ADS2 Practical 14: Chosing the right ANOVA

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Work through this guide alone or in groups. Facilitators are here to help. The time it takes to complete this practical can vary between individuals - this is OK. Do not worry if you do not finish within the session.

Learning Objectives

- State and test the assumptions of an ANOVA
- Use R to perform an ANOVA and appropriate post-hoc tests
- Interpret the results of an ANOVA

Drug trial dataset - revisited

Last week, you ran a simulation-based test using within-group and between-group distances, in order to see whether there was a difference between three conditions in a drug trial. The test yielded a small p-value, suggesting that there is at least one difference between conditions.

This week, we are going look at the same dataset using an actual ANOVA. This includes checking assumptions and conducting a post-hoc test

Formulate H0 and H1

What are the Null and Alternative Hypotheses? Write them down.

H0: There is no difference in all of the groups.

HA: There is difference in groups.

Load and inspect the dataset

Load the data and plot the dataset in a useful format. (You can re-use your code from last week)

Check whether the assumptions for an ANOVA are met

List the three assumptions that need to be met for an ANOVA

1. Independent random sampling.
2. Normality of residuals.
3. Equality of variances.

You learned in lecture how to assess whether those assumptions are met. Do this now.

Remember that for some of the assumptions, it helps to create the model and look at some of the "diagnostic plots":

```r
model <- aov(pain~treatment,data=trial)
plot(model)
```

Run an ANOVA

If you are convinced that the conditions are fulfilled, go ahead and perform an ANOVA

```r
# model <- aov(pain~treatment,data=trial)
summary(model)
```

What is your p-value? What now?

treatment ***
Tukey

Run a post-hoc test

It looks like we have a significant result, so now it is time for a post-hoc test.

```
TukeyHSD(model)
```

The "p adj" values are the *adjusted* p values. This means that they have already been corrected for multiple testing, so you can go ahead and compare those values directly to the α level of your choice.

significance level

What do you conclude?

drugA-drugB: 0.0008
placebo-drugA: 0.839
placebo-drugB: 0.00016

Weight loss in mice

You are interested in a gene that is said to control appetite control. Specifically, mice with one or two copies of the "A" allele seem to be better than mice with the "B" allele at controlling their food intake, even if unlimited food is available.

Is this appetite control allele also related to weight loss?

For this experiment, you tested mice of the homozygous "AA" and "BB" genotypes, as well as heterozygous "AB" mice. Mice were randomly separated into two groups: One group had access to only as much food as would be required to maintain their weight ("restricted"). The other group has access to unlimited food ("unrestricted"). Mice were weighed at the beginning and the end of a 1-month experiment, and their weight gain (in g) recorded (this number can be negative if the animal has lost weight).

The data are provided in file `mouse_experiment.csv`

Import, visualise, and analyse the dataset.