responses.	**3** **3 AO1**	
2.	**Outline the purpose of the results section in a scientific journal article** 1 mark for showing basic understanding and knowledge of the purpose of the results section, e.g. results section is a section of the report where the statistical results are presented – this may be shown implicitly 1 additional mark for a short or rudimentary explanation of the purpose of the results section, e.g. present findings objectively; describe the data; show statistical significance Or 2 additional marks for a more complete explanation of the purpose of referencing, e.g. 'the results section presents the findings objectively (1) which allows the reader to consider the value of the findings without any subjective information from the researcher (1) Credit other relevant responses.	**3** **3 AO1**	

Chapter 5

Practice questions (possible answers)

Question	Answer	Marks	Guidance
1.	**You have been asked to investigate whether the colour of paper a maths test is printed on affects performance on the test.** **Explain how you would conduct an experiment to study if the colour of paper makes a difference or not. As part of your explanation, you need to justify your design choices.** **You need to refer to:** • **laboratory or field experiments** • **your choice of experimental design** • **one or more factors you would control** AO1 – 2 marks **Required to demonstrate understanding and knowledge:** • laboratory **OR** field experiments • your choice of experimental design • one or more factors you would control AO2 – 6 marks Students are awarded AO2 marks for applying their design decisions to the scenario: • application of the experimental method to the scenario, e.g. all the participants will take the test in a quiet room free from other distractions • application of the experimental design to the scenario, e.g. half of the	12 2 AO1 6 AO2 4 AO3	**Level 4: 10–12 marks** **Good** understanding and knowledge of the required features. **Good** demonstration of applying understanding and knowledge to the scenario. **Good** demonstration of justifying design choices. The student's answer meets all required features and demonstrates exact knowledge of each. A high level of understanding is demonstrated through their application. Most or all of the decisions made have been sufficiently justified and some justification may be contextualised to the scenario. The student shows logical and clear reasoning and a well-structured answer. The student's choice of detail is relevant and corroborated. The answer correctly draws on the student's own experience and there are evident links between their investigation and their practical activity. **Level 3: 7–9 marks** **Good** understanding and knowledge of the required features. **Reasonable** demonstration of applying understanding and knowledge to the scenario. **Reasonable** demonstration of justifying design choices.

	AO3 – 4 marks Wide discussion of decisions related to the design. Students should show they can develop their design and procedures via justification of their deci... Answers will typically be awarded one mark for a sufficiently justified dec...t more marks may be awarded if the justification is well-developed. Further marks wil...t be awarded for contextualised justification but this is expected in highe...el answers. Credit other relevan...nts.		**Level 2: 4–6 marks** **Reasonable** understanding and knowledge of the required features. **Limited** demonstration of applying understanding and knowledge to the scenario. **Limited** de...onstration of justifying design choices. The student's ...wer addresses some of the required features and shows some knowled... of them. Evidence of application is limited which demonstrates a ...c level of understanding. A weak attempt to justify some of the deci... has been made. The information is somewhat relevant but is ha...ly structured. Limited evidence is used as support. The response refer... the student's experience and shows inexplicit links between their inves...tion and their practical activity. **Level 1: 1–3 marks** **Reasonable** understanding and knowledge of the required features. **Basic** demonstration of ap...ng understanding and knowledge to the scenario. **Basic** demonstration of justif...design choices. The student's answer addresses one or more of the required features and shows some knowledge of it/them. Weak applications are made. There are few to no decision justifications; if present they will be weak. Basic information is shown and presented without structure. Limited evidence is used as support and it may be unclear what the relationship between the information and evidence is. The answer may refer to the evidence

*** A Level practice questions (possible answers)**

Question	Answer	Marks	Guidance
1.	**Identify two findings from the table** 1 mark for identifying that the mean/median suggests that those in the alcohol condition have slower reaction 1 mark for identifying that there is greater variability in the reaction times in the alcohol condition Credit other relevant points.	**2 AO3**	
2.	**Explain why a table is appropriate for presenting this data** 1 mark for explaining that tables can be used to present time data (interval) 1 mark for explaining that tables allow for easy comparison between the different conditions Credit other relevant points.	**2 AO3**	
3.	**Name and briefly describe the study's experimental design** 1 mark for naming the design as independent measures (or unrelated groups) 1 mark for describing the study correctly, i.e. that the participants are assigned to different conditions	**2** **2 AO2**	Do not award the second mark if the answer suggests that the participants are matched The marks are not dependent on each other
4.	**Explain how the researcher could have randomly allocated his participants to each condition** 1 mark for suggesting a method that is appropriate for random allocation, e.g. lottery method of drawing names out of a bag 1 mark for relating the method to the scenario e.g. the participants' names are all written on pieces of paper and placed into a bag. The first 15 participants' names drawn would be allocated to the alcohol condition, the remaining 15 would be allocated to the no alcohol condition. Credit other descriptions that would create a random sample.	**2** **2 AO2**	
5.	**Identify three ethical issues that should be considered when conducting this experiment** 1 mark for each practical ethical issue, e.g. failing to protect the participant from harm, informed consent, being unaware that they can withdraw, etc	**3**	Do not award marks to issues that are similar to

6.	**The researcher analysed his data using a Mann–Whitney U test. Provide two reasons for choosing this test with reference to his investigation** Up to two marks for any of: • [illegible]ent interested in the difference between two groups • Independent measures • Data [illegible]s interval Additional two marks for relating reasons provided to the study e.g. the experi[illegible] investigated whether there was a difference (1) between the alcohol and non-alcohol group (1) e.g. the researche[illegible]d an independent measures design (1) by comparing the times of participants in condition A to the [illegible]s of participants in condition B Credit other relevant [illegible]nts.	[illegible] **A[illegible]2** **A[illegible]2**	
7.	**Using the critical valu[illegible]bove, explain whether or not the psychologist's research was significant or not** 1 mark for explaining that the difference was significance at 0.05 1 mark for explaining tha[illegible] the observed value was less than the critical value at 0.05 1 mark for explaining that [illegible] is the normal requirement for significance 1 mark for explaining that [illegible]gs are not significant at other levels	**4** **4 AO3**	
8. a)	**Outline each of the features of [illegible]cience below and state how they can be applied to this experiment into reaction times** **Cause and effect** 1 AO1 mark for knowledge of one variable affecting another variable 1 AO1 further mark for specific relevant terminology, e.g. control of extraneous variables, manipulation of the independent variable 1 A02 mark for applying this feature of science to the study, e.g. the independent variable is whether or	**3** **2 AO1** **1 AO2**	

9.	**Explain how you would conduct an observation into the differences in how people behave in a school library compared to a public library. As part of your explanation, you need to justify your design choices.** **You need to refer to:** • **participant or non-participant observation** • **structured or unstructured observation** • **event or time sampling** • **method of collecting data** **AO1 (3 marks)** **Required to demonstrate understanding and knowledge:** • participant **or** non-participant observation • structured **or** unstructured observation • event **or** time sampling • method of collecting data **AO2 (5 marks)** Students are awarded AO2 marks for applying their design decisions to the scenario, e.g. having a checklist for different behaviours seen in the library (for example, talking, reading, asking questions to staff) – structured **AO3 (7 marks)** Wide discussion of decisions related to the design • e.g. non-participant observation would	15 3 AO1 5 AO2 7 AO3	**Level 4: 12–15 marks** **Good** understanding and knowledge of the required features. **Good** demonstration of applying understanding and knowledge to the scenario. **Good** demonstration of justifying design choices. The student's answer meets all required features and demonstrates exact knowledge of each. A high level of understanding is demonstrated through their application. Most or all of the decisions made have been sufficiently justified and some justification may be contextualised to the scenario. The student shows logical and clear reasoning and a well-structured answer. The student's choice of details is relevant and corroborated. The answer overtly draws on the student's own experience and there are evident links between their investigation and their practical activity. **Level 3: 8–11 marks** **Good** understanding and knowledge of the required features. **Reasonable** demonstration of applying understanding and knowledge to the scenario. **Reasonable** demonstration of justifying design choices. The student's answer meets most or all of the required features and demonstrates mostly exact knowledge of each. Evidence of application is present which shows some level of understanding. Some of the decisions made have been sufficiently justified and at times the justification may be contextualised to the scenario. Some structure and reasoning is present. Most of the information is relevant and corroborated by evidence. The answer draws on the student's own experience and there are some links between their investigation and their practical activity. **Level 2: 4–7 marks** **Reasonable** understanding and knowledge of the required features. **Limited** demonstration of applying understanding and knowledge to the scenario. **Limited** demonstration of justifying design choices. The student's answer addresses some of the required features and shows some knowledge of them. Evidence of application is limited which demonstrates a basic level of understanding. A weak attempt to justify some of the decisions has been made. The information is somewhat relevant but is hardly structured. Limited evidence is used as support. The response refers to the student's experience and shows inexplicit links between their investigation and

Glossary

Abstract	A brief overview of your research; read by other s want to read the whole report
Alternate/experimental hypothesis	A prediction on the outcome of the research
Appendices	A section at the end of the report in which inform that it does not disrupt the flow of the main text
Association	A relationship or link between two variables sugg related in some way
Bar charts	A way of repre ng equency information tha
Behavioural categories	A re hat uses a behaviour checklist of all c ation session
Cause and effect	The idea that changing one variable causes a cha prediction possible
Closed on	A question with a fixed response, e.g. 'yes', 'no', restricts how a person can respond to the questi
Closed questions	A question with a fixed response, e.g. 'yes', 'no', person can respond to the question
Coding frames	A pre-planned list of codes that a researcher can systematically
Controlled observation	When the researcher manipulates the environm
Correlation	A measure of the association between two varia
Correlation coefficient	A number that describes the strength and direct
Correlation coefficient	A number that describes the strength and direct
Correlational research	A type of study looking at the association betwe
Covert observation	The people being observed are not aware that th purposes (and so have not given consent)
Critical value	The observed value is compared with this value t
Demand characteristics/effects	When the participant's behaviour is a reflection behave; responding to the 'demands' of the situ
Dependent variable (DV)	A variable which measures the presumed effect
Descriptive statistics	Numerical ways of des the data by identif
Design	A subsec of the methods section in which the n (e.g. independent groups, correlational)
Discussion	A section considering the meaning of the findings and the study's strengths and weaknesses
Ecolog dity	The extent to which the findings can be generali
Event sampling	A recording of how frequently an event occurs
Experiment	A type of study that uses manipulation of the ind control to try to establish cause and effect
External validity	The extent results are generalisable across setti
Extraneous variables	Variables that may influence the behaviour in ad manipulation of IV) and so should be controlled f

Field experiment	An experiment that occurs in real-life settings bu the IV
Fractions	A way of displaying numbers which are not whol
Histograms	A graph that shows frequency data that has beer
Independent measures design	Different participants take part in each condition
Independent variable (IV)	A variable which is manipulated to produce a pre variable
Inferential statistics	Statistics that can be used to make inferences fro
Internal validity	The extent to which ch e aviour is the result o in the IV)
Interval data	ly spaced data
Interview	A series of spoken questions with the aim of findi interest
Intervi as	Sources of bias in which the style of the intervie
In-text citation	When a study is referred to in the text, the autho next to it
Introduction	Provides a rationale for the research by looking a unknown
Laboratory experiment	An experiment conducted in an artificial environ control; it involves manipulation of the independ effect
Likert scale	A type of closed question where a person respon scale
Line graph	A graph used to show trends, especially across ti
Matched participants design	Each participant is matched to another participa important for the study. Each participant takes p acting as its control.
Materials/apparatus	A subsection of the methods section of a report i things he or she needed to conduct the study
Mean	An average that is calculated by adding together number of values there are. This measure takes
Measures of central tendency	Measures that aim to find the central value of a
Median	An average that is calculated by ordering the dat value
Meta-analysis	A type of secondary data, where information fro to find out what the overall result is
Method	A section of a report which describes, in detail, h
Mode	An average that is calculated by ordering the dat most often
Mundane realism	A comparison of how similar the study is to real l
Natural experiment	An experiment that occurs in real-life settings wh manipulation

Natural IV	An independent variable that varies naturally wit gender
Naturalistic observation	An observation that occurs in the natural environ view their natural behaviour
Negative correlation	As one variable increases, the other variable dec
Negative correlation	As one variable increases, the other variable dec
Nominal data	Categorical type data
Non-parametric test	A less powerful inferential test which is used whe assumptions required for a parametric test
Non-participant observation	When observation is co ted from a distance observer
Normal distribution	A be d curve where the peak is the mean s ne peak
Null hypothesis	States there will be no effect
Objec	Free from errors caused by subjective interpreta
Observation	A research methods technique in which data is g behaviour
Observed value	The output of an inferential statistical test
Observer bias	When observers know the desired goal or outcon unintentionally interpret the data that way
Observer effect	When the presence of an observer alters behavio
One-tailed (directional) hypothesis	A hypothesis that predicts the direction of the hy
Open question	A question that allows the person to respond wit qualitative data
Open question	A question that allows the person to respond wit qualitative data
Operationalisation	Precisely defining your variables so that a hypoth
Operationalisation	Precisely defining your variables so that a hypoth
Opportunity sampling	A sampling method in which the sample is drawn the study and meets the required criteria for par
Ordinal data	Ordered or ranked data that may not have an eq
Outlier	An extreme point that differs from the other resu results
Overt observation	It is clear that the person is being observed for re
Parametric test	fe tial test that should only be used when
Participant observati	When the observer has a high level of interaction observed
Peer re	A process by which research is evaluated by exp certain standards
Percentages	A number that compares an amount to the total
Perfect correlation	You are able to perfectly predict what the value o
Pie chart	A visual method of presenting frequency data so the whole
Population	The people who are relevant to your research

Positive correlation	As one variable increases, the other variable also
Positive correlation	As one variable increases, the other variable also
Primary data	Data that is collected by the researchers to study
Procedure	A subsection of the methods section of a report t was conducted
Qualitative	In-depth exploration of non-numerical data to un contexts
Qualitative data	Data of a more in-depth nature which provides g analyse
Qualitative research	A methodology that generates data of a more in detail but is more difficult to analyse
Quantitative data	Data of a numerical nature which can be easily a
Quantitative resea	A methodology that generates data of a numeric
Quasi **me**	An experiment that uses naturally occurring IVs; manipulate the IV or randomly allocate participa
Questionnaire	A series of written questions with the aim of find interest
Random sample	A sample that is drawn so that members of the p being selected
Randomly assigned	Assigning participants to their conditions random
Range	A measure of spread that is calculated by subtrac greatest value
Rapport	A relationship built on mutual understanding and
Ratio	A way of presenting the data so that it shows the
Reactivity	The participants may react to the setting they are aware they are being observed may intentionally behaviour
Reference	Providing information about the author of the st
Reliability	The extent to which results are consistent, acros
Repeated measures design	The same participants take part in all of the study
Research aim	What the study intends to research
Research question	The question you are trying to answer with your
Results	A description of the study's findings in terms of s explain the findings
Sample	The participants that have been selected to take
Sample/participants	A subsection of the methods section of a report in
Samp	The method of selecting participants from the re your study
Scatter diagram	A graph that shows correlational data where each
Secondary data	Data that is created from looking at primary sour
Self-report	A Research method that gathers data by asking th interest
Semantic differential rating scale	A type of closed question where participants rate scale that has polar-opposite adjectives on either

Semi-structured interview	An interview that has a mixture of fixed and non using fixed questions and then follow-up questio
Significant figures	A way of rounding a number so that only a certai present
Skewed distribution	A bell-shaped curve that is skewed towards one s
Snowball sampling	A sampling method where the researcher recruits participants nominate their associates to be the s
Social desirability bias	When a person alters their answer to avoid nega
Standard deviation	A measure of spread that uses every point of dat
Standard form	An alternative way of very large or very s
Standardisation	The pro re materials of the experiment could replicate the experiment exactl
Structured interview	An interview with a set of ordered questions tha interview
Structu servation	An observation in which the researcher plans in a record during the observation session. The obse even if they are relevant to the research aims.
Tables	A way of easily organising data using columns an
Tally chart	A type of frequency table in which the frequency
Time sampling	A recording that uses regular intervals and repor or absent in a time frame
Two-tailed (non-directional) hypothesis	A hypothesis that predicts that there will be an e the effect
Type I error	When we reject the null hypothesis when we sho
Type II error	When we accept the null hypothesis when we sh
Unstructured interview	An interview that does not have a specific set of more comparable to an everyday conversation. or questions that they wish to cover which are d
Unstructured observation	An observation in which the researcher records w into which specific behaviours to record
Variance	A measure of dispersion that looks at how score
Volunteer/Self-selected sampling	Participants self-select; they choose to participat
Zero correlation	Points are dispersed randomly and there is no re