

Exercise 1:

Suppose we want to measure how many mistakes a user makes when using the old version and the new version of a piece of software.

- o What is the output variable (DV)?

Mean number of mistakes made

- o What is the independent variable (IV)?

Version of the software

- o What conditions of the IV should be included?

Old version, New version

- o What is the basic hypothesis?

Changing the version of the software used leads to a change in the mean number of mistakes made by the users.

Exercise 2:

Suppose we want to measure the effectiveness of a computer's firewall.

- o What is the output variable (DV)?

We cannot measure 'effectiveness' directly so we must use a proxy for it. A useful proxy might be 'how many attacks against the firewall are successful'. This gives the experimenter a total value rather than a mean value.

- o What is the independent variable (IV)?

Firewall configuration

- o What conditions of the IV should be included?

Firewall configuration 1, Firewall configuration 2, Firewall configuration 3, ...

- o What is the basic hypothesis?

The effectiveness of the firewall, as measured by the number of successful attacks against it, varies depending on what firewall configuration is used.

Exercise 3:

We want to show that the new version of a piece of software allows users to complete tasks more quickly than the previous version.

- What are the DV, IV, and IV conditions?

DV: Time taken to complete tasks

IV: Software version

IV Conditions: Old version, New version

- Formulate a null hypothesis H_0 and an alternative hypothesis H_1 for this experiment.

H_0 : The mean time taken to complete tasks using the new system is equal to or more than the mean time taken to complete tasks using the old system

H_1 : The mean time taken to complete tasks using the new system is less than the time taken to complete tasks using the old system

- What would you need to show to reject the null hypothesis?

Show that $\bar{X}_{old} > \bar{X}_{new}$

Exercise 4:

For each of the following situations, should you use a one-tailed test or a two-tailed test when looking for a significant difference between the mean values of the dependent variable?

- A company wants to see if there is any difference between the ease of use of the old version and the new version of their software.

'Any difference' therefore two-tailed test

- A network engineer wants to know what difference changing a setting on the firewall has on the security of their system.

'Any difference' therefore two-tailed test

- A company wants to know if a new website design will lead to more sales.

'[M]ore sales' means only greater than, therefore one-tailed test