Study Design

LLE – Mathematics and Statistics Skills

1. For each of the following studies, determine whether the design is cross-sectional, case control, cohort, or a randomised control trial.

   (a) A group of people who contracted symptomatic Covid-19 and who did not contract symptomatic Covid-19 are selected. They are asked about their exercise habits to determine whether exercise habits are a contributing factor to symptomatic Covid-19.

   ○ cross-sectional ⊗ **case control** ○ cohort ○ RCT

   Solution

   People have been selected by outcome (those who contracted Covid and those who didn't). This is a case-control study.

   (b) A researcher carries out a survey where people are asked whether they are a smoker and whether they have lung cancer. The researcher uses this to look for a connection between smoking and lung cancer.

   ⊗ **cross-sectional** ○ case control ○ cohort ○ RCT

   Solution

   Exposure (smoking) and outcome (cancer) are simultaneously looked at, at a single point in time. This is a cross-sectional study.

   (c) A group of people, suffering from chronic lower back pain, are selected to trial a new drug. They are randomly divided into two groups, with one group receiving a placebo and the other the new drug. They are checked after 3 months to analyse

the effectiveness of the new drug.

○ cross-sectional ○ case control ○ cohort ⊗ **RCT**

Solution

Participants are randomly assigned to one of two groups and given different treatments. This is a randomised-control trial.

(d) A group of people are selected based on whether they have high blood pressure or not. A researcher wants to determine whether having high blood pressure is linked to high meat consumption, so all people are asked to describe their diet.

○ cross-sectional ⊗ **case control** ○ cohort ○ RCT

Solution

People have been selected by outcome (high blood pressure and not). The diet is then looked at. This is a case-control study.

(e) To determine if there is a link between work computer use and RSI, a group of people who spend more than 5 hours a day and a group of people who spend less than 5 hours a day on computers is selected. The two groups are followed to look for developing issues with RSI.

○ cross-sectional ○ case control ⊗ **cohort** ○ RCT

Solution

The starting point is exposure (more than 5 hours and less than 5 hours of computer use) and followed over time to look for outcomes. This is a cohort study.

2. For study (c) above, there is the option of blinding or double blinding in the study.

(a) Explain what is meant by the terms blinding and double blinding

in research studies.

Solution

Blinding: The participants are unaware of which group they have been assigned to.
Double blinding: Both the participants and the researcher are unaware of which group participants have been assigned to.

(b) What are the advantages and disadvantages of blinding in research studies?

Solution

Advantages:
* If participants are aware of which group they belong to (for example active drug or placebo drug) it can affect the behaviour of the participant. This can introduce bias into a study.
* Similarly, if researchers are experimenting and are aware of which group is which, this can also introduce bias into the research. Double-blinded studies may carry more weight when reporting results.
* The same procedures of a blinded study can be replicated, and similar results add validity to the study.

Disadvantages:
* Blinding is not always possible, as it is sometimes obvious which group a participant belongs to (e.g. a high carb diet group and a high protein diet group, participants could probably tell which group they are in).
* Blinding may not reflect real-life circumstances.

3. Each of the study designs given have their advantages and disadvantages.

(a) What are the advantages and disadvantages of a case-control study?

Solution

Advantages:

* Cheap and quick.
* Smaller number of subjects needed compared to cross-sectional.
* For rare disorders, it's often the only feasible type of study.

Disadvantages:

* Recall bias of participants.
* Creating appropriate control groups is difficult.
* Confounding variables.

(b) What are the advantages and disadvantages of a cohort study?

Solution

Advantages:

* Easier and cheaper to administer than a randomised-control trial.
* Can establish timing and direction of events.
* Ethically safe.

Disadvantages:

* Exposure may be linked to a confounder that is hidden.
* No randomisation.
* For rare disorders, large samples sizes or long follow-up are needed.

(c) What are the advantages and disadvantages of a cross-sectional study?

Solution

Advantages:

* Cheap and simple. * Generally not a problem with ethics.

Disadvantages:

* Recall bias of participants.
* May have unequal groups sizes.
* Often establishes association and not causality.
* Confounding variables may be unequally distributed.

(d) What are the advantages and disadvantages of a randomised control trial study?

Solution

Advantages:

* Confounders are distributed randomly.
* Blinding is possible.
* Can establish causality.

Disadvantages:

* Expensive to carry out.
* Volunteer bias.
* Potential to be tricky ethically.