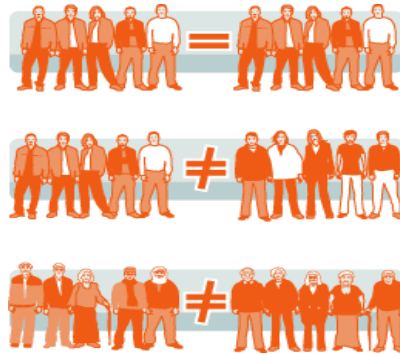


Lesson 3

Experimental Design and Control of Variables



Learning Objectives

- Identify and distinguish between the different types of **experimental design**.
- Identify **strengths** and **weaknesses** of each experimental design.
- Identify and explain the **control of variables** in given psychological investigations.

Key Terms

- Experimental design: independent groups, repeated measures and matched pairs
- Extraneous variable
- Confounding variable
- Demand characteristics
- Investigator effects
- Randomisation
- Standardisation
- Random allocation
- Counterbalancing

Extension activity: Have a go at the following multiple choice question quiz:
<https://www.tutor2u.net/psychology/reference/134748/experimental-method-revision-quiz>
Make a note of any answers you get wrong and revisit the relevant section of your class notes/textbook to reinforce your knowledge.



Questions to guide your thinking ...

- What are the three types of experimental design?
- Can you state the strengths and weaknesses of each?
- What is the difference between an extraneous variable and a confounding variable?
- How might demand characteristics and investigator effects have an impact on a study?
- How do psychologists try to prevent unwanted factors from affecting their results?

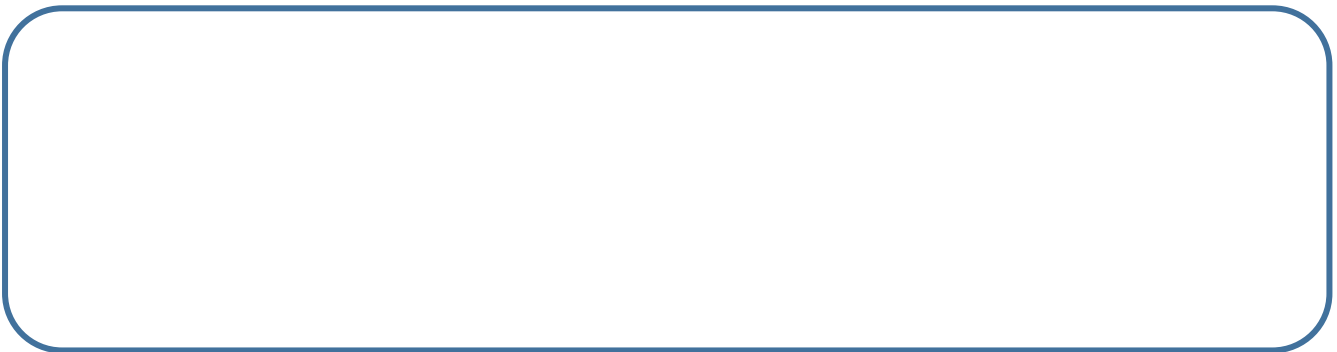
Experimental Design

To find out whether the independent variable (IV) in an experiment affects the dependent variable (DV), we need a comparison condition or different level of the IV. This leads to types of experimental design – how researchers allocate participants to the experimental and control condition in an effort to control participant variables.

- **Draw the three types of experimental design in the spaces below:**

1. Independent Groups Design

There are two separate groups of participants. One group do condition A and a second group do condition B.



2. Repeated Measures Design

The same participants take part in all conditions of an experiment.









3. Matched Pairs Design

Two groups of participants are used, but they are also related to each other by being paired on participant variables that matter for the experiment.



- Decide which experimental design to use for each of the studies below. In some cases, you have no choice; in others, you should decide which would be most appropriate.

STUDY	Experimental design?
1. A study to see if there is a difference in the ability of grey and white rats in learning to run a maze.	
2. A study to investigate whether a twin born first is more confident than a second-born twin.	
3. A study to see if watching violent television programmes is likely to make children aggressive.	
4. A study to investigate whether people are more likely to make a risky decision when they are in a group than when they are alone.	
5. Research into finding a cure for fear of spiders, comparing a treatment group with a non-treatment group.	
6. An investigation into whether people prefer gin and tonic or vodka and lime.	

Why use different types of experimental design? There are advantages and disadvantages to each design:

<i>Design</i>	<i>Strengths</i>	<i>Weaknesses</i>
Independent groups	<p>Participants are only tested in _____ condition so are less likely to work out the _____ of the experiment. Therefore there is less risk of demand _____ which means the _____ of the experiment is increased.</p> <p>Participants are only tested once so there is no problem of _____ effects influencing the next condition, for example, _____, boredom, practice, etc.</p>	<p>Participants in the two groups are different, so participant _____ are not controlled. This means that individual differences between participants could interfere and act as an _____ variable.</p> <p>One practical problem is that twice as many participants are needed as repeated measures. Therefore, the investigation becomes less _____ and more _____.</p>
Repeated measures	<p>The _____ participants are used in each condition so you are _____ the same people. This means that participant variables are _____ and so removed as an extraneous variable.</p> <p>_____ participants are needed as each person contributes two sets of data which means the design is _____ economical and _____ time-consuming.</p>	<p>As all participants do all conditions of the experiment, order effects are a problem .Participants could be affected by practice, fatigue or _____.</p> <p>As all participants take part in ALL conditions, they are involved in the study a lot more than in other designs and so have more _____ available to them.</p> <p>There is an increased risk of _____ for this reason.</p>
Matched pairs	<p>Participants only ever take part in one condition of the experiment and so are less likely to interpret cues and _____ to demand characteristics.</p> <p>There is no problem of _____ influencing the next condition.</p>	<p>It is _____ to match participants exactly and it is very time-consuming and _____ as pre-tests are required. Even though an attempt has been made to make participants more _____ , two people can never be matched exactly so there is still a possibility of _____ affecting the outcome.</p>

Variables and Control

As we have seen, an experiment is designed to determine the effect of an independent (IV) variable on a dependent variable (DV).

In a perfect experiment, only the IV would have an effect on the DV, but in reality, there will always be a number of unwanted factors that can affect their relationship.

Extraneous variables (EVs)

Any variable, other than the IV, that may have an effect on the DV if not controlled. These 'nuisance' variables do not vary systematically with the IV, but they may make it harder to detect a result.

In a properly conducted experiment, a researcher will identify and take steps to control EVs so they can conclude that the IV will have caused the effect on the DV.

Confounding variables (CVs)

Any variable, other than the IV, that may have affected the DV so that we cannot be sure of the true source of any change in the DV. Confounding variables vary systematically with the IV.

For example, a researcher might set out to study the effect of caffeine on exam performance. If, using an independent groups design, all the participants in the experimental group receiving caffeine also had more sleep than those in the control group, sleep would act as a CV. Equally, if all the participants in the experimental group had extra preparation before the exam, the researcher would not be able to conclude that the IV was the only thing causing an effect on the DV.

- **Explain the difference between extraneous and confounding variables:**

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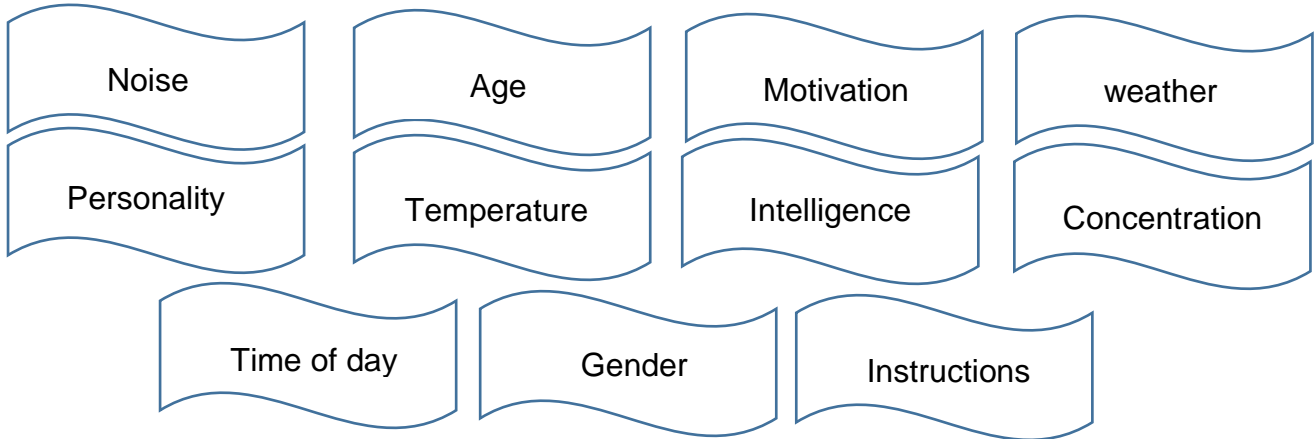
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Extraneous variables can be sub-divided into:

- participant variables – individual differences between the participants that may affect the DV.
- situational variables – features of the experimental situation that may affect the DV.

➤ **Sort the EVs below into participant variables and situational variables:**



Demand Characteristics and Investigator Effects

Some of the many extraneous variables in a psychological study stem from the fact that a psychology experiment is a social situation in which neither the participants nor the researchers are passive, inanimate objects but are active, thinking human beings. The participants will be trying to work out the aims of the study. Researchers have expectations about the outcome of the study.

Demand characteristics: Any cue from the researcher or from the research situation that may be **interpreted by the participants** as revealing the purpose of the investigation. This may lead to participants changing their behaviour within the research situation:

- They may act in a way they think is expected and over-perform to please the experimenter – the ‘please-U effect’
- They may deliberately underperform to sabotage the results of the study – the ‘screw-U effect’

Investigator effects: Any effect of the **investigator’s behaviour** (conscious or unconscious) on the outcome of research (the DV). This may include everything from the design of the study to the selection of, and interaction with, the participants during the research process.

➤ **Consider how investigator effects and demand characteristics might influence the results of the following studies:**

1. A male researcher asks women about their pregnancies.

2. An observer stands by a zebra crossing watching how children cross the road.

3. An attractive woman conducts a study into how long people can keep their hands in ice-cold water.

4. A teacher and a sixth form student conduct interviews about how much homework students should do each week.

Controlling variables

Researchers try and minimize the effect of extraneous/confounding variables in a number of different ways.

- **Read the following problems with experimental control and try to find a solution for each.**

Problem Variable	Method of Control
Order Effects In a repeated measures design, each participant has to do at least two tasks. If task B is always done after task A, performance of task B may be affected by practice, fatigue or boredom (i.e. order effects)	
Participant Variables Individual differences (such as age, gender or personality) may create random or confounding effects, especially in an independent groups design.	
Investigator Effects An investigator may influence the outcome of a study (the DV) by the way they design an experiment. For example, in a study to investigate whether people are more likely to remember the last three words on a list, a researcher might place easy words at the end of the list.	
Investigator Effects and Situational Variables A researcher's behaviour and expectations might influence participants' responses and therefore the outcome of a study. In addition, environmental factors (e.g. location, temperature, time of day) may affect the DV.	

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