Research terminology (pg. 274 Psychology Self & Others also covers this information)

Experimental research: research that allows a researcher to manipulate (change) the independent variable. A cause-and-effect relationship can be found. (Cause and effect relationship refers to changes in an independent variable causing differences in a dependent variable). Experimental research allows for the random assignment of participants to conditions.

Non-experimental research: research that does not allow the researcher to manipulate the independent variable. A cause-and-effect relationship cannot be found and instead researchers may rely on interpretation, observation or interactions to come to a conclusion. Non-experimental research does not allow for the random assignment of participants to conditions.

Scientific research: research that follows scientific method and the findings of scientific research can be reproduced and demonstrated to be consistent (the results can be reliable).

Non-scientific research: research that does not follow scientific method and cannot be reproduced and demonstrated to be consistent (the results are not reliable).

Population: the complete collection of people, objects or events that can possibly be measured. The population is the entire group of people belonging to a particular category (for example, all university students or all AFL footballers). It is the larger group of research interest from which a sample is to be drawn.

- In this context, the term population does not refer to the number of people living in a particular area (such as the population of Western Australia), but rather a group of people with similar characteristics that are of interest to the researcher.

- For example, if you were to conduct a study investigating Western Australian year 12 students’ favourite subjects, the population would be all the students who are enrolled in year 12 in schools in Western Australia.

Sample: a group of participants selected from, and representative of, a population of research interest. A sample must represent the population from which it is drawn in order for inferences to be made about that population. The process of choosing participants from the population for use in a study is called participant selection, or sampling. A sample is a subsection of a population, and therefore it is a smaller group than the population itself.

Subjects: the people being studied in the experiment.
Ethics in psychological research

Ethics are the moral principles and codes of ______________________ that must be abided by.

Role of the experimenter

Before starting any research, the experimenter submits a research plan to an e____________ committee for approval. This ensures that participants’ welfare is considered.

The potential benefits to society of the research need to be weighed against the risks or discomfort to the participants. Once the research plan has been approved, the research may commence.

It is the experimenter’s responsibility to protect participants’ physical and psychological welfare and ensure that occupational health and s____________ guidelines are adhered to.

At no time must an experimenter conduct a study that causes severe distress to participants.

If a participant does encounter unexpected distress, the experimenter must immediately stop the experiment and provide the participant with access to counselling or t____________.

The experimenter is expected to publish any results so that other researchers may be kept up to date. This may also minimise the occurrence of any overlap in research in the same field.

Participants’ rights

Voluntary participation

Participants need to agree to participate of their own accord.

Participants cannot be forced to participate, cannot be bribed or be threatened with failure of a course or the exclusion from a treatment program.

Withdrawal rights

Participants have the right to remove their results from the study.

Participants can leave the study at any time without pressure or penalty.

Privacy (pg. 286 text book)

The participant’s rights to have the collection, storage and sharing of their personal information protected.

Anonymity (pg. 286 text book)

The protection of people’s i____________ through not disclosing their name or not knowing it.

The participant has a right to stay ‘anonymous’ during research.

Confidentiality

Personal details about the participants are not to be revealed without the participant’s written consent.

Data must be stored securely and disposed of when no longer needed.

Informed consent procedures

Experimenter must get written informed consent from participants (consent form).

The consent form must explain the reason for the research and explain what is expected of the participants.

The consent form must explain that the participants have the right to withdraw from the study or withdraw their results from the study at any time and for any reason.

If deception is used as telling the participants the true purpose of the study would defeat the purpose of the study, then the experimenter must make sure participants do not experience any d____________ and must be fully informed about the study after it is completed (debriefed).

Participants who are under 18 (minors) or are without intellectual ability need to obtain consent from their legal g__________________.

NOTE: informed consent is not counted as ‘participants’ right’.

Pg. 149 of the text book shows an example of a parental consent form.
Deception in research

- Deception is used in research when informing the participants of the true purpose of the research would alter the results.

- The benefits of the research must outweigh the risk to the participants.

- If deception is used, participants must be fully debriefed at the end of the study. This involves giving participants full information about the true purpose of the study and correcting any mistaken ideas they have about the study, themselves, or other participants in the study.

Professional conduct

- Any psychological, medical or scientific research work in Australia with patients must comply with two documents:

  1. The most recent update of the National Statement on Ethical Conduct in Human Research 2007 (the latest update was May 2015).
  2. The Australian Psychological Society’s Code of Ethics (2007), which has a section on research.

- All institutions where research with humans is undertaken (like at universities or hospitals) have a Human Research Ethics Committee, which approves all research involving humans.

There is a copy of both documents in the classroom, have a browse through them.

- Many well-known studies from the past have proved controversial because they appear to violate ethical principles, such as Milgram’s obedience study. These studies took place before a code of ethics was established. However, one beneficial result of these studies was they got psychologists discussing the need for ethical guidelines, which today are an integral (vital) part of the profession.

Past exam questions: 2013 11 ATAR Psych WACE Stage 2 Exam

1. A researcher decides to conduct interviews with ten students from Harman High School’s year 12 group to gain an understanding of their attitudes toward wearing the school uniform.

   a) Name the population from which the researcher has drawn the sample group. (1 mark)
Past exam questions: 2011 11 ATAR Psych WACE Stage 2 Exam

A sample of secondary students completed a quantitative self-report measure to determine their attitudes toward wearing school uniforms. The age of participants and the mean of the group, indicating their level of support for wearing a school uniform, are shown in the table below. (Higher scores indicate a stronger level of support.)

<table>
<thead>
<tr>
<th>AGE (years)</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCORE</td>
<td>8</td>
<td>12</td>
<td>18</td>
<td>20</td>
</tr>
</tbody>
</table>

a) Describe, using an example, the difference between ‘population’ and ‘sample’ when conducting research. (2 marks)
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________

b) Identify two ethical considerations relevant to this study. Explain how the researchers would deal with each of these considerations in their research. (4 marks)
_______________________________________________________________________________________________
_______________________________________________________________________________________________
_______________________________________________________________________________________________
_______________________________________________________________________________________________

Past exam question: 2015 WACE Stage 3 Psychology Exam

3a. Identify two features that make psychological research ‘scientific’. (2 marks)

One: ______________________________________________________________________________________

Two: ____________________________________________________________________________________

b) In 1963, Stanley Milgram conducted his well-known obedience experiment in which he had participants believe they were giving a fellow participant (who was actually an associate of Milgram) increasingly strong electric shocks. Describe briefly the most significant ethical issue associated with this study and explain why it was a problem. (3 marks)
_______________________________________________________________________________________________
_______________________________________________________________________________________________
_______________________________________________________________________________________________
_______________________________________________________________________________________________

_______________________________________________________________________________________________

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_______________________________________________________________________________________________
_______________________________________________________________________________________________

_______________________________________________________________________________________________

_______________________________________________________________________________________________
Steps in scientific research: review from year 11 psychology (pg. 275 Psychology Self & Others)

1. Identify a research issue or problem to investigate.
2. Develop the exact research question or the hypothesis.
3. Choose a research design and method.
4. Collect data.
5. Examine the evidence.
6. Interpret the results.
7. Conclude the findings.

Features of experimental research methods

- A variable is any condition that can change.
- The independent variable: a condition that the experimenter manipulates (changes) in order to gauge its effect on another variable.
- An independent variable is a suspected cause of differences in behaviour or results between groups of participants in an experiment.
- The dependent variable: is the condition in an experiment that is affected by the independent variable.
- The dependent variable is used to measure the independent variable’s effect. A dependent variable ‘depends’ on the independent variable, to determine whether it changes and by how much.

Identify the independent and dependent variables in the following list of hypotheses.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Independent variable</th>
<th>Dependent variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eating a low-sugar diet will improve physical health.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girls with abnormally low fat content in their bodies will experience more hormonal disturbances than girls with a normal fat content in their bodies.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Species who have a large portion of their brains allocated to the cerebrum are more intelligent and adaptable than species with a small portion of their brains allocated to the cerebrum.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stroke patients who have suffered damage to Broca’s area will have poorer pronunciation and grammar than patients who have sustained damage to Wernicke’s area.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individuals whose right brain hemisphere is more active than the left are more likely to be involved in risk-taking behaviour than individuals whose left brain hemisphere is more active than the right.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Operational hypothesis

First of all, remember that a hypothesis needs to include both the independent and dependent variable.
- The independent variable is the variable that is being changed or is changing.
- The dependent variable is the variable that is being measured.

Operationalisation of a variable means that it is stated in terms that show how it is measured. For example:
- Age: operationalised as age in total months.
- IQ: operationalised as the score on a 40-item multiple-choice test.
- Aggression: operationalised as the number of aggressive responses in an observed 30 minute period.

NOTE: In an exam you may be asked to give an independent or dependent variable OR an operationalised independent or dependent variable. You need to know the difference between the two types. You may be asked to write a hypothesis or an operationalised hypothesis. The hypothesis doesn’t have operationalised variables.

An operationalised hypothesis requires three parts:
1. Population (that the sample is taken from).
2. Operationalised independent variable.
3. Operationalised dependent variable.

Start it with: It is hypothesised that.... It is a prediction so you are writing what you think will happen in the future.

It should only be one sentence long.

For each of the following scenarios, find the different pieces of information and then write an operationalised hypothesis. Use coloured highlighters to help you find the three main parts. The first one has been done for you as an example.

Dr Meldrum wants to research the influence of caffeine on ability to memorise in 20 middle-aged men who live in Leederville. She gives her experimental group four cups of coffee a day and then measures the number of words they recall on a series of short-word recollection tests. The control group completes the same tests but does not consume any caffeine.

Sample: twenty middle-aged men who live in Leederville.


Independent variable: caffeine or no caffeine.

Operationalised independent variable: Four cups of coffee a day or no cups of coffee each day.

Dependent variable: memory.

Operationalised dependent variable: Memory measured by the number of words recalled on a series of short-word recollection tests.

Operationalised hypothesis: It is hypothesised that middle-aged men given caffeine (four cups of coffee a day) will have a better memory, measured by the number of words recalled on a series of short-word recollection tests, than middle-aged men who do not consume any caffeine.

OR you could predict that the men who don’t drink the coffee will have a better memory. Either prediction is correct.

Operationalised hypothesis: It is hypothesised that middle-aged men given caffeine (four cups of coffee a day) will have a worse memory, measured by the number of words recalled on a series of short-word recollection tests, than middle-aged men who do not consume any caffeine.
1. The Ferrari team wanted to see if their drivers’ reaction times (metres per second) would improve if they fitted their cars with thicker wheels rather than thin wheels.

Population sample is taken from: ________________________________________________

Independent variable: __________________________________________________________

Dependent variable: _____________________________________________________________

Operationalised independent variable: ______________________________________________

Operationalised dependent variable: _______________________________________________

Hypothesis (normal, not operationalised): ____________________________________________

Operationalised hypothesis: ______________________________________________________
Controlled and uncontrolled variables

- **Controlled variable**: a variable that remains unchanged throughout an experiment.
- A controlled variable is a variable whose influence has been eliminated from an experiment so that it cannot affect results.

- **Uncontrolled variable**: a randomly occurring variable that might cause changes in the dependent variable.
- An uncontrolled variable is a variable whose influence has not been eliminated from an experiment.

Uncontrolled variables may include differences between research participants, such as memory, motivation or personality. They can also include differences in how the experimenter treats the participants or how the participants react to the experimental environment. Another name for uncontrolled variable is confounding variable.

Uncontrolled variables may be present without the researcher knowing, and they may not be identified (if at all) until after the experiment is complete.

How to prevent uncontrolled variables from occurring

- Be sure the experimenter’s own personal variables, expectations and behaviours bias the results.
- Have a clearly planned design for the experiment with controls in mind.
- Consistently monitor controlled variables.
- Design an experiment where differences in the sample are eliminated (differences except the independent variable).
- Use random selection when creating control and experimental groups.

1. Chelsea is a university graduate researching whether caffeine can improve driving ability. Group A ingests caffeine before taking a simulated driving test, and group B does not ingest any caffeine before taking the same simulated driving test. As members of group A are conducting their driving test, Chelsea actively encourages them. When members of Group B conduct their driving test, Chelsea stands over them and points out their errors.

Uncontrolled variable: _____________________________________________________________

Way to prevent uncontrolled variable: ______________________________________________________

2. A teacher decides to give half the students in his class a new ‘super-drug’ he has discovered which is intended to improve their intelligence. The remaining students in the class receive no drug and are told they will have to compete academically as best they can.

Uncontrolled variable: ________________________________________________________

Way to prevent uncontrolled variable: ______________________________________________________
**Experimental and control groups** (pg. 277 Psychology Self & Others)

- **Experimental group**: the group exposed to the ______________________ variable.

- **Control group**: the group of participants exposed to all conditions or variables except the independent variable.

- For example, in a test of the effects of a new drug, the experimental group is the group given that drug. The control group is the group that is exposed to the control condition; that is, where the variable under investigation is absent. The control group is often given no treatment, or is given a sugar pill or fake treatment rather than the new drug (placebo).

- The control group allows you to see if the drug (independent variable) has had an effect on the experimental group’s behaviour (dependent variable).

**Why it is important to have a control group**

- It is important to have a control group because: it provides a standard that the performance of the experimental group can be compared with in order to determine if the independent variable had an effect on the ______________________ variable.

- Without the control group, an experimenter would have no idea if the independent variable had an effect on the dependent variable or if the change would have occurred naturally or due to other factors altogether.
1. A research study was conducted to determine the effectiveness of a herbal treatment for children with Attention Deficit/Hyperactivity Disorder (ADHD). One hundred and twenty children aged 6-12 participated in the study. Eighty children in the treatment group were given a herbal medicine for four months. The 40 children in the control group were given a substance that looked, smelt and tasted similar to the herbal medicine but which did not contain any active ingredients. The children and their parents were not told which treatment they were receiving. Children completed pre-treatment and post-treatment measures of attention, where higher scores show better attention.

The results of the study were as follows.

<table>
<thead>
<tr>
<th></th>
<th>Average pre-treatment score</th>
<th>Average post-treatment score</th>
<th>Results of the statistical test on the difference between pre- and post-treatment scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment group</td>
<td>85.6</td>
<td>97.9</td>
<td><em>p &lt; 0.05</em></td>
</tr>
<tr>
<td>Control group</td>
<td>88.8</td>
<td>84.3</td>
<td><em>p &gt; 0.05</em></td>
</tr>
</tbody>
</table>

a) Identify:

(i) The dependent variable for the study. (1 mark)

(ii) The independent variable for the study. (1 mark)

b) (i) State the conclusion that the researchers could draw from the results for the treatment group. (1 mark)

(ii) State the conclusion that the researchers could draw from the results for the control group. (1 mark)

c) Explain why the control group was given an inactive substance. (2 marks)
Placebo (pg. 278 of text book)

• If a participant believes they are being given a drug to improve sleep quality, they may report an improvement in their sleep quality. This is an example of the placebo effect, which refers to a change in a participant’s behaviour because they believe they have been exposed to a treatment that will affect them in some way. It is overcome by the use of a placebo, which is a fake treatment that has no active effect.

• For example, a placebo could be a pill that looks identical to the pill containing a drug. In a well-designed experiment, participants do not know if they are being given the real drug or a placebo. This is called a single blind experiment, the researcher knows who is getting the real drug, but the participants do not.

• Sometimes, researchers may unwittingly be biased in their treatment of the experimental group. If this is possible, a double blind experiment is used. In this kind of experiment, neither the participants nor the researcher are aware of which participants are receiving the real drug and which are receiving the placebo.

• Placebo: a neutral substance or procedure that looks like a real substance or procedure that is being evaluated, and is delivered in a s_______________ way.

1. Contrast between a single blind experiment and a double blind experiment.

Video: BBC Horizon: The Power of the Placebo: 53min: https://www.youtube.com/watch?v=C5VEIA_DbRc

Both sets of participants have been told whether they are given the caffeine pills or the mixed supplements. In fact, all the capsules are filled with ______________ flour and have no active substance at all.

Participants should not know what group they are put in (group given placebo or not given placebo).

Study using thermal pain: shown that a dummy pill, cream or surgery can release the naturally occurring painkillers in our brains.

Our thoughts and expectations can trigger chemical reactions that change our bodies. If we expect a placebo to do something, it can release chemicals in our brains and change our physiology.

The placebo effect relies on d________________________.
Experimenter effects/experimental bias (pg. 285 text book)

• These could be due to inaccurate observation, recording or interpretation of the data, or there may be a simple bias in the way the experiment is presented to the participants.

• It is assumed that in an experiment the researcher will be objective to make sure that they have no effect on the behaviour being observed or recorded or on the results.

• In order to counter the experimenter effect, it is common for researchers to acknowledge any such expectations and potential biases and to put in place s__________________ to minimise these as far as possible through p__________________ and emotional distance from the study.

• **Experimenter effects**: the experimenter’s own personal variables as well as his or her expectations and behaviours that may bias results.

Past exam question: 2015 12 ATAR Psych WACE Stage 3 Exam

Professor Zheng of Smart University wanted to test whether a vitamin supplement helped to improve students’ grades. To test her idea, she told her class she was giving them all a supplement that would make them smarter. She told them they all had to participate.

Professor Zheng divided the class into two equal groups. Group A received the vitamin supplement and Group B received an inactive substance (sugar pill).

Over the two week trial, Professor Zheng spent a lot of time with the students gathering data. She was excited to find that the results showed that all students’ grades had improved. She concluded that the vitamin supplement had worked.

a) (i) Name three rights that people have as participants in research. (3 marks)

_______________________________________________________________________________________________
_______________________________________________________________________________________________
_______________________________________________________________________________________________

(ii) Outline two pieces of information about a research study that the researcher must provide to participants so that they can give informed consent. (2 marks)

_______________________________________________________________________________________________
_______________________________________________________________________________________________
_______________________________________________________________________________________________

b) (i) Identify the term that refers to a substance with no known medical effects used as a control in an experiment. (1 mark)

_______________________________________________________________________________________________

(ii) Explain why Professor Zheng gave one group a substance with no known medical effects. (2 marks)

_______________________________________________________________________________________________
_______________________________________________________________________________________________
_______________________________________________________________________________________________
_______________________________________________________________________________________________
Reliability and validity (pg. 144-145 text book)

- **Reliability**: the degree to which an assessment tool/test produces stable and consistent results.

  - For example, if a person takes the same IQ test multiple times, they would have achieved the same score each time if it was reliable.

  There are two types of reliability that you need to know this year:

  - **Internal consistency reliability**: a measure of reliability that can be provided by the split-half method. A method that measures the extent to which all parts of the test contribute equally to what is being measured. This is done by comparing the results of one half of a test with the results from the other half, if the two halves of the test provide similar results, this would suggest that the test has internal reliability.

    - For example, if there is a 20-item scale that claims to be measuring depression, we should find that people’s responses to the first 10 items should be consistent with their responses to the second 10 items.

  - **Test-retest reliability**: is a measure of reliability obtained by administering the same test twice over a period of time to a group of individuals.

    - For example, a test designed to assess student learning in psychology could be given to a group of students twice, with the second administration perhaps coming a week after the first.

- **Validity**: how well an assessment tool/test measures what it is designed to measure.

  - For example an IQ test must actually assess general knowledge and abilities, not just mathematical understanding.

  There are four types of validity that you need to know this year:

  - **Face validity**: the degree to which an assessment tool/test seems to measure what it reports to measure.

    - For example, if an IQ test contained questions about our sporting, we would be likely to question its face validity.

  - **Construct validity**: the extent to which the assessment tool/test items keep with the constructs on which the test was based.

    - For example, we would expect that Eysenck’s personality test would have items related to the two constructs he believed made up personality (introverted-extraverted and emotionally stable-emotionally unstable).

  - **Concurrent validity**: a measure of how well an assessment tool/test correlates with a previously validated measure.

    - For example, when the WISC-IV was being developed, the people constructing the test compared the performance of a sample of children with their performance on the earlier version of the test (WISC-III) and with other tests such as the Children’s M Scale (CMS).

  - **Predictive validity**: the extent to which performance on a test is related to later performance that the rest was designed to predict.

    - For example: the WACE exams taken by year 12 ATAR students to predict their future performance in university. If students who scored high on their WACE tend to have high grades in university, then we can say that the WACE exams have good predictive validity. If there is no significant relation between WACE scores and university grades then we would say that WACE exams have low or poor predictive validity, because it did not predict what it was supposed to.
We can liken the concepts of validity and reliability to playing darts. A test with high validity and low reliability can be likened to hitting the dartboard with all the darts, but not hitting it in the same spot. In contrast, a test with high reliability and low validity can be likened to hitting the wall in the exact same spot with each dart, but missing the dartboard altogether.

Choose whether the following examples match with (a), (b), (c) or (d) in the diagram above.

1. Students take a vocabulary test two times to measure their spelling skills and the scores are similar for both tests.
   _________

2. A researcher found that the mood of his subjects (measured using a BMIS mood scale) was consistently greater when students meditated for 10 minutes every morning for a month.
   _________

3. The math ability of 5 year olds (measured using a spelling test) was recorded after one test.
   _________

4. Write an example of research where results would demonstrate diagram (c).
________________________
________________________
________________________
________________________
Researchers at Highpoint University were interested in finding out whether there was any difference in the likelihood of seeking help from psychologists between people who live in rural and remote areas and people who live in urban areas. They surveyed 200 people (100 rural and remote and 100 urban) on how likely they were to seek psychological help if they needed it.

1. a) (i) Identify the independent variable for the study.
   ____________________________

   (1 mark)

   (ii) Identify the dependent variable for the study.
   ____________________________

   (1 mark)

   b) Write an operational hypothesis for this study.
   ____________________________

   ____________________________

   ____________________________

   (2 marks)

   c) Identify two variables the researchers would need to control (i.e. take account of) when conducting this study.
   ____________________________

   One: ____________________________

   Two: ____________________________

   (2 marks)

   The researchers collected data using the ‘Attitudes towards Psychologists Questionnaire’ to determine how likely a person was to seek help from a psychologist.

   d) (i) State what psychologists mean when they say that a questionnaire is ‘reliable’.
   ____________________________

   ____________________________

   ____________________________

   (1 mark)

   (ii) Name and describe one type of reliability a psychologist could test for the questionnaire.
   ____________________________

   ____________________________

   ____________________________

   ____________________________

   (2 marks)

   e) (i) State what psychologists mean when they say that a questionnaire is ‘valid’.
   ____________________________

   ____________________________

   ____________________________

   (1 mark)

   (ii) Name and describe one type of validity a psychologist could test for the questionnaire.
   ____________________________

   ____________________________

   ____________________________

   ____________________________

   (2 marks)
Longitudinal and cross-sectional designs

- **Longitudinal study design**: a study that collects data over two or more periods in time, using the same participants.

  - This period of time could be several days, weeks, years of even decades.
  
  - This type of study is often used in psychology to study developmental trends across the lifespan.

  - Some advantages of longitudinal studies:
    - Researchers can study ways in which early development can affect later development.
    - Researchers can see the development of children over time.
    - Differences among individuals as well as changes within individuals over time can be assessed.

  - Some disadvantages of longitudinal studies:
    - It is expensive.
    - It takes a long time to get results.
    - Participants may drop out along the way because they withdraw, move, and cannot be traced.

An example of a well known longitudinal study: Child of Our Time is a documentary commissioned by the BBC, co-produced with the Open University and presented by Robert Winston. It follows the lives of 25 children, born at the beginning of the 21st century, as they grow from infancy, through childhood, and on to becoming young adults. The aim of the series is to build up a coherent and scientifically accurate picture of how the genes and the environment of growing children interact to make a fully formed adult.

A large portion of the series is made up of experiments designed to examine these questions. The main topic under consideration is: "Are we born or are we made?". The nature of the family in contemporary Britain is also addressed.

The project is planned to run for 20 years, following its subjects from birth until the age of 20.

- **Cross-sectional study design**: a study performed at one set period in time.

  - Much psychological research uses the cross-sectional design because it is a lot simpler examining the effect of an independent variable on the results once than doing it repeatedly over time. Also, large amounts of data can be gathered at a relatively low cost to the researcher.

  - Some advantages of cross-sectional studies:
    - Large amounts of data can be gathered at a relatively low cost.
    - Relatively quick and easy to conduct (no long periods of follow-up).
    - Data on all variables is only collected once.

  - Some disadvantages of cross-sectional studies:
    - The sample size should be sufficiently large enough to be able to generalise results to the whole population.
    - Only takes a snapshot, the situation may provide differing results if another timeframe had been chosen.
1. Complete the table below showing the differences between longitudinal and cross-sectional study designs.

<table>
<thead>
<tr>
<th></th>
<th>How often are participants observed?</th>
<th>High or low cost to the researcher</th>
<th>Is it time consuming or not?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Longitudinal study design</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cross-sectional study design</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Contrast between longitudinal study designs and cross-sectional study designs using full sentences.

_______________________________________________________________________________________________
_______________________________________________________________________________________________
_______________________________________________________________________________________________
_______________________________________________________________________________________________
_______________________________________________________________________________________________

Past exam question: 2010 ATAR Psych WACE Stage 3 Psychology Exam

3. Since 2003, a group of researchers has been studying the development of two groups of Australian children. At the beginning of the study, one group was aged 0-1 years and the other group was aged 4-5 years. Researchers will continue to study these 10000 children and their families until 2018, to collect data on child development and family wellbeing.

a) State the major advantage of this kind of study. (1 mark)

_______________________________________________________________________________________________
_______________________________________________________________________________________________
_______________________________________________________________________________________________
_______________________________________________________________________________________________

b) Identify one disadvantage of this kind of study. (1 mark)

_______________________________________________________________________________________________
_______________________________________________________________________________________________
_______________________________________________________________________________________________
_______________________________________________________________________________________________
### Types of graphs - put in exam notes

<table>
<thead>
<tr>
<th>Type of graph</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line graph</td>
<td>Both variables are increasing/decreasing at regular increments.</td>
<td><img src="image" alt="Temperature in New York City over six days" /></td>
</tr>
<tr>
<td></td>
<td>There is a pattern or trend occurring.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Data is continuous for both variables.</td>
<td></td>
</tr>
<tr>
<td>Bar graph</td>
<td>Bars do not touch.</td>
<td><img src="image" alt="Birthday of Students by Month" /></td>
</tr>
<tr>
<td></td>
<td>Data is discrete.</td>
<td></td>
</tr>
<tr>
<td>Histogram</td>
<td>Class intervals are on the horizontal axis and the frequency is on the vertical axis.</td>
<td><img src="image" alt="Frequency of rainfall over time" /></td>
</tr>
<tr>
<td></td>
<td>The bars are touching.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Data is continuous.</td>
<td></td>
</tr>
<tr>
<td>Scatterplot</td>
<td>Independent variable on x axis and dependent variable on y axis.</td>
<td><img src="image" alt="Depth of water at one-minute intervals" /></td>
</tr>
<tr>
<td></td>
<td>OR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>If there is no dependent variable (two independent variables instead) then they can be plotted on either axis.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Will show degree of correlation between two variables.</td>
<td></td>
</tr>
<tr>
<td>Pie chart</td>
<td>Circular chart divided into sectors.</td>
<td><img src="image" alt="Comparison of weight-loss methods used" /></td>
</tr>
<tr>
<td></td>
<td>Illustrate relative frequencies or percentages.</td>
<td></td>
</tr>
</tbody>
</table>
A frequency distribution shows how often a score or event occurs. Draw a frequency distribution table for the following scores obtained by a class of psychology students on a research methods test.

11, 99, 19, 80, 97, 65, 85, 38, 74, 77, 69, 57, 79, 88, 91, 55, 49, 59, 89, 89, 48, 28, 64, 84, 57, 62, 37, 29, 13

a) First, organise the raw data above into scores of increasing magnitude.

<table>
<thead>
<tr>
<th>Class interval</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-19</td>
<td></td>
</tr>
<tr>
<td>20-39</td>
<td></td>
</tr>
<tr>
<td>40-59</td>
<td></td>
</tr>
<tr>
<td>60-79</td>
<td></td>
</tr>
<tr>
<td>80-99</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
</tr>
</tbody>
</table>

b) Then, tally the number of times scores occur within categories of class intervals of equal proportions.

c) Present this data in the form of a histogram. (Put the frequency on the vertical axis).
How to draw a scattergram

1. Draw the axis.
2. Independent variable goes on x axis.
3. Dependent variable goes on y axis.
4. If there are two independent variables, then it doesn’t matter which axis each is written on.
5. Draw the scales for each axis.
6. Plot each data set as a dot.
7. Write a title that includes both variables.

Past exam question: 2012 12 ATAR Psych WACE Stage 3 Exam

1. A psychologist conducted a study to investigate the relationship between the total number of hours of television watched and total number of hours of sleep over seven days. Seven volunteer participants recorded for one week the number of hours of television they watched and the number of hours they slept. The results of the study are shown in the table below.

<table>
<thead>
<tr>
<th>Participant number</th>
<th>Total number of hours of television watched</th>
<th>Total number of hours of sleep</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>35</td>
<td>45</td>
</tr>
<tr>
<td>2</td>
<td>14</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>9</td>
<td>58</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
<td>60</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>64</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>67</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>82</td>
</tr>
</tbody>
</table>

The mean number of hours of television watched was 11.57 hours.

a) Identify the mode of the number of hours of television watched. (1 mark)

b) Identify the median number of hours of television watched. (1 mark)

c) State one advantage of using the median instead of the mean as a measure of central tendency. (1 mark)
d) Plot a scattergram of the results on the axes below. (3 marks)

![Scattergram Axes](image_url)

e) Name the type of relationship between the scores shown in the scattergram. (1 mark)

_______________________________________________________________________________________________

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f) State a conclusion that the researcher could draw from the results of the study. (1 mark)

_______________________________________________________________________________________________

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Data interpretation: measures of central tendency: mean, median, mode

- Measure of central tendency: a type of descriptive statistic that displays the typical or average value of a set of scores usually in the form of the mean, median or mode. The mean, median and mode are the most common measures of central tendency.

- **Mean**: a measure of central tendency found by adding up the values in the data set then dividing by the number of values that were added.

  **Example**:
  
  Data Set = 2, 5, 9, 3, 5, 4, 7  
  Number of Elements in Data Set = 7  
  Mean = \( \frac{2 + 5 + 9 + 7 + 5 + 4 + 3}{7} = 5 \)

- **Median**: a measure of central tendency found by listing the values of the data set in numerical order and identifying the value that appears in the middle of the list.

  The "Median" of a data set is dependent on whether the number of elements in the data set is odd or even. First reorder the data set from the smallest to the largest then if the number of elements are odd, then the Median is the element in the middle of the data set. If the number of elements are even, then the Median is the average of the two middle terms.

  **Examples : Odd Number of Elements**
  
  Data Set = 2, 5, 9, 3, 5, 4, 7  
  Reordered = 2, 3, 4, 5, 7, 9  
  Median = 5

  **Examples : Even Number of Elements**
  
  Data Set = 2, 5, 9, 3, 5, 4  
  Reordered = 2, 3, 4, 5, 9  
  Median = \( \frac{4 + 5}{2} = 4.5 \)

- **Mode**: a measure of central tendency found by identifying which value in the data set occurs most often.

  It is not uncommon for a data set to have more than one mode. This happens when two or more elements occur with equal frequency in the data set. A data set with two modes is called bimodal. A data set with three modes is called trimodal.

  **Examples : Single Mode**
  
  Data Set = 2, 5, 9, 3, 5, 4, 7  
  Mode = 5

  **Examples : Bimodal**
  
  Data Set = 2, 5, 2, 3, 5, 4, 7  
  Modes = 2 and 5

  **Examples : Trimodal**
  
  Data Set = 2, 5, 2, 7, 5, 4, 7  
  Modes = 2, 5, and 7

- Two advantages of using the median instead of the mean as a measure of central tendency is that:
  - The median is not affected by extreme scores/outliers.
  - The median is not affected by/does not depend on the size/value of the other scores.
Past exam questions: 2015 12 ATAR Psych WACE Stage 3 Exam

Test scores for a group of students are listed below. (3 marks)

1, 2, 2, 3, 5, 7, 8

Calculate the mean, mode and median for these scores.

Mean: ________________________________________________________________

Mode: ________________________________________________________________

Median: ______________________________________________________________

Past exam questions: 2015 12 ATAR Psych WACE Stage 3 Exam

1. Researchers were interested in finding out how much time students at a small rural high school spent each day on using electronic devices for recreation. They surveyed all the students at Ridge High School and collected the data shown in Figure 1.

Measures of central tendency for the data in Figure 1 are as follows:
• Mean = 3.84
• Median = 4

a) Identify the mode of the data in Figure 1. (1 mark)

b) A new student starts at Ridge High School. This student does not own any electronic devices and therefore spends 0 hours per day using electronic devices for recreation. State the effect on each measure of central tendency if the score of 0 was added to the data in Figure 1.

(i) Effect on mean: (1 mark)

(ii) Effect on median: (1 mark)

(iii) Effect on mode: (1 mark)
Data interpretation: measures of dispersion: range, normal curve, variance and standard deviation

- **Range**: the difference between the lowest and highest values in a set of data.

  \[
  \text{First reorder the data set from smallest to largest, then subtract the first element from the last element.}
  \]

  **Examples**:

  \[
  \begin{align*}
  \text{Data Set} & = 2, 5, 9, 3, 5, 4, 7 \\
  \text{Reordered} & = 2, 3, 4, 5, 5, 7, 9 \\
  \text{Range} & = (9 - 2) = 7
  \end{align*}
  \]

Normal curve/normal distribution/bell curve (pg. 293 text book)

**NOTE**: normal curve, normal distribution and bell curve mean the same thing. Use any of the terms.

**Normal distribution**: a bell shaped curve that has the same slope up and downwards.

![Normal Distribution Graph](image)

This graph shows the normal distribution (or bell curve). The curve has the same slope upwards and downwards.

**Variance** (pg. 293 text book)

- In a population, the mean, median and mode may be the same, but the distribution (spread) of scores may be different, as illustrated by the graphs on the right.

- These graphs depict two different distributions of IQ scores with respect to two unique populations. Note that in both examples, the mean, median and mode are 100. However, in the first population, there is a greater spread of scores.

- In such situations, it is useful to calculate the variance.

- **Variance**: the spread of variables around the in a set of data.

For example, the set of scores \([1, 1, 3, 5, 7, 9, 9]\) has greater variance than the set of scores \([1, 3, 5, 5, 7, 9]\). Both have a mean of 5 but the top set has more numbers spread further away from 5 than the bottom set.
Standard deviation (pg. 293 text book)

- Because the variance gives very large numbers, the variability of the data is most conveniently measured by the standard deviation, which measures the ‘average’ or standard distance of scores from the mean.

- The greater the spread of scores, the higher the standard deviation.

- **Standard deviation**: the spread of a group of scores.

**Role of probability**

- Probability refers to the likelihood of an event occurring. Tests of statistical significance provide an estimate of how often experimental results might have occurred by chance alone. The results of a significance test are stated as a probability, or *p*-value. This probability gives the odds that an observed difference is due to chance alone. In psychology, an experimental result that could have occurred by chance is five times (or fewer) out of 100 (in other words, less than 5% probability, or *p*<0.05) is considered statistically significant.

- **Statistical significance**: It is a statistic that provides an estimate of how often experimental results could have occurred by chance alone. It is expressed as ‘*p*-value.’

![Diagram of Statistical Significance](image)

Tests of statistical significance provide an estimate of how often experimental results might have occurred by chance alone.

- Some researchers use a more conservative estimate of statistical significance, depending on the research they are conducting. In a conservative experiment (a drug trial, for instance) where it is important that only results due to the IV (independent variable) are reported, the significance levels are set very high (for example, at 0.01 or 0.001). In such cases, a statistically significant result is considered to be one that could have occurred by chance alone one time (or fewer) out of 100 (in other words, an equal or less than 1% probability, or *p*<0.01). In other exploratory studies where researchers are examining general trends, much lower significance levels can be set (for example, at 0.1).

- If you conduct a study with a significance level set at *p*<0.05, then the following will be true:

  - If *p* is less than or equal to 0.05 (for example, 0.04), then the difference between the experimental group’s results and the control group’s results is said to be statistically significant (that is, not due to chance alone), and likely due to the effect of the IV (independent variable). The experimental hypothesis is therefore supported.

  - If *p* is greater than 0.05 (for example, 0.08), then the difference between the experimental group’s results and the control group’s results is said not to be statistically significant (that is, it is likely due to chance alone). The experimental hypothesis is rejected.
2. Researchers wanted to determine the effect of drinking caffeine on students’ heart rates. The researchers collected 100 year 12 student volunteers. Fifty students were randomly assigned to Group One and fifty were assigned to Group Two.

The following sequence of tasks was undertaken by each of the participants.

• Sit calmly in a quiet room for five minutes.
• Drink one cup of hot coffee (for Group One, no caffeine; for Group Two, caffeine).
• Have researcher measure heart rate.
• Return and repeat the procedure on two more consecutive days.

At the conclusion of the study, the following results were calculated.
Group One: no caffeine. Mean heart rate = 70 beats per minute.
Group Two: caffeine. Mean heart rate = 85 beats per minute.

a) State the hypothesis the researchers would be testing in this study. (2 marks)

_______________________________________________________________________________________________
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b) (i) Identify the independent variable. (1 mark)

_______________________________________________________________________________________________

(ii) Identify the dependent variable. (1 mark)

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c) A statistical test on the difference between the mean scores for Group One and Group Two found that it was ‘statistically significant’. Explain what this finding means. (2 marks)

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d) Identify one source of error in the design of this experiment and suggest a way of reducing this error. (2 marks)

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3. Teachers at Ridge High School wanted to further investigate the amount of use of electronic devices for recreation by their students by examining the relationship between the amount of use and students’ achievement test scores. The data is shown in Figure 2.

![Graph showing relationship between recreational electronic device use and students’ achievement test scores](image)

Figure 2

a) (i) Name the type of graph shown in Figure 2. (1 mark)

_________________________________________________________________________________________________

(ii) Identify the type of relationship between the variables shown in Figure 2. (2 marks)

_________________________________________________________________________________________________

b) The researchers calculated the correlation between the variables in Figure 2 and found $p < .05$. State whether this result was statistically significant. (1 mark)

_________________________________________________________________________________________________

c) Describe what it means when psychologists find a ‘statistically significant’ result from a statistical test. (2 marks)

_________________________________________________________________________________________________

_________________________________________________________________________________________________

d) The researchers concluded that using electronic devices for recreation for more than 2 hours per day causes lower achievement test scores in students. State whether this was a correct conclusion to draw and explain your response. (2 marks)

_________________________________________________________________________________________________

_________________________________________________________________________________________________
**Interpreting correlation coefficients and scattergrams**

- A correlation measures the linear relationship between two variables. Correlation coefficients are numerical measures of this relationship.

- Example of a correlation: the corpus callosum is a band of fibres connecting the two hemispheres of the brain, enabling them to communicate with one another. Researchers have found a strong positive correlation between the amount of classical musical training a person has, involving the coordination of the left and right hands, and the size of the corpus callosum. This means that the corpus callosum of a trained pianist may be larger than the corpus callosum of a non-pianist. This example, like all correlations, can only measure the degree of association between two variables. Causal relationships cannot be established. Therefore, without further statistical analysis, we would be unable to assert that musical training causes the corpus callosum to grow. A positive correlation means that as one variable increases, the second variable also tends to increase. Our musician example illustrates this. A highly trained musician will have a large corpus callosum; a moderately trained musician will have a moderately-large corpus callosum, and an individual with no musical training will have an average-sized corpus callosum.

There are many other examples of positive correlations. The amount of tobacco smoked and the incidence of lung cancer is one such example.

*List three more examples of positive correlations.*

a) _______________________________________________________________

b) _______________________________________________________________

c) _______________________________________________________________

A negative correlation means that as one variable increases, the other tends to decrease. For example, as exercise increases, the risk of heart disease decreases.

*List three more examples of negative correlations.*

a) _______________________________________________________________

b) _______________________________________________________________

c) _______________________________________________________________
• As well as the direction of a correlation, its strength can also be measured using a statistical formula.

You do not need to know how to calculate these formulae but you do need to be able to interpret the correlation coefficients from these calculations.

• Correlation coefficients vary in strength from 0.00 (no correlation) to 1.00, a perfect correlation. A plus sign (+) before the correlation coefficient indicates a positive correlation, whereas a minus sign (-) indicates a negative correlation. Therefore a correlation of -1.00 is a perfect negative correlation. Usually a correlation needs to be equal to or stronger than 0.50 to be considered statistically significant by psychologists.

A scatterplot is a useful way of simultaneously visually depicting both the direction and strength of a correlation. The values of one variable are shown on the x axis, and the values of the other variable are shown on the y axis. Each piece of data is represented by a dot. If the dots tend to slope upwards, this is indicative of a positive correlation. Conversely, if the dots tend to slope downwards, a negative correlation is evident.

A line of best fit is drawn through the centre of the dots to indicate where a perfect correlation should lie. This is used to gauge the strength of the correlation. Dots mainly falling close to or on the line mean that the correlation is strong, while dots spread widely away from the line mean that the correlation is weak. Dots that appear to be indiscriminately placed mean that there is a 0.00 or no correlation.

Using these blank scattergrams, draw examples of the following correlations.
**Difference between sample and population data**

Data: information (observable facts) that psychologists systematically collect in studies, investigations and experiments.

**Population data**: data collected from a whole population that is defined by the researcher.
- For example, the height for all women in the U.S ages 18-35 or the weekly time spent online in hours by all children ages 11-17.
- A large population may be impractical to study because of the time it would take and the high cost.

**Sample data**: data collected from the sample that is being studied.
- A small but well-chosen sample can accurately reflect the characteristics of the entire population from which it is chosen.
- Collecting sample data is more manageable and less expensive to study.

**Sampling methods**

- **Convenience sampling**: is a method of sampling in which participants are chosen because they are close by and easily accessed.

- **Random sampling**: is a common sampling method that ensures that each member of the population of research interest has an equal chance of being selected into a study. This method is to ensure that the sample is representative of the population. This can be done through using a series of random numbers (manually selected like Lotto, from a random numbers table or from a computer-generated program) to determine group allocation, by tossing a coin, or by drawing names out of a hat.

- **Stratified sampling**: is a method of sampling used when there are several groups or ‘strata’ in a population and it is important to represent these groups in the same proportions in the sample.

- **Random-stratified sampling**: the population is divided into a number of strata according to some characteristic of interest related to the variable(s) being studied (for example, age, gender or income). Then a list of all persons within each stratum is obtained. Simple random samples are then selected from each stratum to ensure that each member of the group has an equal chance of being selected for the sample. Random samples of proportionate size are drawn from within each stratum, making the sample a proportionately-stratified random sample.

**Sources of error in data and ways of reducing these** (pg. 158, 295 text book)

- There are potential sources of error in data that emanate from the participants and from the experimenter.

Sources of error in data could include: participants not randomly selected, participants in groups not randomly allocated, experimenter effect/experimental bias, participants changing behaviour due to predictions regarding research.

1. Random sampling can be used to ensure that the sample is representative of the population.

2. Random allocation is used to allocate participants to groups and can be used as a way to reduce differences between experimental and control groups. (Random allocation is a concept of ‘independent measures’, an example of a type of experimental research method).

3. Try to eliminate the experimenter effect.

4. Use a placebo to reduce participant error (when participants change their behaviour due to being part of a study).
Practical issues associated with planning and conducting research

Practical issues associated with planning and conducting research include:

- Obtaining ethical consent before being able to carry out the research.
- Making sure the ethical guidelines are followed throughout the research.
- Obtaining an appropriate sample.
- Carrying out research that will be valid as well as reliable.
- Carrying out research that will be statistically significant.
- Trying to eliminate uncontrolled variables.
- Trying to eliminate the experimenter effect.

Evaluation of and ways of improving research (pg. 297-298 text book) – put in key points for four general steps.

Evidence-based conclusions related to the hypothesis

• When psychologists carry out experiments, they usually want to do more than describe and summarise data. They want to be able to determine whether their hypotheses have been supported by the data. To do this, they use inferential statistics, statistics that let them draw inferences and make conclusions from the data.

• There are many different types of inferential statistics that are beyond the scope of your course. The specific type used depends on the type of data being collected, the type of study being done, and what the researcher wants to know about the results. Researchers typically want to draw conclusions about the larger population from which their sample of participants was drawn.

• The researchers’ ability to come to conclusions about the population will depend on all the factors we have considered:
  • Selection of a representative sample.
  • Appropriate allocation of participants to experimental and control groups.
  • Ensuring participants are unaware of which group they have been allocated to.
  • Eliminating the possibility of experimenter bias.
Experimental and non-experimental research methods summary

Remember experimental research can allow for the researcher to manipulate the independent variable, a cause-and-effect relationship can be found and it allows for the random assignment of participants.

Remember non-experimental research does not allow for the researcher to manipulate the independent variable, a cause-and-effect relationship cannot be found and it does not allow for the random assignment of participants.

Experimental research methods include: independent measures.

Non-experimental (descriptive) research methods include: case studies, surveys, questionnaires, correlational studies, archival research, observational studies/observations.

Qualitative and quantitative methods summary

Qualitative methods are those that involve written descriptions and no numerical data.
Quantitative methods are those that include numerical data.

Quantitative methods include: rating scales, Likert scales, checklists, surveys (self-rating scale), questionnaires.

- Subjective quantitative methods: rating scales, Likert scales, checklists, questionnaires.
- Objective quantitative methods: physiological measures (e.g. heart rate).

Subjective: based on personal opinions, interpretations, emotions and judgement.
Objective: based on facts that can be proved through analysis, measurement and observation.

Qualitative methods include: interviews (fixed response/open ended), focus groups, questionnaires (open ended), surveys, observational studies/observations, archival research, checklists.

<table>
<thead>
<tr>
<th>Role of experimenter</th>
<th>Limitations</th>
<th>Strength/benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qualitative methods</td>
<td>Experimenter can influence the way in participant answers the question. The experimenter can bias the results by the way they ask questions. The experimenter has much more freedom around how the results are analysed. The researcher has more freedom around how the results are interpreted/interpretation of the results is very subjective.</td>
<td>Time consuming to collect Data. Time consuming to collate/analyse data. Can not generalise results to the population. Costs a lot of money. Cannot analyse statistically.</td>
</tr>
<tr>
<td>Quantitative methods</td>
<td>Experimenter is independent/external to the process.</td>
<td></td>
</tr>
</tbody>
</table>
Correlational studies

• To begin, two factors of interest are measured. Then a statistical technique is used to find their degree of correlation. For example, we might look for a correlation between the number of hours slept at night, and afternoon sleepiness. If this relationship were shown to be strong, then knowing how long a person sleeps at night would allow us to predict their degree of afternoon sleepiness. Likewise, afternoon sleepiness might be used to predict the duration of night-time sleep.

Behavioural variables in correlational studies

• Correlational studies are often conducted when experimental ones would be inappropriate, for example, when studying whether there is a relationship between pre-term (or low) birth weight and academic performance at school. It would be unethical as well as impractical to vary infants' birth weight, so existing information is used to explore the relationship.

• Behavioural variables in correlational studies are thus often those that pre-exist and cannot be varied as an independent variable. The strength of the correlation (if that is calculated) describes the relationship, usually as strong, moderate or weak. If the correlation coefficient is calculated, a score of +1 indicates a very strong positive correlation between two variables and one of -1 indicates a strong negative relationship. Such extreme correlations are rare. A positive correlation means that high scores on one variable are associated with high scores on the other variable, while a negative correlation means that when the score on one variable is high it is low on the other.

• A correlation does not indicate causation in most cases, often because there are other variables involved. So there might be a correlation between the amount of lead left in a pencil and the time spent writing (which could be cause and effect), but the type of lead and the pressure applied by the writer might also affect the amount of lead left.
<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
<th>Benefits</th>
<th>Limitations</th>
<th>How to classify it</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case studies (e.g. Phineas Gage case study)</td>
<td>An in-depth focus on all aspects of a single person. Case is studied in context (e.g. children school) &amp; uses variety of data collection techniques (including observation and interview).</td>
<td>Provide detailed info. Provides insight for future research.</td>
<td>They are uncontrolled studies. Lack formal control groups limiting the conclusions that can be drawn from clinical observations.</td>
<td>Non-experimental Could be either/both quantitative or qualitative depending on data collection techniques used.</td>
</tr>
<tr>
<td>Survey (self-rating scale)</td>
<td>Researcher gathers self-reported data from participants who, ideally, have been randomly selected.</td>
<td>Can analyse data statistically. Can collect data from large Number of people. Can be conducted remotely to reduce/prevent geographical dependence. Cost efficient to study large group. Time efficient to study large group. Often administered to different groups of people allowing comparisons to be made across groups.</td>
<td>Responses limited to options provided. No opportunity for rich data or reasons for responses. Wording effect (phrasing &amp; order of questions can greatly affect people’s answers. Responses must be gathered from a representative sample.</td>
<td>Non-experimental Could be either/both quantitative (subjective) or qualitative depending on data collection techniques used</td>
</tr>
<tr>
<td>Checklists</td>
<td>Provides Yes/No information on certain statements.</td>
<td></td>
<td></td>
<td>Non-experimental Quantitative (Subjective quantitative)</td>
</tr>
<tr>
<td>Rating scales (e.g. Likert scales)</td>
<td>Allows people to indicate strength of agreement/ how much they agree with a certain statement.</td>
<td></td>
<td></td>
<td>Non-experimental Quantitative (Subjective quantitative)</td>
</tr>
<tr>
<td>Correlational Studies</td>
<td>Study designed to measure the degree of relationship between two existing traits, behaviours or events.</td>
<td>They raise alternative hypotheses that can be then tested in research using an experimental design that can allow cause to be examined.</td>
<td>Finding a correlation between two measures doesn’t demonstrate causation.</td>
<td>Non-experimental Could be either/both quantitative or qualitative depending on whether description or numerical data used.</td>
</tr>
<tr>
<td>Archival Research (e.g. using private documents like diaries, public documents held by hospitals).</td>
<td>Examination of old, usually written material found in places like libraries, government buildings, law courts and universities.</td>
<td>Usually cheaper than collecting new data. Allows examination of data gathered over long period of time without taking researcher’s lifetime. Allows access to very large, representative samples.</td>
<td>Time needed to identify appropriate data sets &amp; get permission to use the data. Effort required to understand all factors involved with the data. Knowledge and skill required to analyse large and complex data sets.</td>
<td>Non-experimental Qualitative</td>
</tr>
<tr>
<td>Physiological measures (e.g. heart rate)</td>
<td>Measurement of physiological structures &amp; functions.</td>
<td></td>
<td></td>
<td>Non-experimental Quantitative (Objective quantitative)</td>
</tr>
<tr>
<td>Interview</td>
<td>A meeting between a participant &amp; an interviewer to collect data for research.</td>
<td>Rich data collected. Opportunity to discover detail or reasons for responses.</td>
<td>Responses may not be Honest. Huge time required to study group.</td>
<td>Non-experimental Qualitative (Subjective qualitative)</td>
</tr>
<tr>
<td>Observational studies/ observations</td>
<td></td>
<td></td>
<td></td>
<td>Non-experimental Qualitative</td>
</tr>
<tr>
<td>Independent measures</td>
<td>Random allocation is used to make sure each participant has an equal chance of being assigned to one group or the other.</td>
<td></td>
<td></td>
<td>Experimental</td>
</tr>
</tbody>
</table>