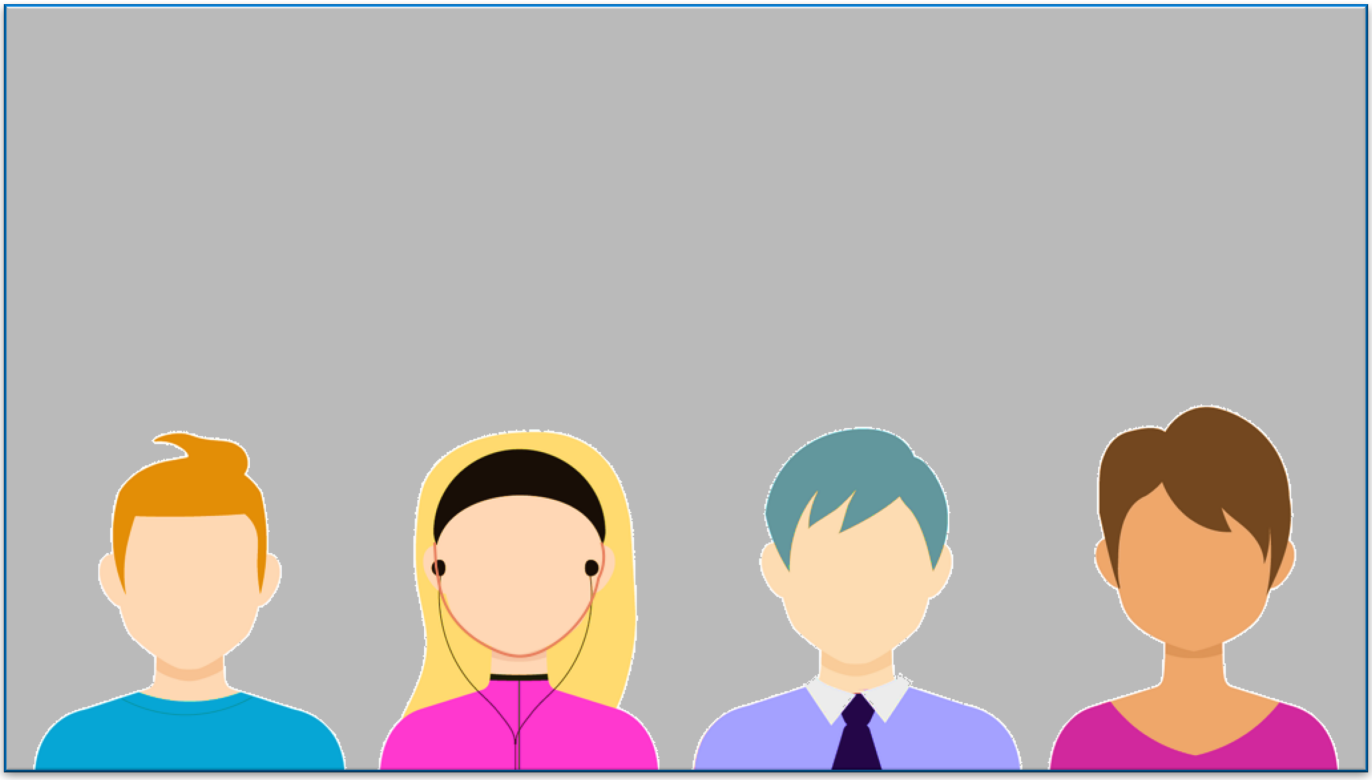


Research Methods

Psychology

Year 11/12 Transition Booklet

Contents

Types of Psychological Studies

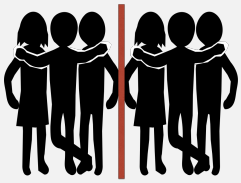
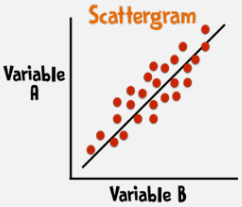
Exercise 1: Fill in the missing parts of the table below. The gap-fillers will help you.

Type of study: Experiment • Correlational Study • Naturalistic Observation

Nature of the Study: Investigates the relationship between two variables • Detailed examination of a single individual • Presents a number of questions in oral or written form

Number of individuals studied: One • Usually a large number of people or instances • Many in each group/condition • Usually quite a large sample of literate people

Characteristics: Unobtrusive, occurs in realistic environment • Cannot establish a cause-effect relationship, but can show an association between variables

					
Type of Study	Case Study	Survey or Questionnaire			
Nature of the Study			Investigates what people or animals do in normal conditions	Controls a certain variable systematically in order to establish its effect (if any)	
Number of Individuals or Instances Studied			Usually several individuals		
Characteristics	Suitable for studying rare conditions or experiences	Allows investigation of a large literate population; dependent on respondent interpretation and accuracy		Can establish a cause-effect relationship, provided that it is well conceived and carefully carried out	

Which psychological study?

case study | experiment | correlational study naturalistic observation | survey or questionnaire

Exercise 2: Which type of study above would you choose – and why?

a A young worker for Oxfam develops Post-Traumatic Stress Syndrome after being kidnapped by a terrorist group and later released. His experiences are examined closely, especially since his case is relatively rare.

b The duration of breast-feeding is found to be linked to IQ: the longer the duration, the higher the IQ. (Mortensen, 2002)

c A study of doctors' fatigue found that young interns driving home after a 24-hour shift were twice as likely to have a car accident when driving home than those who had completed a 12-hour shift or less.

d After radical surgery affecting his hippocampus, HM suffered a horrifying loss of memory functionality. He was no longer able to form new long-term memories. His experience was closely examined for decades, since it revealed how human memory functions.

e When people are questioned by telephone about whether they wash their hands after using a public bathroom, 91% per cent respond that they do so. (Bakalar, 2005)

f Through unobtrusive surveillance of people in six major cities in the USA, it is found that 82% wash their hands after using a public bathroom; 90% of women wash their hands, but only 75% of men. (Bakalar, 2005)

g Phineas Gage was working on the railway when, during explosive works, an iron rod shot through his head, destroying part of his left frontal lobe. The changes in his behaviour and personality became a subject of investigation and interest.

h In a study carried out by McClure et. al. (2004), people's taste preferences for Coke or Pepsi were explored through examining their brain activity on an fMRI machine. In one condition, participants tasted the two drinks, which were offered unlabelled. In the other, one drink was labelled and the other was not (yet it was the same coke as the labelled drink). (Plotnik, p.210)

i Children with ADHD are watched closely by an aide in a school classroom. It is found that they have difficulty in staying seated, do not pay attention to the teacher, are sometimes rude to other students and often do not complete their work. (Hill, 2003)

j Each year the Education Department requires students to fill out an "Attitudes to School" booklet, in which most questions are presented on a five-point scale from "strongly disagree" to "strongly agree".

Independent and Dependent Variables

Consider the study below, which you first encountered above on page 3:

In a study carried out by McClure et. al. (2004), people's taste preferences for Coke or Pepsi were explored through examining their brain activity on an fMRI machine. In one condition, participants tasted the two drinks, which were offered unlabelled. In the other, one drink was labelled and the other was not (yet it was the same coke as the labelled drink). (Plotnik, p.210)

The **independent variable** is always the key difference between groups or conditions in an experiment. It is the factor that is hypothesised to bring about a change in the participants' behaviour, performance or reactions. It is the variable that the experimenter has isolated in order to investigate its effect. The experimental group, or the participants in the experimental condition, are exposed to this variable or factor.

In the study above, therefore, the independent variable (or IV) is how the drinks are presented – labelled or not.

Independent Variable:
One labelled and one unlabelled drink presented (as opposed to both drinks being unlabelled)
You could also express it like this:
Presentation of drinks: one of two labelled versus neither drink labelled

The **dependent variable** is what the experimenters or researchers are measuring in order to make a judgement on the effect (if any) of the independent variable. In this study the researchers examine the brain activity of the participants in each condition. This is therefore the dependent variable. It must be a factor or variable that you can quantify, measure systematically and describe clearly.

Exercise 3: Mark the following phrases with different-coloured highlighters to show which pertains to or refers to the **independent variable** and which to the **dependent variable**.

Hypothesised causal factor in a study

This measure provides insight into the performance, reactions or responses of all participants

Factor to which the experimental group is exposed

Variable that is measured in order to determine the effect of the supposed "causal" variable

The control group does not experience this factor.

Factor that is isolated and manipulated by the researcher

The key difference between groups or conditions in an experiment

The so-called "effect" in an experiment

Identify the variables…

Exercise 4: Identify the **independent** and **dependent variables** in each of the following experiments:

a In a study of the effects of sleep deprivation, eighty participants are randomly allocated to four groups: no deprivation (normal sleep), partial deprivation (of REM sleep), partial deprivation (of deep sleep) and total deprivation (no sleep). After two nights of these conditions, the participants undertake various tests and gain a score for their memory and problem-solving performance.

- **Independent Variable:** _____
- **Dependent Variable:** _____

b The school administration wishes to investigate the effects of introducing laptops on student motivation. They select two parallel classes at Year 7, both taught by the same English teacher, one of which works with the laptops, while the other uses exercise books as usual. After two months of classes, students complete a survey in which they rate their motivation levels and their perception of their learning achievement.

- **Independent Variable:** _____
- **Dependent Variable:** _____

c A group of children who have been diagnosed as suffering from ADHD are involved in a study of the effects of Ritalin. First, all the children are assessed through their teachers' ratings of their concentration span and willingness to pay attention. The experimental group is then given Ritalin over a month-long period, while the control group is given a placebo. Naturally the participants do not know whether they are in the control or the experimental group. In addition, the researchers who interact with the participants do not know which ones are given the real medication and which ones the placebo. After the month-long treatment, the children's teachers, who also do not know whether the child has been given a real or a simulated treatment, again rate the students on their concentration span and willingness to pay attention. The difference between the original ratings and the final ratings is measured to determine the effect, if any, of the Ritalin therapy.

- **Independent Variable:** _____
- **Dependent Variable:** _____

d Instead of the usual escalator and stairs provided at underground railway stations, a Swedish company designed steps that looked and sounded like piano keys. The prediction was that commuters would be more willing to use the stairs if there was some kind of novelty in doing so. It was found that on the day the stairs were introduced, a substantially higher percentage of commuters chose to climb them than on the day before.

- **Independent Variable:** _____
- **Dependent Variable:** _____

Three Experimental Designs

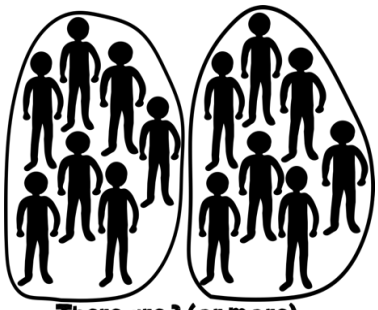
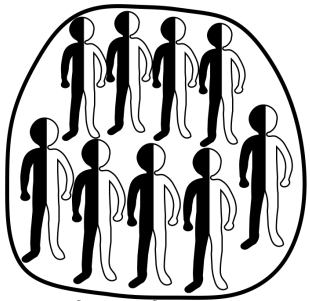
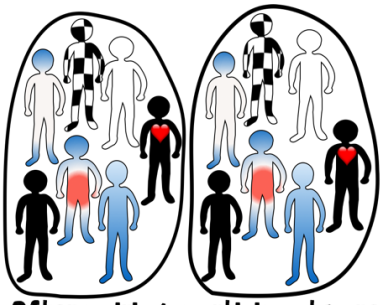
Exercise 5: Fill in the missing parts of the table below. The gap-fillers will help you. Then answer the questions below the table.

Type of experiment: Repeated Measures • Matched Participants • Independent Groups

Description: Participants are paired on vital characteristics • All participants are exposed to both the experimental condition(s) and the control condition • There are two completely unrelated groups

Advantages: Reduces the effect of participant variables X2 • Simplest design to administer

Disadvantages: May lead to order effects • The results may be affected by participant variables • Quite complex to administer, since preknowledge of participants is required

	 There are 2 (or more) separate groups.	 All participants experience each condition.	 After pairing, participants are randomly allocated to groups.
Type of Experiment			
Description			
Advantages of Design			
Disadvantages of Design			

a List five examples of participant variables that might be influential in the outcome of an experiment.

b Which characteristics might form the basis of pairing participants in the "Matched Participants" design? Give at least three examples.

c In which two designs above does random allocation to groups take place? Why is this important?

Identify the experimental design and the variables…

Exercise 6: Read the accounts of each study and identify the design and variables for each.

a A researcher wishes to investigate the effects of patient expectations of a medical procedure.

His sample is comprised of patients with painful carpal tunnel syndrome and other illnesses causing arm pain. He divides 270 patients into 2 equal groups. One group is given a placebo. The other is given a fake acupuncture procedure (the needles retract and do not pierce the skin, but the patients do not know this). Although both treatments involve no actual medical therapy, the patients in both groups report reduced pain. Those in the fake acupuncture group report more reduced pain than those in the placebo group.

- **Experimental Design:** _____
- **Independent Variable:** _____
- **Dependent Variable:** _____

Discussion Questions:

A study similar to this one was carried out by Kaptchuk et. al. (2011). The account of the study above is somewhat simplified.

- What concerns might an ethics committee raise about this study?

- Why do you think such concerns ultimately did not prevent the study from being carried out?

b The Year 12 Psychology teachers decide to experiment with a special memorisation method to support students in Year 12 next year. They plan to try out the method in Term 1 and, if the students who use the method perform better in the first SAC, both classes will then use the new method for the rest of the year. In order to minimise participant differences, they pair all the continuing Year 11 Psychology students based on reported levels of motivation, Unit 2 exam results and overall grades. The students are then randomly allocated to one of the two classes.

- **Experimental Design:** _____
- **Independent Variable:** _____
- **Dependent Variable:** _____

Discussion Questions:

- Why is it important for the teachers to plan that all students learn the new method, if it is found to be effective?

- What is a potential confounding variable in this study?

Identify the experimental design and the variables… (cont'd)

c The leading teachers at a suburban high school in Melbourne have observed the high levels of stress that Year 12 students experience. They decide to work with a random sample of Year 12 students, who will all try out stress-management techniques for four weeks. At the beginning of the year, their baseline measure of self-perceived stress is measured through a survey. At the end of each four-week period, the students complete a survey about their levels of stress. The techniques include: four weeks of massages 3 times per week; four weeks of meditation 3 times per week; and four weeks of training in positive self-talk. Students are randomly placed into each condition so that they experience each technique in a random order.

- **Experimental Design:** _____
- **Independent Variable:** _____
- **Dependent Variable:** _____

Discussion Questions:

- What is the randomising of the order of conditions called and why is it a sensible idea?

- What potential flaws can you identify in this experiment as a study of the effectiveness of stress-management techniques?

d In a study of the effects of screen time, it was found that young mice exposed to six hours of sound and light, similar to what one experiences when playing a video game, displayed widespread and dramatic changes in brain circuitry, when compared with mice in a typical environment. After this treatment, the screen-exposed mice appeared to develop a lack of attention and showed signs of riskier behaviour. They seemed to require more stimulation in order to be able to pay attention to their environment.

- **Experimental Design:** _____
- **Independent Variable:** _____
- **Dependent Variable:** _____

Discussion Questions

- What generalisation might the researcher be expected to make after gaining these results?

- For what reasons could such a generalisation be questioned?

Analysing and Evaluating a Study

***The Negative Association between Religiousness and Children's Altruism across the World* (Decety, et. al., 2015)**

The account of the study below is a simplified version intended purely to provide practice in evaluation and criticism.

A study from the University of Chicago undertaken in 2015 found that children from secular homes (raised with no religious teaching) behaved in more altruistic ways (that is, were more generous and selfless) and were less judgmental (less critical of others' behaviour and less likely to impose punishments) than those raised in religious homes.

Participants

- 1,170 children from 5-12 years from 6 countries.
- 23.9% identified as Christian.
- 43% were Muslims.
- 27.6% came from non-religious households
- Other faiths occurred too rarely to be included in the statistics.

Procedure

The children were given a set of stickers and were told there were not enough stickers for all the children in their school. They were asked to give some of their stickers to children who had missed out. If children agreed to share their stickers, this was considered a sign of altruism.

On average, non-religious children gave away 4.2 stickers, Christian children 3.1 stickers and Islamic children 1.9 stickers.

The children were also shown images depicting interpersonal harm like pushing and bumping to see how they would respond. Muslim children recommended harsher punishments for those children who pushed and bumped others than those from Christian families. Children from non-religious homes were the least "judgmental" according to the study.

Conclusions and Generalisation

The researchers concluded that their results "demonstrate that children from households identifying as either of the two major world religions (Christianity and Islam) were less altruistic and more judgmental than children from non-religious households". This finding was more pronounced for children who are older and had thus been exposed to religious activity for longer.

The researchers also argued that their findings support the view that moral training for children should be non-religious and that this would lead to an increase in "human kindness".

Analysing and Evaluating a Study

Exercise 7: Answer the questions below briefly. Use the phrasing supplied where appropriate.

a Identify **possible research hypotheses** for this study.

Phrasing: children with a religious background | children with a non-religious background | as measured by | altruistic | judgemental | it was hypothesised that… | the hypothesis was that…

b Identify the assumed **independent variable**.

c What are the **dependent variables**? Make sure you show how these were **operationalized** within the framework of this experiment.

d Restate the **conclusion** in your own words.

e How do the researchers **generalize** their findings to other people and situations?

f What are some **flaws, potential and actual,** in the study?

Wording: extraneous variables | confounding variables | operationalisation of variables

g To what extent would you consider the **conclusions** drawn by the researchers to be valid?

Wording: warranted | unwarranted | justified | unjustified | questionable
dubious | unconvincing | uncertain | doubtful

A Sample Analysis and Evaluation

- **Possible hypotheses**

(a) Children with a religious background will be more altruistic than the non-religious children, as shown by their degree of generosity with the stickers.

(b) Children with a religious background will be more likely to insist on punishments for unacceptable social behaviours than children from non-religious backgrounds.

- **The independent variable**

Religious background (Christian | Islamic | None)
Note that this is not really a true "independent variable". It was not possible to randomly allocate children to groups, since they already possessed the very characteristic that was being investigated. This meant that a variety of extraneous variables may have affected the results and could not be controlled for through the usual careful procedures.

- **Dependent variables**

"Altruism" as measured by the number of stickers given away by children; "Judgement" as measured by the number and harshness of punishments recommended by children for other children viewed behaving in an anti-social fashion.

- **Conclusion**

Children from religious backgrounds exhibited less altruistic behaviour than the non-religious children. Hypothesis (a) not supported.
Children from religious backgrounds were more judgmental than the non-religious children. Hypothesis (b) supported.

- **Generalization**

Non-religious moral training would lead to an increase in human kindness.

- **What are some serious flaws in the study (particularly in the operationalization) and in the conclusions drawn by the researchers?**

The operationalisation of the DVs is absurdly narrow and effectively meaningless. Whether children are willing to give away stickers can hardly be considered to be any kind of measure of selflessness, kindness or concern for others. Furthermore, the degree of importance that children attach to them might vary significantly from culture to culture, depending on the affluence of each country and the ease of access to education and educational products.

Similarly, the increased desire of the religious children to impose punishments for anti-social behaviour could be interpreted as concern for others rather than as a sign of "judgmental" attitudes. The children may have been exhibiting a desire to protect victims of bullying rather than to punish miscreants. Once again, this operationalization is ridiculously narrow. Moreover, interpreting the children's answers is difficult and potentially ambiguous.

Both "measures" fail to show that the researchers had thought through their definition of altruism. Nor was there any clear reference to other factors that might have influenced the children's choices, such as their economic situation and the nature of the school environment they were experiencing.

Given the clear flaws of the study, the generalization is unwarranted, unjustified and irresponsibly vague. It is difficult to determine what the researchers could mean by an "increase in human kindness" and indeed it is impossible to be sure that the questionable findings can be attributed to religion and not to a myriad of other confounding factors, such as economic background, cultural experiences, school training and so forth. This kind of study does not allow a cause-effect relationship to be established, yet the researchers appear to assume that this is actually the case.

External Validity

Can an experimental finding… **…be applied in a real-world setting?**

→
?

"Valid" in a general sense means accurate, sound, reasonable and genuine.

When used in a psychological setting, the word "validity" has a more precise and specific meaning.

Test validity, for instance, refers to whether a test accurately and genuinely measures the attribute it is intended to measure. For example, if students in Year 11 Psychology were given a Year 12 exam at the end of the year, this would not be an accurate, appropriate or genuine measure of their performance in Year 11.

Validity can also refer to the soundness and accuracy of psychological experiments; in this sense, the concept can be divided into **external validity** and **internal validity**.

External validity refers to the degree to which the findings of an experiment can be applied to people, situations and experiences outside the bounds of the experiment.

- How confidently can the researcher generalise the findings from the sample to the population under investigation?
- Would these findings be reflected in a non-laboratory task in a real-life setting?
- Do the conclusions of the experiment provide insight into real-life behaviours?
- Can we infer from the findings of this experiment that other people will behave similarly if exposed to the same variable?

In theory, a psychology experiment is intended to provide valid, generalizable insights into people's likely behaviour in a real-world setting. An experiment is externally valid if one can credibly generalise from the results of the experiment to people's probable experiences and reactions in a real-life setting. This is only possible if:

- the sample sufficiently represents the population
- the definition of the variables, while narrow enough to allow quantification and precision, is also broad enough to be meaningful in a real-life setting
- the situation in which the experiment occurs is relatively similar to potential environments and settings in the world at large

Evaluating External Validity

Example 1: Mice and Screen Time

If we return to the mouse and screen-time experiment, for instance, described above on page 8, some possible inferences from this experiment might be:

- The brain circuitry of young children exposed to screens over significant periods will be affected by this screen experience.
- Young children who are exposed for long periods to screens may have reduced ability to pay attention and may therefore require more stimulation in order to respond to their environment.

Despite these possible inferences, one must consider the question of **external validity**.

- To what extent can the behaviour and reactions of young mice be compared or applied to that of young children? Young children, for instance, have a far greater capacity to learn, to develop higher cognitive processes and so on.
- In what ways might children's screen time differ significantly from that of the young mice? For instance, children might interact more with the screen, listen to stories, drag elements onto other elements, and undertake much more complex cognitive tasks. This could mean that screen time for young children is more enriching than for mice.
- Furthermore, young children may well encounter other stimulating experiences, such as playing with friends, being read to by their parents and going to kindergarten. These other aspects of their lives may mean that the screen time has quite a different impact on them than on mice.

Example 2: Children, Religion and Altruism

In the experiment based on children from religious and non-religious backgrounds (see p.9), the concept of **external validity** can also be applied in order to question the soundness of the generalisations of the researchers.

The operational definition of "altruism" or "kindness" as "willingness to give away stickers", for instance, is not easily generalised to real-life situations. It seems unlikely that the results would predict whether a child will help a friend who needs help, stand up to a bully to protect a classmate, or donate toys and clothes to poorer children. Real-life evidence of "altruism" is usually far more complex than the narrow focus in the experiment.

Evaluating External Validity

Example 3: A Word of Praise – Your Turn to Evaluate

Imagine that a researcher wishes to investigate the impact of praise on students. She sets up the following experiment:

Participants: Students in an eastern suburbs high school in Melbourne

Type of praise: One of five sentences, to be delivered whenever a student works especially hard, hands in homework, pays close attention to instructions or treats another student in a particularly thoughtful and considerate way.

Five sentences: "I am proud of you", "Your performance was really impressive", "You are working very well at the moment", "You are a wonderful student" and "You should be proud of yourself"

After a period of four weeks, changes in student self-ratings of self-esteem are carefully analysed.

At the end of the experiment, the researcher concludes, based on the increase in self-ratings of self-esteem, that the systematic "praising sentences" did indeed have a positive effect. She generalises that employing such praise is vital to increasing student self-esteem, not just for teachers, but also for parents, employers and other people in positions of authority. She recommends the implementation of a systematic "praising regime" in all schools, sport centres, workplaces and other environments in which increased self-esteem might play a part in greater well-being and productivity.

Exercise 8: How would you evaluate the external validity of this experiment? Consider these three questions.

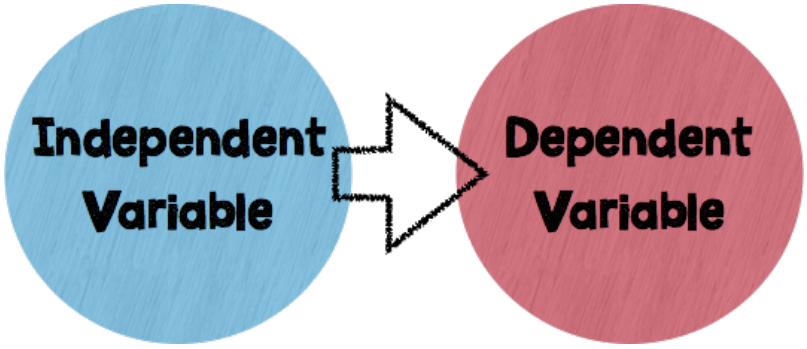
a To what extent are the researcher's participants similar to other students in Victoria or to the people who are included in the researcher's generalisations (such as employees, athletes, etc.)?

b To what extent can this type of praise be employed in other environments? How certain can one be that this kind of praise would be beneficial, effective and appropriate in other settings?

c How similar is the setting in the experiment to that of the other settings to which the researcher generalises her results?

Internal Validity

When conducting an experiment, the central aim is to isolate the **independent variable** in order to investigate its effect. To this end, a researcher has to minimise or eliminate the influence of other factors that may have an impact on the variable being measured, which is called the **dependent variable**. The procedures that one follows in an experiment are intended to ensure that this causal relationship is not interfered with in any way. If these procedures are carefully followed, one can credibly conclude that the changed behaviours, responses or performance of participants (if indeed there are any changes), are due to exposure to the independent variable.



In the ideal, well-conceived and carefully run experiment, the independent variable is the only causal factor that can influence the dependent variable. An experiment in which this is the case can be described as **internally valid**.

Researchers need to be aware of the potential influence of several types of extraneous variables when running an experiment. These variables need to be considered and minimised or eliminated if an experiment is to be considered internally valid.

Exercise 9: Can you match each type with the appropriate explanation or series of examples? Write **a**, **b**, **c**, **d**, **e** or **f** in the boxes below.

a experimenter effects **b** participant variables **c** order effects

d situational variables **e** non-standardised instructions **f** placebo effect

☐ explaining the procedures in a study in a different way to different participants or groups

☐ time of day, noise levels, temperature, physical environment

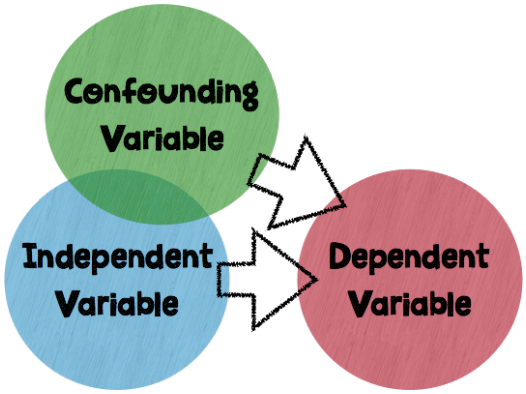
☐ whether participants carry out a task or procedure first, second or third, since practice, boredom or fatigue could influence their performance

☐ the influence of participant expectations on how they should behave or react, based on their belief or assumption that they have received some kind of experimental treatment

☐ intelligence, prior knowledge, training, motivation, age, gender, language background

☐ behaviour of the researcher (including facial expressions, mannerisms and tone of voice), expectations communicated to participants, observer effects that affect how data are recorded

Fortunately, systematic procedures have been developed in order to minimise or eliminate these potential **extraneous variables**. These procedures are essential, because if an extraneous variable interferes with the (supposedly) direct causal relationship between the IV and DV, it is considered to a be a **confounding variable** and the experiment is no longer **internally valid**.



Ensuring Internal Validity by Controlling Extraneous Variables 1

a experimenter effects **b** participant variables **c** order effects

d situational variables **e** non-standardised instructions **f** placebo effect

Exercise 10: Which type/s of extraneous variable can be minimised or eliminated by each of the following procedures? Write **a – f** beside each procedure.

NOTE: Some procedures may be beneficial in controlling more than one kind of variable, in which case you should write more than one letter.

Procedure	→ Controls which extraneous variable?
1 In a **repeated measures design**, introduce a **counter-balancing procedure** to randomise the order in which participants carry out tasks or experience conditions.	
2 Use a **single-blind procedure**, in which the participants do not know whether they are in the control or experimental group and consequently whether they are receiving a real or a placebo treatment.	
3 Employ a **double-blind procedure**, in which the participants do not know whether they are in the control or experimental group and consequently whether they are receiving a real or a placebo treatment.	
4 Ensure that all procedures are carried out in a **systematic and pre-determined way**, so that participants receive the same instructions and carry out tasks in similar conditions (such as time of day, type of room, heat, noise).	
5 Allocate participants randomly to groups in an **independent groups** design.	
6 Pair participants on important characteristics such as IQ or prior experience in a **matched participants design**.	

Ensuring Internal Validity by Controlling Extraneous Variables 2

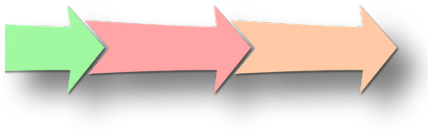
Participant Variables

Situational Variables

Experimenter Effects

Standardised Instructions

Placebo Effects



Order Effects

Exercise 11: Match the procedures required to the type of experiment in which they are employed. Most procedures apply to only one type of experiment; some apply to more than one.

Type of Experimental Design	Which Design/s?	Procedure
1 Independent Groups Design		Randomise the order in which participants undergo each condition.
		Select the participant characteristics (e.g. prior knowledge, intelligence) most likely to affect the results and pair your participants accordingly.
		Ensure that the situational variables (time of day, setting, noise, temperature) are held constant for both control and experimental groups/conditions.
		Do not divulge to participants whether they are in the control or experimental group/condition. (single-blind procedure)
2 Repeated Measures Design		Randomly allocate participants to groups.
		Set up your experiment so that all participants experience both a control condition and one experimental condition (or more).
		Randomly allocate one member of each pair of matched participants to the control and the experimental group.
3 Matched Participants Design		The knowledge of which participants are in the control and experimental groups/conditions is not divulged to either the participants or the researcher. (double-blind procedure).
		Carry out pre-testing in order to ensure that you can pair participants on crucial variables (such as prior knowledge, language ability, etc.)
		Define and employ a set of standardised instructions

Writing a Research Hypothesis

Any hypothesis predicts the expected outcome of an experiment by stating the kind of effect that the IV is expected to have on the DV. Will the IV increase or decrease the DV, impair it, facilitate it, allow it to develop more or reduce its efficiency?

Here are some simple hypotheses:

- Young children who spend a significant amount of time playing on a touch-screen tablet will demonstrate an impaired performance on cognitive tasks.
- Students who receive praise will have increased self-esteem.
- Young women who undertake a motivational course will apply for more leadership positions.
- Learner drivers who undertake lessons with a simulator in addition to normal driving practice on "L" plates will have fewer accidents.

These hypotheses show the main idea of the research, but they do not show how relatively **abstract terms** are being defined in the research. For example, how will "self-esteem" be defined and measured in the study? What is meant by a "significant amount of time"? What kind of "motivational course" is it? What kind of position can be considered to be a "leadership position"? Defining these terms in a precise and systematic way is called **operationalising** them.

A research hypothesis should refer to:

- the opposing groups or conditions in the experiment (the independent variable)
- exactly how one group will be treated differently from the other
- what effect this is expected to have on the carefully defined dependent variable

For instance:
Children of kindergarten age who spend 2 hours a day in the course of one week playing five chosen games on a touch-screen tablet will gain a lower score on a memory task than kindergarten children whose playtime is free of touch-screen devices.

Exercise 12: Try writing a research hypothesis for two of the simple hypotheses above. You will need to define the variables and show their expected effect.

Underline each part of your hypothesis as shown above, just to ensure that each required part has been included. Make sure that you have operationalised the IV and the DV in your hypothesis.

Research Hypothesis 1:

Research Hypothesis 2:

Practice with Operationalising Variables

How will you operationalise your IV and your DV? This is central to carrying out any experiment, because an IV must be clearly defined and a DV must not only be defined but quantifiable and measurable.

The IV must represent the abstract concept (for example, learning, attention, arousal) that is being explored. The DV must also represent an abstract concept and it must be measurable in a way that allows statistical analysis. In a sense, researchers have to be able to narrow these concepts to something concrete, yet without losing the original meaning of the concept or making it so narrow that it becomes meaningless in a real-world setting.

Exercise 13: Identify which factors need to be operationalised…

Highlight the terms that need to be operationalised in the simple, rather vague hypotheses below.

a Year 7 students who experience a special transition program will experience an increased sense of well-being in comparison to those not in the program.

b Waiters who give diners particular attention towards the end of a meal will receive a larger tip than those who do not.

c A housing developer wishes to explore the impact of apartment design on the development of friendships among inhabitants. The aim is to design apartment buildings that contribute to social connectedness. He organises a psychologist to investigate the social relationships of people in apartment buildings with differing designs. (Think about how these designs might differ: is there a gym, a shared mailbox area, a glass lift, a building notice board?)

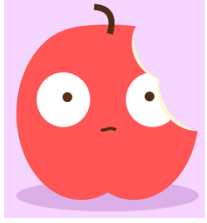
d Students who become involved in a school/work program will become more motivated to complete their schoolwork than those whose whole time is spent at school.

Exercise 14: Operationalise any 4 of the variables you have highlighted above. How do your operationalisations differ from those of other students?

Operational Variable 1	Operational Variable 2
Operational Variable 3	Operational Variable 4

Would this promote tip-giving?

How shall I define well-being?



Companionable mailboxes

Social connectedness

Summary of Questions to Consider When Evaluating an Experiment:

- To what extent is the sample representative of the population?
- If the experiment has an independent groups design, were the participants randomly allocated to groups?
- If the experiment has an independent groups design, is the sample large enough to ensure that random allocation of participants is likely to produce roughly equivalent groups?
- How appropriately have the independent and dependent variables been operationalised?
- Which participant variables might have influenced the results? Have they been minimised or considered in the design of the experiment?
- If it is a matched participants design, have the participants been paired on the participant variables that are most likely to influence the results?
- If it is a matched participants design, has each member of each pair been randomly allocated to either the control or the experimental group?
- Were there other factors involved that could have affected the results, such as situational variables or non-standardised instructions?
- Could the researcher have (unwittingly) influenced the results?
- If the experiment is a repeated measures study, has a technique like counterbalancing been employed in order to minimise or eliminate the influence of order or practice effects?
- Has an attempt been made to use a single-blind or double-blind design? If not, could participant and researcher assumptions or expectations have influenced the results?
- Can the findings of the study be generalised to other groups of people, situations, tasks or behaviours?

Glossary

- **case study:** A single person, often with a rare experience, illness or disorder, is studied in depth.
- **confounding variable:** A factor that interacts with the independent variable and/or acts on its own in an experiment in such a way that it influences the dependent variable. This makes it impossible to establish what effect, if any, the independent variable has had on the dependent variable and therefore impairs the internal validity of the experiment.
- **correlational study:** A piece of research that investigates the relationship between two variables, such as parental reading time and child vocabulary development. This method cannot be employed to establish a cause-effect relationship between variables.
- **counterbalancing:** A technique that minimises or eliminates order or practice effects in a repeated measures experiment by randomising the order in which participants are exposed to each condition
- **dependent variable:** The factor in an experiment that is measured by the researcher in order to gauge the effect (if any) of the independent variable
- **double-blind study/procedure:** Neither the participants nor the researcher running the study knows who is receiving the experimental treatment and who is not. This reduces the risk of experimenter effects (through experimenter expectations) and placebo effects (through participant expectation).
- **experimental study:** A study in which one variable is isolated and its effect on another variable is investigated; allows the establishment of a cause-effect relationship, providing that appropriate procedures have been followed and extraneous variables minimised or eliminated.

Glossary, continued

- **external validity:** The degree to which the results of an experiment can be generalised to other groups, tasks, experiences and settings
- **extraneous variable:** Any factor that might influence the dependent variable in an experiment other than the independent variable. This may be a participant, situational or experimenter variable.
- **independent groups design:** The simplest type of experimental design, in which two or more groups of participants take part, having been allocated randomly to a control group or (an) experimental group(s)
- **independent variable:** The factor that is isolated by the experimenter in order to investigate its effects
- **internal validity:** A study can be considered to have internal validity if the independent variable is the only causal factor that can influence the dependent variable. This is achieved through careful adherence to standardised procedures that minimise the effects of extraneous variables.
- **matched participants design:** Allows researchers to control participant variables better than an independent group design, but is more complex and time-consuming to administer. Participants are paired on the variables most likely to affect the outcome of the experiment (e.g. prior experience, IQ), then one of each pair is randomly allocated to either the control or the experimental group
- **naturalistic observation:** A study of people or animals in their typical or normal environment
- **operational definition:** A definition or explanation of a variable that shows exactly how it will be tested, measured or employed in an experiment
- **placebo effect:** The expectations aroused in participants who assume that they are experiencing some kind of treatment and whose anticipation could lead to unintended influences on their behaviour and the dependent variable
- **population:** The group of people or events of research interest in a given study
- **repeated measures design:** Every participant experiences the control and experimental condition(s). This design eliminates participant variables but requires care to eliminate order or practice effects.
- **sample:** A smaller group chosen from the population to be participants in a research study
- **single-blind procedure:** The participants do not know who is receiving the experimental treatment and who is not. This reduces the risk of placebo effects occurring through participant expectation.
- **survey or questionnaire:** A set of written or oral questions directed usually to a large sample of literate people in order to gain information on a topic of psychological interest

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