

ERSH 8310, Fall 2007

Homework #2

Due: Thursday 9/27/2007 at 11:59:59 pm

Homework format: all homework answers must be provided electronically. Please answer each question with as much detail as you can provide. Do not provide direct SPSS (or other package) output for any question (the exception being figures/graphs).

A researcher thinks that music affects concentration. He hypothesizes that soft music will increase concentration; moderately loud music will have no effect on concentration, and loud music will detract from concentration. He randomly breaks 24 college students into four groups. All groups are given a reading comprehension task while listening to a tape of their favorite music (which each subject was asked to bring to the experiment). The Soft Group hears the music at a low background level, similar to that played in a grocery store: It is there, but you can hardly hear it. The Moderate Group hears the music at listening level: The music is clearly present and can be easily heard. The Loud Group hears the music at a very high level. The Control Group hears only the soft sounds of an air conditioning system.

Reading Comprehension Scores

| Soft | Moderate | Loud | Control |
|------|----------|------|---------|
| 20 | 36 | 25 | 22 |
| 12 | 30 | 28 | 15 |
| 12 | 32 | 25 | 27 |
| 13 | 36 | 20 | 19 |
| 17 | 30 | 25 | 20 |
| 17 | 33 | 24 | 21 |

The data in the table are reading comprehension scores; the higher the score the greater the comprehension. Given these were the same data for Homework #1, let's continue the analysis for the experiment...

1. Form a contrast and test following hypothesis:

$$H_0: \mu_{control} = \frac{\mu_{soft} + \mu_{moderate} + \mu_{loud}}{3}$$

- a. Describe in non-statistical terms what the hypothesis is testing.
 - b. Form the contrast: what are the coefficients you use?
 - c. Report the test statistic.
 - d. Using an $\alpha = 0.05$, do you reject or fail to reject the null hypothesis (report your p-value and your conclusion).
 - e. Interpret your result and your decision about H_0 .
2. Imagine that each condition had the following level of volume for music:
Control: 0 db
Soft: 30 db

Medium: 60 db

Loud: 90 db

Form a set of orthogonal contrasts testing the trend of the means (form as many as are possible).

- a. How many contrasts for trend can you form?
- b. What are the trends you are testing (e.g. linear)?

For each contrast, then:

- c. Describe in non-statistical terms what the hypothesis is testing.
 - d. Form the contrast: what are the coefficients you use?
 - e. Report the test statistic.
 - f. Using an $\alpha = 0.05$, do you reject or fail to reject the null hypothesis (report your p-value and your conclusion).
 - g. Interpret your result and your decision about H_0 .
3. Now imagine you want to just test all possible pairs of means for a difference. Using the Tukey post-hoc test, report the following for each mean comparison:
- a. Describe in non-statistical terms what the hypothesis is testing.
 - b. Report the null and alternative hypotheses.
 - c. Using an overall $\alpha = 0.05$, do you reject or fail to reject the null hypothesis (report your p-value and your conclusion).
 - d. Interpret your result and your decision about H_0 .