

Study Description

Maxwell and Delaney (1990) describe a study in which the effects of three possible treatments for hypertension were investigated. The details of the treatments are as follows:

Treatment	Description	Levels
Drug	Medication	Drug X, drug Y, drug Z
Biofeed	Psychological feedback	Present, absent
Diet	Special diet	Present, absent

All 12 combinations of the three treatments were included in a $3 \times 2 \times 2$ design. Seventy-two subjects suffering from hypertension were recruited to the study, with six being randomly allocated to each of 12 treatment combinations. Blood pressure measurements were made on each subject after treatment, leading to the data.

Study Analysis

Questions of interest concern differences in mean blood pressure for the different levels of the three treatments and the possibility of interactions between the treatments.

1. Use PROC TABULATE to show the mean blood pressure in each of the 12 different treatment x Feedback x Diet ($3 \times 2 \times 2$) combinations. Include the number of observations in each cell as well as the standard errors.
2. Is the design balanced or unbalanced?
3. Test whether there is any evidence of heterogeneity of variances among the 12 combinations. What is your conclusion?
4. Construct an ANOVA table and discuss the results. Is there a statistically significant treatment effect (Use $\alpha = .05$)?
5. Is there a statistically significant effect from biofeedback (Use $\alpha = .05$)?
6. Is there a statistically significant effect from diet (Use $\alpha = .05$)?
7. Are there statistically significant interactions (Use $\alpha = .05$)? Construct interaction plots and also do the formal statistical tests.
8. Use the Bonferroni multiple comparison procedure to determine which, if any, of the three treatment combinations are statistically significantly different. State your conclusions using an overall $\alpha = 0.05$ level of significance.

The Dataset (available on course website) is shown below:

Biofeedback	Drug	Special Diet											
		No						Yes					
Present	X	170	175	165	180	160	158	161	173	157	152	181	190
	Y	186	194	201	215	219	209	164	166	159	182	187	174
	Z	180	187	199	170	204	194	162	184	183	156	180	173
Absent	X	173	194	197	190	176	198	164	190	169	164	176	175
	Y	189	194	217	206	199	195	171	173	196	199	180	203
	Z	202	228	190	206	224	204	205	199	170	160	179	179