**Identifying extraneous and potential confounding variables**

Researchers have described different types of variables that can be identified as extraneous or potential confounding variables in an experiment.

You must know what the following are and how to minimize their effects.

1 ) participant differences,

2) use of non-standardized instructions and procedures,

3) order effects (2 types)

4) experimenter effect and placebo effect.

**Individual participant differences**

The unique combination of personal characteristics, abilities and backgrounds each participant brings to an experiment are commonly referred to as **individual participant differences**. (*participant variables*)

They make one individual different from another, are expected by the researcher and may be biological, psychological or social in nature.

Eg age, gender, athletic ability, intelligence, personality, memory, educational background, family environment, social relationships, work experience, ethnicity, cultural background, religious beliefs, motivation, emotional state, mood, problem-solving, self esteem, prior experience etc

**Use of non-standardized instructions and procedures**

The instructions and procedures used by the researcher can also impact on how participants respond and therefore on the results

Generally**, *procedures***involve everything the researcher does in conducting their research study, including:

* selection of participants
* instructions for participants in different groups
* interaction with participants
* use of materials or apparatus
* use of rooms or other experimental settings
* observation and measurement of variables
* data-recording techniques.

When the research procedures (including instructions) are **non-standardized**, this means that they are not uniform, or the same, for all participants. Even small variations in procedures may affect participants’ responses in unforeseen ways.

An experiment that uses non-standardized instructions and procedures is not strictly controlling all of the procedures, and this feature is a source of potential confounding variables that can influence the DV and therefore the results.

**Order effects**

In some experiments, participants are exposed to more than one treatment condition (IV) and they may be required to perform the same type of task twice or even many times under different treatment conditions. (repeated measures)

EG an experiment to determine the effects of alcohol on driving performance, the *same* group of participants may be exposed to one treatment condition (or IV)

An **order effect** occurs when performance, as measured by the DV, is influenced by the specific order in which the experimental tasks, treatments or conditions are presented rather than the IV.

There are 2 types

***Practice effects***are the influence on performance (the DV) that arises from practising a task.

Through repeated experience, participants may get better at the task

***Carry-over*** *effects* are the influences that a particular task has on performance in a task that follows it. They arise simply from experiencing a task.

if a task (such as taking a test in a driving simulator) happens to be very easy, difficult, frustrating or even anxiety-provoking, the feeling may ‘carry over’, lowering performance the next time the task is completed

**Experimenter effect**

Personal characteristics of the experimenter (or any other researcher) and their behaviour during an investigation are also sources of extraneous and confounding variables. The **experimenter effect** is an unwanted influence(s) on the results which is produced consciously or unconsciously by a person carrying out the research.

In an experiment, the effect occurs when there is a change in a participant’s response because of the experimenter’s expectations, biases or actions, rather than the effect of the IV.

* facial expressions, such as smiling at participants in the experimental or control group but not at those in another
* mannerisms, such as shaking hands with participants in one group but not with those in another
* tone of voice, such as speaking in a monotone voice to participants in one group and in a more lively way to those in another.

**Placebo effect**

In medicine, the placebo effect refers to an improvement in health or wellbeing due to an individual’s belief that the treatment given to them will be effective.

This inactive substance or fake treatment, which substitutes for the real substance or treatment, is called a **placebo**.

In an experiment, the **placebo effect** occurs when there is a change in the responses of participants 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 IV. Essentially, the participants’ behaviour is influenced by their *expectations* of how they should behave due to their belief that they have received some treatment.

**Ways of minimizing extraneous and confounding variables**

There are a number of ways researchers will attempt to reduce the effect of the above

**Participant selection and allocation**

The way participants are selected and how they are allocated to different groups are very important features of experimental research. Selection and allocation procedures provide the most commonly used means of minimizing the influence of extraneous and confounding variables.

**Participant selection**

The process of selecting participants for a research study is called **sampling**.

A **representative sample** is a sample that is approximately the same as the population from which it is drawn in every important participant variable.

Larger samples also minimize the likelihood of an unexpected ‘sampling error’ resulting in a sample which does not represent its population well and would therefore make it dif cult to apply the results to that population.

Some researchers have described the law of large numbers in relation to sampling. The ***law of large numbers***states that as sample size increases, the attributes (characteristics) of the sample more closely reflect the attributes of the population from which the sample was drawn.

We have looked at 3 methods of sampling

**Participant allocation**

***Random allocation***

It is to be expected that individual participants will have different abilities and other personal characteristics or backgrounds that may affect the outcome of an experiment. One way of minimizing differences in the composition of the control and experimental groups is to randomly allocate, or assign, participants to the groups.

**Random allocation**, also called *random assignment*, is a procedure used to place participants in groups so that they are as likely to be in one group as the other. This means that every participant has an equal chance of being selected for any of the groups to be used.

**Use of an appropriate experimental research design**

Various experimental research designs can be used to minimize the effects of potential extraneous and confounding variables, particularly variables associated with individual differences of participants.

Three of these designs are the **independent groups, repeated measures and matched participants designs.**

**Counterbalancing**

A counterbalancing procedure is commonly used to control or minimize order effects such as practice and carry-over involved when repeated measures experimental design is used.

**Counterbalancing** involves systematically changing the order of treatments or tasks for participants in a ‘balanced’ way to ‘counter’ the unwanted effects on performance of any one order. By counterbalancing, the researcher recognizes that an order effect is a potential confounding variable and cannot be controlled or eliminated through other means**.**

**For Lachie**

*between-participants counterbalancing*procedure involves alternating the order in which the experimental and control groups are exposed to each condition of the experiment. Each group is exposed to each condition in a different order.

For example, suppose a researcher will conduct an experiment in which all participants first learn a list of words when rap music playing is playing and then learn a list of similar words when there is no music. It is possible that the participants may demonstrate better learning in the no music condition because of a practice effect. To address this order effect, the researcher could split the sample into two groups — A and B. Group A could learn words in the rap music condition first, then learn words in the no music condition. Group B would learn words in the no music condition, followed by the rap music condition. Participants would also be randomly allocated to each group to experience either condition first or second.

The results for all participants are then combined across the entire experiment to achieve counterbalancing. In this way, whatever order effects impact on learning the words are controlled. Although an order effect may have occurred for each participant, because they occurred equally in both groups, they have balanced each other out in the results.

**(See notes on Weebly under experimental design)**

**Single-and double-blind procedures**

Participants’ expectations can influence the results of any investigation, so it is important that participants do not know whether they are in an experimental or a control group. In this case, the experiment is said to be using a single-blind procedure. It is called a **single- blind procedure** because the participants are not aware of (are ‘blind’ to) the condition of the experiment to which they have been allocated

To control possible experimenter effects, researchers may use a procedure in which neither the participant nor the researcher interacting with the participants knows which participants are in the experimental or control conditions. This is called the **double-blind procedure** because the participants *and* the researcher (or research assistant) directly involved with the participants are unaware of (are ‘blind’ to) the conditions to which the participants have been allocated.

**Placebos**

In an experiment, participants in the experimental group are exposed to the treatment (the IV) and participants in the control group are not.

Because only the experimental group receives the treatment, only the participants in this group may be influenced by their expectations about how they should behave. Therefore, there is a potential confounding variable — the experimental group may respond differently to the control group either because of the treatment or because of their expectations of how they should behave.

In order to control this potential confounding variable, control groups can be given a **placebo**, or fake treatment, so that they form the same expectations and beliefs as the experimental group.

**Standardized instructions and procedures**

This is achieved by standardization (‘consistency’) across the different conditions. Using **standardized instructions and procedures** means that instructions and procedures are the same for all participants (except for variations required for experimental group participants exposed to the IV).