Chapter 16: Multivariate analysis of variance (MANOVA)

Self-test answers

SELF-TEST Why might the univariate tests be non-significant when the multivariate tests were significant?

Although the issue of power is complicated in MANOVA (see the book chapter), one reason why the multivariate statistics might be significant when the univariate tests are not is that the multivariate tests take account of the correlations between dependent variables, whereas the univariate tests do not. It's also worth remembering that the univariate and multivariate tests look at different things: the multivariate tests tell us whether groups can be discriminated based on a linear combination of the dependent variables, whereas the univariate tests tell us whether the groups can be discriminated by a single variable.

SELF-TEST Based on what you have learnt in previous chapters, interpret the table of contrasts in your output.

In the chapter I suggested carrying out a *simple* contrast that compares each of the therapy groups to the no-treatment control group. **Error! Reference source not found.**The output below shows the results of these contrasts. The table is divided into two sections conveniently labelled *Level 1 vs. Level 3* and *Level 2 vs. Level 3* where the numbers correspond to the coding of the group variable. If you coded the group variable using the same codes as I did, then these contrasts represent CBT vs. NT and BT vs. NT, respectively. Each contrast is performed on both dependent variables separately and so they are identical to the contrasts that would be obtained from a univariate ANOVA. The table provides values for the contrast estimate and the hypothesized value (which will always be zero because we are testing the null hypothesis that the difference between groups is zero). The observed estimated difference is then tested to see whether it is significantly different from zero based on the standard error. A 95% confidence interval is produced for the estimated difference.

Contrast Results (K Matrix)

group Simple Contrast[a]			Dependent Variable: Number of obsession-related behaviours	Dependent Variable: Number of obsession-related thoughts
Level 1 vs. Level 3	Contrast Estimate		-.100	-1.600
	Hypothesized Value		0	0
	Difference (Estimate - Hypothesized)		-.100	-1.600
	Std. Error		.615	.951
	Sig.		.872	.104
	95% Confidence Interval for Difference	Lower Bound	-1.361	-3.551
		Upper Bound	1.161	.351
Level 2 vs. Level 3	Contrast Estimate		-1.300	.200
	Hypothesized Value		0	0
	Difference (Estimate - Hypothesized)		-1.300	.200
	Std. Error		.615	.951
	Sig.		.044	.835
	95% Confidence Interval for Difference	Lower Bound	-2.561	-1.751
		Upper Bound	-.039	2.151

a. Reference category = 3

The first thing that you might notice (from the values of *Sig.*) is that when we compare CBT to NT there are no significant differences in thoughts (p = .104) or behaviours (p = .872) because both values are above the .05 threshold. However, comparing BT to NT, there is no significant difference in thoughts (p = .835) but there is a significant difference in behaviours between the groups (p = .044, which is less than .05). The confidence intervals confirm these findings: they all include zero (the lower bounds are negative whereas the upper bounds are positive), except for the BT vs. NT contrast for behaviours. Assuming that these intervals are from the 95% that contain the population value, this means that all of these effects might be 0 in the population, except for the effect of BT vs. NT for behaviours. This finding is a little unexpected because the univariate ANOVA for behaviours was non-significant and so we would not expect there to be group differences.