# Unit 3 & 4 Psychology Key Science Skills

**Psychology Key Science Skills/Research Methods** Summary Pages

## Research Methods Key Areas & Concepts:

### Key Science Skills

- Develop aims and questions, formulate hypotheses and make predictions.
- Comply with Safety and Ethical Guidelines
- Generate, collate and record data
- Analyse and evaluate data and investigation methods
- Construct evidence based arguments and draw conclusions.
- Analyse and communicate scientific ideas.

## Aim, Hypothesis & Variables:

### Aim:

The aim is a statement outlining the purpose of the investigation.
It can range in length from a single sentence to a short paragraph and should be expressed as clearly and precisely as possible. Some examples of appropriate research aims are:

- The aim of this investigation is to compare differences in the amount of sleep obtained by adolescents and very old people.
- The aim of this experiment is to assess the effects of practice on learning.

### Hypothesis:

**A research hypothesis is a testable prediction of the relationship between two or more variables (events or characteristics)**
For example, it may be a prediction about the relationship between: Mobile phone conversation while driving (one event) and driving performance (another event)

The hypothesis formulated for an investigation essentially describes the researcher's expectation about what the results will be. It is usually based on knowledge of other research findings or theories or models on the question of interest.
The hypothesis is formulated before the investigation is conducted and provides a very specific focus for the investigation and its report

### Research Hypothesis:

A research hypothesis must include four elements:

- A **Population**
  - An *Independent variable*
  - A *Dependent variable*
- **Directionality** (a prediction)

### Formulating a Hypothesis:

This is where you write a testable prediction or an educated guess about what you expect will happen.
When constructing a hypothesis, use the following template:

> It was hypothesised that POP who IV would have increased/decreased/higher/lower/more/less DV, compared to POP who no IV, as measured by _____.

### Hypothesis vs Theory and Models

In VCE Psychology you need to be able to develop aims and hypotheses and link these to theories and models.
**A theory is a body of interrelated concepts ('ideas') that attempt to explain interrelated observations and make predictions about future events.**
The term model is often used interchangeably with theory, however, **a model in psychology focuses more on representing how some behaviour and/or a mental process(es) could, should or does occur.**

- A research hypothesis is a specific prediction that guides the collection, analysis, interpretation and evaluation of data that has been collected to test it.
- Whereas a theory or models are generally broader and far more detailed, with a focus on describing and/or explaining.

### Variables: IV = Manipulated or Changed; DV = What is being measured

A key science skill in VCE Psychology requires you 'to identify independent, dependent and controlled variables in controlled experiments'.
A controlled experiment is an experimental investigation to test the relationship between an independent variable and a dependent variable, whilst controlling all other variables.
**A variable is something that can change ('vary') in amount or type and is measurable.** There are many different types of variables, which include

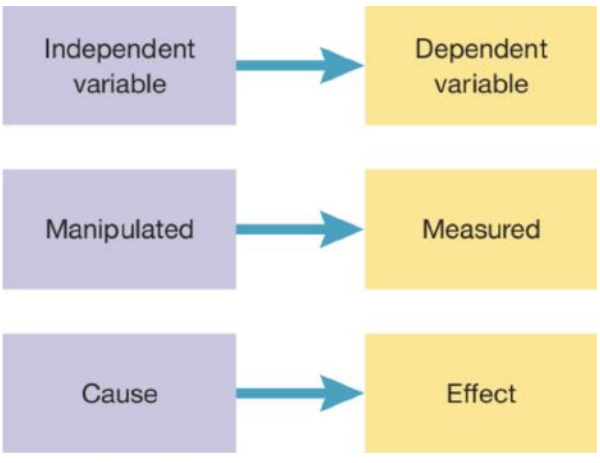
- **Independent variable (IV):** The variable that is manipulated (controlled, selected or changed) in order to test its effects on the dependent variable
- **Independent variable (DV):** The variable the researcher measures, after selecting the independent variable that is assumed to have an effect on the independent variable
- **Controlled variable**: a variable that is considered to have an effect on the dependent variable so it is held constant to remove its potential effect

The IV is assumed to have a direct effect on the dependent variable. Therefore, in terms of cause and effect, the IV is viewed as the cause of any change that may result in the dependent variable.

- **For example,** an experiment on whether watching a violent TV program increases aggressive behaviour, the IV will be exposure to a violent TV program.

An experiment can also have more than one IV. More complex experiments have three or more values of the IV
The DV is often the responses made by participants and usually has a numerical (quantitative) value.

- **For example,** behaviour such as aggression in young children. Aggressive behaviour is the DV, because the participants' responses are believed to be influenced by, or 'dependent on', the effects of the IV




### Controlled Variables:

In addition to the independent and dependent variables, there are other variables that the experimenter should anticipate and take account of.
A **controlled variable** is one that is considered to have an effect on the dependent variable in an experiment so it needs to be held constant ('controlled') to remove its potential effects.

- **For example**, an experiment on the effect of listening to classical music while studying for a Psychology Exam. Variables that would have to be kept constant include **how**

**long students listen to the music for**, **what classifies as classical music**, t**he ability of the students and previous knowledge** and **exposure to Psychology content**.

When planning and conducting an experiment, it is essential that the experimenter is confident that manipulation of the IV is likely to cause the predicted change in the DV, rather than some other variable that is not adequately controlled.

## Controlled Experiments/Experimental Design:

### Within Subjects:

**Within subjects** is an experimental design in which each participant is in both the experimental and control groups or all the treatment conditions (if there is no control group); also called *repeated measures*

| Advantages | Disadvantages |
|---|---|
| Need fewer participants than other research designs | Order effects |
| Fewer participants variables | |

### Between Subjects

**Between subjects** is an experimental design in which each participant is assigned to only one group or condition and provides only one score for data analysis; also called ***independent groups and between groups.***

This is where participants are allocated to *either* the control or the experimental condition; not both.

### Mixed Design:

**Mixed design:** An experimental design that combines the features of the within subject and between subjects designs

The researcher can assess the potential differences between two or more separate groups of participants (i.e. between subjects) as well as change in the individual members of each group over time (i.e. within subjects).

- **For example:** The blue eyed/brown eyed experiment - Jane Elliot
  - This was a between subjects design that was also done in a different order

## Sampling & Allocation:

### How to Choose Participants:

- We need to choose a ***sample*** from the ***population of interest***.
- Population of interest is the 'big' group we are interested in testing (**e.g:** uni students, doctors, township…)
- The sample is chosen from this population to be tested (a small proportion)

### Sampling:

- It is important to make sure that the sample is representative of the population (shares similar characteristics) for the best research conclusions to be made.

### Convenience Sampling:

- Convenience sampling is when subjects are picked based on their availability at the time of the experiment. Quick, easy, cost effective.
- Convenience sampling **usually presents a biassed sample**. They may not be representative of the population. Therefore, generalisations cannot be made.

### Random Sampling:

- Random sampling is where every member of the population has an **equal** chance of being selected for the sample being used in the study.
- Quick(er than stratified), relatively simple to employ. Less chance of bias, however can be open to bias if the population has under or over represented groups in it.

### Stratified & Random Sampling

- Stratified sampling is to be used when there is diversity or under/over represented groups in the population.
- Stratified sampling involves breaking the population into groups or 'strata' based on the characteristics you wish to control for in the sample.
- This could be age, gender, ethnicity etc.
- Once the population is divided into strata, participants are selected for the sample in the same **proportions** (ratios, percentages) that exist in the population.
- If random stratified sampling is used, this just means that the selection from the already defined strata uses the equal chance methods (**i.e:** names in hat)

## Experiment & Control Conditions:

The ***control condition*** is used as a comparison…the participants are NOT under the influence of the IV (they may be given a placebo)

The ***experimental condition*** is where participants ARE under the influence of the IV

### Participant Allocation:

**Random allocation:** participants have an equal chance of being assigned to any of the groups of the experiment (for example, control or experimental group)

- Use the same strategies to randomly allocate as is used for random sampling

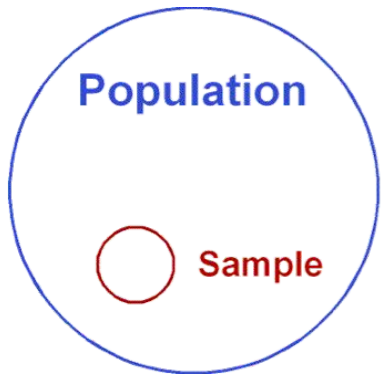
If the sample size is large enough it is likely that the participant characteristics of all groups will be fairly even (reducing the likelihood of participant related extraneous variables)

## Sources of Error & Their Control of Minimisation:

### Random Errors:

**Random errors** are errors due to some chance factor or chance variation in a measurement (so they are also called *chance errors*).

- **For example,** consider all the things that might affect each individual participant's performance on a memory task in an experiment — Perhaps one participant presents feeling ill, another arrives after an argument with their partner, another skipped breakfast and is hungry and another has to leave early for an appointment.




Many random errors cannot be eliminated but their influence can be controlled or minimised.

- **E.g:** Randomly allocating the participants to each group

### Systematic Errors:

**Systematic errors** are produced by some factor that consistently favours one condition rather than another (so they are also called *constant errors*).

They are typically associated with a flaw in some aspect of the research design, its procedures or implementation, like an inbuilt fault. Eg a sampling error or a faulty measuring instrument

Random errors reduce **both the consistency (reliability) and the accuracy (validity)** of measurements or results; whereas systematic errors **reduce accuracy (validity) but not consistency (reliability)** as the error is always in the same direction (i.e. consistently too high or too low).

- Random and systematic errors are different from personal errors.
- **Personal errors** are a fault or mistake by the researcher, also

called *human errors.*

## Extraneous Variables:

**Extraneous Variables:** They are any other variable apart from the IV which may cause a change in the DV (results)

↳ They are unwanted, annoying and interfering!

## Confounding Variables:

A confounding variable is a variable that **actually does** cause an impact on the DV

They **C**onfuse the results

They make the results ***unreliable***

It means the experiment will have to be conducted again (with the CV controlled for)

## Controlling Extraneous Variables:


## Participant Variables:

**The participant variables** are the personal characteristics that individual participants bring to an experiment and which could influence their responses.

These may be biological, psychological and/or social in nature.

**E.g:** Mood, temperament

*How can participant variables be controlled?*

- Random Sampling
- Random allocation
- Use of experimental design

## Situational Variables:

**Situational variables** are external factors (other than the IV) associated with the experimental setting that may influence participant responses and therefore the results.

**Examples of Situational Variables**

- Physical features of the immediate environment lighting conditions, background noise, time of the day, air temperature, presence or absence of other participants etc
- Order Effects
- Non- Standardised set of Instructions.

*Can be controlled by:*

- Standardised Set of Instructions
- Laboratory Settings/Controlled Environment
- Counterbalancing

## Order Effects:

**Order Effects:** Order effects imply that participants may ***improve*** in the second part of the experiment due to ***practice***. They may perform ***worse*** in the second condition due to ***boredom***

Which can be countered by; **Counterbalancing**

**Counterbalancing:** systematically changing the order or sequence of conditions to counter the effects of practice or carry over. This is where the participants complete the conditions in different orders.

**Everyone completes all conditions, just in different orders.**

## Standardised Instructions

We need to use standardised procedures to ensure that we are testing only for an impact of the IV on the DV (whilst limiting extraneous variables)

To assist with the standardised procedures...we need to choose the most appropriate research design

## Demand Characteristics

Cues in the experiment that may influence or bias the participants' response, therefore distorting the results.

Not a natural or genuine response. Manipulated in some way by the participants ( whether on purpose or unknowingly)

**E.g:** Participants bias - personal bias, guessing experiment, persumming results.

*Can be controlled by:*

- Deception
- Placebo
- Single Blind procedure

## Placebo/Deception

**Placebo effect** when there is a change in a participant's behaviour due to their belief that they are receiving some kind of experimental treatment and they respond in accordance with that belief, rather than to the effect of the independent variable

- A placebo could be described as a fake or false substitute

## Single Blind Procedure:

A **single blind procedure** is where the participants are unaware as to whether they have been allocated to the control or experimental condition

- Remember; we can also use a placebo to reduce likelihood of participants behaving in accordance to their expectations

## Experimenter Effects:

Is any influence the experimenter or other research assistants may have on the results of the investigation.

An experimenter effect may be derived from or occur through:

- Interaction with participants, or
- Unintentional errors when making observations, measuring responses, when analysing or interpreting the results.

*Controlled by:*

- Double blind
- Triple blind

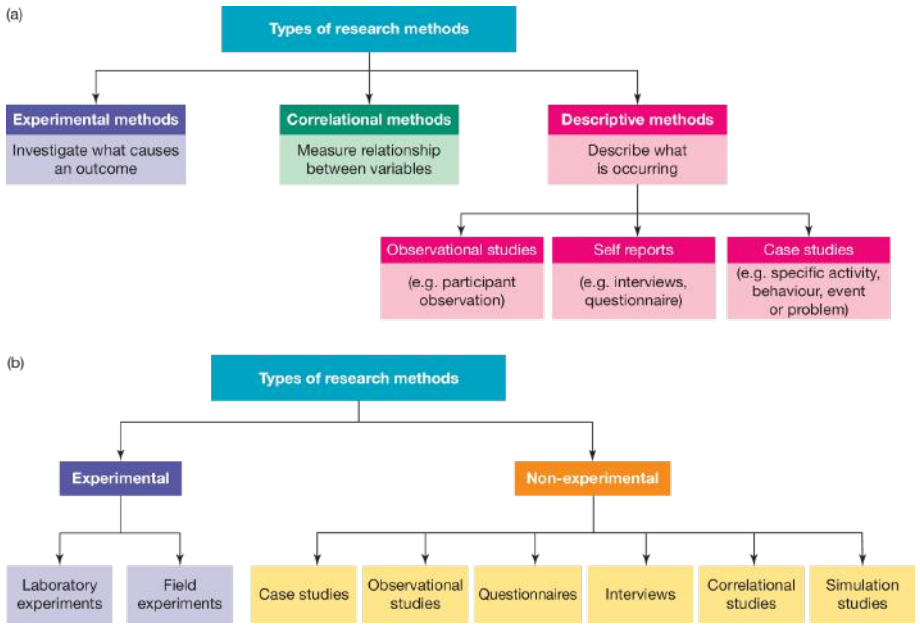
## Double & Triple Blind Procedures:

The **double blind procedure** is when both the participants and the experimenter(s) interacting with them are unaware of the conditions to which the participants have been allocated.

- Can be used in the setting of a placebo or experimental and control conditions.

**Triple blind** is a procedure in which the participants, experimenters, and research assistants only doing data analysis are all unaware of the particular *experimental conditions*

## Scientific Methodologies:




## Non-Experimental Methodologies:

1. Case Studies
2. Observational Studies
3. Questionnaires
4. Interviews
5. Correlational Studies
6. Simulation Studies

### 1. Case Studies:

**Case studies** are intensive, in depth investigations of some behaviour or event of interest. (Often a person or small group of interest)

- **E.g:** Genie, Phineas Gage

Most of what we know about the brain and mental processes comes from studying cases of people with brain damage.

| Advantages | Disadvantages |
|---|---|
| Very detailed and provide a hypothesis to be tested in the future | Unable to be replicated |
| Useful for investigating rare disorders and conditions | Very time consuming to process the data |

### 2. Observational Studies:

Data collection through watching behaviour as it occurs (in a natural setting or contrived setting)

Most often structured with a set list of observable data to measure. Data can be collected with the researcher taking either a **participant** (active group member) or **non-participant role** (conceal presence)

| Advantages | Disadvantages |
|---|---|
| More accurate information about typical behaviours of people and animals | Unable to obtain informed consent prior to the study |
| Unethical to study some behaviours in an experimental setting | Observer bias (similar to the experimenter effect) |

### 3 & 4. Questionnaires and Interviews - Self Reports

Questionnaires, interviews and rating scales are common

- Useful for a large number of participants
- Less structured than a questionnaire
- Easy to collect numerical data (likert scale)

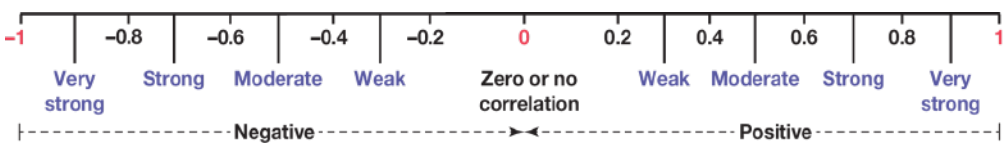
| Advantages | Disadvantages |
|---|---|
| Time efficient to collect data | People may not provide accurate information |
| Enable anonymity in collecting sensitive data | Language dependent (difficult to do with children) |

### 5. Correlational Studies:

A **correlational study** is used to investigate the relationship that exists between variables without any control over the setting in which the relationship occurs or any manipulation by the researcher.

- There are no IVs or DVs, or control groups, nor can the researcher randomly assign participants to different conditions.
- The researcher merely measures the relationship between the variables of interest with no intervention.

The term **correlation** is used to describe the degree of a relationship between two variables; that is, how strongly two variables are 'co-related', associated or co-vary. When describing a correlation, reference may be made to the direction of the relationship between the variables and the strength of the relationship.




| Advantages | Disadvantages |
|---|---|
| Can be used to test hypotheses where an experiment may be ethically inappropriate | They do not permit the researcher to draw firm conclusions about cause-and-effect relationships. |
| They can indicate patterns or trends and contribute to the development and testing of theories and models. | |

### 6. Simulation Studies:

**Simulation studies** involve reproducing situations of research interest in a realistic way to investigate the behaviour and/or mental processes of individuals in that environment.

- **For example:** The Stanford Prison experiment, Virtual Reality simulation

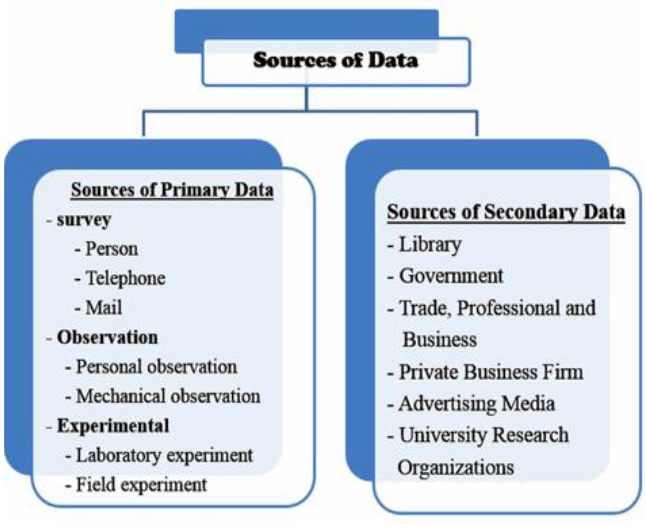
| Advantages | Disadvantages |
|---|---|
| A suitable alternative when the real environment is not available or possible | The studies may lack realism and participants may behave differently due to the artificial setting |
| a time- and cost-effective alternative for researchers. | Difficult to generalise results |

### Types of Data:

### Secondary & Primary Data:

**Primary Data:** collected directly by the researcher and analysed by the researcher

**Secondary Data:** collection by someone else (journalist, ABS)



## Qualitative & Quantitative Data:

**Qualitative Data:** written or verbal or even a picture (NOT numerical data)…can even be converted into quantitative data

**Quantitative Data:** Numerical data, which enables more precise analysis

- Often qualitative and quantitative data are both used

## Objective and Subjective Data:

**Objective data** is information that is observable, measurable, verifiable and free from the personal bias of the researcher.

**For example:**

- The data can be seen, heard or touched (observable)
- Counted or precisely described (measurable)
- Factual (free from personal bias).

**In science, there is a strong preference for objective data**.

**Subjective data** is information that is based on personal opinion, interpretation, point of view or judgement.

- It cannot always be verified by the researcher
- It is often biassed
- It can vary from person to person, day to day from the same person
- It is not always entirely accurate.

## Reliability and Reproducibility:

When conducting psychological research, it needs to be reliable and valid. The restils need to be accurate and measure the aim of the experiment.

Reliable and Valid results are achieved when the research, its data collection procedures and measurement tools are also reliable and valid.

**Reliability** refers to the extent to which the results are consistent, dependable and stable. (if the experiment was replicated/repeated would similar results be obtained)

- **For example**, in everyday life we would like a reliable car or thermometer. In Psychology reliability refers to the measurement tool producing the same and consistent results, for example IQ tests are generally considered reliable and produce consistent results no matter who is conducting them.

**Reproducibility** how close the results are to each other when an investigation is replicated under changed conditions.

*This can include:*

- The observer, **e.g:** a different independent researcher
- The measurement instrument, **e.g:** data collection tool
- The measurement procedure, **e.g:** research method, type of experimental design, number of experimental and control groups
- The setting, the location, and the time.

## Validity:

**Validity** refers to the appropriateness and accuracy of the measurement. (does it measure what it is intending to measure)

- **For example,** placing a hand on a person's forehead is not a valid measurement of their temperature**,** Whereas a thermometer is a valid measurement of temperature.

Validity also relates to the results obtained from research and the conclusions (including any generalisations) the researcher makes. Validity means that the results represent accurate findings among similar individuals in the population from which the sample was drawn.

- **Internal validity;** the extent to which an investigation actually investigated what it set out to investigate and/or claims to have investigated; compare with *external validity*
- **External validity;** the extent to which the results obtained for a study can be applied beyond the sample that generated them, specifically to individuals in a different setting and over time; compare with *internal validity*

## Ethics:

## National Statement on Ethical Conduct in Human Research:

- Jointly developed by the National Health and Medical Research Council, the Australian Research Council & the Australian Vice-Chancellors' Committee.

| | |
|---|---|
| *1.* Research merit and integrity | **Merit:** worthwhile and conducted appropriately **Integrity:** researches committed to search for knowledge, follow ethical guidelines and report findings (favourable or not) |
| *2.* Beneficence | Benefits to participants and wider community outweighs any risks of conducting such research |
| *3.* Justice | Burden of participation AND benefits spread among the population |
| *4.* Respect for human beings | Respect for the uniqueness of the individual |

## Role of the Experimenter:

- To **uphold the rights of the participant**…to make sure they don't come to any harm!
- To **observe legislation**

*Ethical Treatment of Participants:*

- Do no harm
- Explain the studies benefits
- Explain participant rights and protections
- Obtain informed consent

## Confidentiality:

- Do not disclose personal information that may identify a participant

## Voluntary Participation:

- The ***participant cannot be coerced or forced*** to be involved in the experiment…it must be via their own free will

## Withdrawal Rights:

The participant ***has the right to leave the experiment at any time…or to have their results excluded at the conclusion of the experiment***.

- They CANNOT be forced to stay
- A participant can leave whenever they chose to do so

## Informed Consent:

- Participants must be told of the ***nature*** of the experiment, including any risks associated
- Then they **sign** a consent form, or if they are under 18 years of age their **parent/guardian** must sign

## Deception:

- Can ***only*** be used if approved by an ethics committee
- Only approved if that particular piece of **knowledge** might influence the outcome of the experiment
- It is where some information is withheld…
- At the end of the experiment it must be explained to the participant how and why deception was used (**Debriefing**)

## Debriefing:

- At the end of the experiment the researcher must ***explain*** the **results** of the experiment, how they will be **used**, and offer counselling to ***remove any psychological effects/harm*** as a result of the experiment