



## EXPERIMENTAL DESIGN

Types of experimental design and methods of study

Cognitive Approach

### CONDITIONS

A study can have a different number of **conditions**. These are aspects of the independent variable, and there must be two or more conditions, so that a comparison can be made with the results. For example, in an experiment to find out how age affects IQ, you might test three age brackets: 10-19, 20-29 and 30-39. In this case, there are *three* conditions for the experiment

There are three main types of **participant design**. These will depend upon the **conditions** the experiment has.

The researcher can ask all participants to take part in every condition of the study. This participant design is called **repeated measures**. All participants do all groups.

An alternative design is to split the participants up so that they each only do one condition. This is called **independent groups** design. There are different participants in each group, and they each do different conditions. Under this design, all conditions are still fulfilled by the participants, although not every participant does each one.

A **matched pairs** design is very similar to the independent groups design. Here, again, participants only do one condition each. However, before they are split into groups, the researchers pair up the participants with factors which they think are important, such as age, gender, social class or ethnicity. This enables as similar as possible participants in each group without using the repeated measures design, so still a good comparison can be made using results.

One strength of *repeated measures* is that all the participants do every condition, and so participant variables (features of the participants which might affect data) are controlled. This is because if every participant does each condition, any participant variables present will be present for *all* conditions, so it cancels itself out. Another strength is that more data can be gathered because everyone does all conditions. Also, if you use independent groups and there are two conditions, you will require twice as many participants, which is more costly, less convenient and possibly less ethical.

A weakness of repeated measures is that **order effects** may arise. It is possible that if one participant is doing all four conditions of an experiment, they may get more tired each time the next condition happens, and therefore put less effort in: this is called **fatigue effect**. Also, it is possible that participants may get better at the conditions as they go along because they know what to do and how they could do it better, having already done the first condition: this is called **practice effect**. Order effects do affect data, and incorrect conclusions can be drawn from the findings unless they are noticed. A further weakness is the possibility of **demand characteristics**. These occur when participants respond by trying to guess what the study is about, and may want to help the researcher out by giving the response they think the study wants; or by purposely going against what is predicted. Either way, this will affect results.

### Repeated Measures

- ✓ Participant variables are controlled, as all participants do all conditions
- ✓ Uses fewer participants, so more convenient in terms of costs, convenience and ethics
- ✗ Demand characteristics are possible if participants guess the aim of the study from repeating conditions
- ✗ Order effects such as practice and fatigue effects can affect results if there is no counterbalancing

A benefit of using *independent groups* is that there are *no order effects*. This is because different people do different conditions, no one participant does two conditions. Similarly, there is less possibility of demand characteristics being present. This is because when the participants are not taking part in every condition, they are less likely to guess the nature of the study.

A drawback of the design is participant variables can easily affect the findings, as different participants are in each condition. Also, more participants will be required for the study, because they are needed for each different condition. This is negative because it is more costly, it can be more unethical, it makes samples slower to obtain, and means that the study can take longer to complete.

[youtube.com/c/MegaLecture/](https://www.youtube.com/c/MegaLecture/)

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### Independent Groups

- ✓ No order effects to affect the findings because each participant only does one condition
- ✓ Demand characteristics are less likely to be present
- ✗ Participant variables are very likely to affect the results
- ✗ More participants are required, so it is less convenient, more costly and possibly less ethical

A strength of the *matched pairs* design is that (like repeated measures) participant variables should not affect the findings, if the most important participant variables have been matched well. Also, there will not be order effects, because everyone is doing different conditions, and no participant does two.

However, a weakness of matched pairs is that different people are used, and even though the experimenters attempt to match them into pairs in some ways, there are still always going to be some participant variables, which can affect the data. This is an unavoidable feature of the design. For example, it may be difficult to match education or background. Also, another weakness is that more people are needed for this design, so the same problems as before arise: more costs, less ethically-valid, etc.

### Matched Pairs

- ✓ No order effects to affect the findings because each participant only does one condition
- ✓ Demand characteristics are less likely to be present
- ✗ Participant variables are very likely to affect the results
- ✗ More participants are required, so it is less convenient, more costly and possibly less ethical

### EXPERIMENTAL METHODS

Researchers not only have to consider the type of *participant design*, but also the **experimental method**. There are three types of experiment...

The first type is a **laboratory experiment**. These usually take place in a lab, or at least a controlled setting – this will be unnatural for the participants. These are the most scientific experiments, because only one variable is manipulated (the independent variable, IV) and all extraneous variables are normally controlled. A common design within this type of experiment is to have an **experimental group** and a **control group**. The experimental group does something the control group does not, so the control group provides a **baseline measure** (i.e. what the dependent variable, DV, would be like without manipulation). The findings for the experimental group are then able to be compared against the baseline measure. This is important, because otherwise the “normal” situation would be unknown.

A second type is the **field experiment**. These have as many controls as possible, but not all of them can be controlled to their optimum because they take place “in the field” (in the real world). Field experiments take place in natural settings, such as that of Hofling et al. (1966) (see 1.7 Hofling et al. (1966) for more), which took place in a hospital – a natural setting for the nurses who were being studied. Apart from being in a separate setting, the features of field experiments tend to generally mirror those of lab experiments.

**In the field** -  
a term meaning in the participants' natural setting

The third type is a **natural experiment**. These also take place “in the field” rather than in a laboratory, and they involve a *naturally-occurring IV*. These are uncommon, because it is out of the experimenter’s control if the IV is manipulated naturally. An example of a natural experiment comes from those which have looked into the effect of children’s behaviour from TV. Their behaviour was studied, such as levels of aggression, in an area where TV was yet to be introduced, and then they continued to study after television had appeared in that area. The researchers themselves had not arranged for TV to not be in the area and then for them to have it – that would be neither ethical nor practical. They found a community where television was about to be introduced and decided to study it: a natural experiment. A natural experiment is a **quasi experiment**, because the IV is not manipulated by the researcher. A quasi experiment uses situations which are *discovered*, not *manipulated*, and so take place in the participants’ natural setting.

	Strengths	Weaknesses
<b>Laboratory experiments</b>	<p>Strong controls are present, which makes the experiments replicable, so reliability can be tested (and results are more likely to be reliable)</p> <p>Because of the strong controls on extraneous variables, clear cause-and-effect conclusions can be drawn from the findings</p>	<p>Because of the strong controls, the tasks may become unnatural, giving invalid results</p> <p>There is no ecological validity, because the environment is not natural for the participants and there are controls</p> <p>Experimenter effects could affect the results, and cause bias</p>
<b>Field experiments</b>	<p>More ecologically valid than lab experiments because they take place in natural settings to the participants</p> <p>Fairly replicable, and so still likely to be valid, because generally there are some controls present, as with laboratory experiments</p>	<p>Because of the natural setting, it is hard to control all factors, so findings may be less valid than lab experiments, also may not be replicable</p> <p>Experimenter effects could affect the results, and cause bias</p>
<b>Natural experiments</b>	<p>The independent variable occurs naturally, so the findings are valid because it is not artificially set up</p> <p>High ecological validity, experiment takes place in a natural environment, with a naturally-occurring IV</p>	<p>It is difficult to control variables because the IV is naturally occurring, so other variables may contribute to findings</p> <p>Hard to control the experimenter effects, using a double-blind technique is not straight forward, because most are carried out in a natural setting</p>

The table above displays the main strengths and weaknesses of each experiment type.