



Cramming Sam's Tips for Chapter 11: Comparing several means: ANOVA (GLM 1)

Planned contrasts

- After an ANOVA you need more analysis to find out which groups differ.
- When you have generated specific hypotheses before the experiment use *planned contrasts*.
- Each contrast compares two 'chunks' of variance. (A chunk can contain one or more groups.)
- The first contrast will usually be experimental groups against control groups.
- The next contrast will be to take one of the chunks that contained more than one group (if there were any) and divide it into two chunks.
- You then repeat this process: if there are any chunks in previous contrasts that contained more than one group that haven't already been broken down into smaller chunks, then create a new contrast that breaks it down into smaller chunks.
- Carry on creating contrasts until each group has appeared in a chunk on its own in one of your contrasts.
- The number of contrasts you end up with should be one less than the number of experimental conditions. If not, you've done it wrong.
- In each contrast assign a 'weight' to each group that is the value of the number of groups in the opposite chunk in that contrast.
- For a given contrast, randomly select one chunk, and for the groups in that chunk change their weights to be negative numbers.
- Breathe a sigh of relief.

Post hoc tests

- After an ANOVA you need a further analysis to find out which groups differ.
- When you have no specific hypotheses before the experiment, use *post hoc tests*.

- When you have equal sample sizes and group variances are similar use REGWQ or Tukey.
- If you want guaranteed control over the Type I error rate then use Bonferroni.
- If sample sizes are slightly different then use Gabriel's procedure, but if sample sizes are very different use Hochberg's GT2.
- If there is any doubt that group variances are equal then use the Games–Howell procedure.

One-way ANOVA

- The one-way independent ANOVA compares several means, when those means have come from different groups of people; for example, if you have several experimental conditions and have used different participants in each condition.
- When you have generated specific hypotheses before the experiment use *planned comparisons*, but if you don't have specific hypotheses use *post hoc* tests.
- There are lots of different *post hoc* tests: when you have equal sample sizes and homogeneity of variance is met, use REGWQ or Tukey's HSD. If sample sizes are slightly different then use Gabriel's procedure, but if sample sizes are very different use Hochberg's GT2. If there is any doubt about homogeneity of variance use the Games–Howell procedure.
- Test for homogeneity of variance using Levene's test. Find the table with this label: if the value in the column labelled *Sig.* is less than .05 then the assumption is violated. If this is the case go to the table labelled *Robust Tests of Equality of Means*. If homogeneity of variance has been met (the significance of Levene's test is greater than .05) go to the table labelled *ANOVA*.
- In the table labelled *ANOVA* (or *Robust Tests of Equality of Means* – see above), look at the column labelled *Sig.* If the value is less than .05 then the means of the groups are significantly different.
- For contrasts and *post hoc* tests, again look to the columns labelled *Sig.* to discover if your comparisons are significant (they will be if the significance value is less than .05).