Trends Analysis

PSY710

3 Initialize R

Before starting this lab, please initialize R by entering the following commands at the prompt:

```r
options(contrasts = c("contr.sum", "contr.poly"), digits = 6, width=70)
load(url("http://www.psychology.mcmaster.ca/bennett/psy710/datasets/tracklearn.Rdata"))
```

3.1 Sensorimotor learning task

An experiment was conducted to evaluate the effects of the duration of the inter-trial interval on learning/performance in a sensorimotor task. On each trial, a spot moved along a random, curvilinear path on a computer screen, and the subject’s task was to use a computer mouse to keep a cursor on the dot. To increase task difficulty, the relation between the mouse’s horizontal motion and the cursor’s horizontal motion was reversed: leftward mouse movement produced rightward cursor movement and vice versa. There were 10 trials and each trial lasted one minute. The dependent variable was the duration (in seconds) in which the cursor was located on the target spot. The independent variable was the duration of the inter-trial interval, which was 0, 20, 40, or 60 seconds. (N.B. In the 0 second condition, trial N+1 started immediately following trial N). The duration of the inter-trial interval was a between-subject variable: each subject was assigned randomly to one condition with the constraint that there were 5 subjects per group. The data are stored in the data frame `tracklearn`: the dependent variable is `y` and the independent variable is the factor `itd` (inter-trial duration). The group means are plotted in Figure 1.

1. Calculate the mean and standard deviation of `y` for each `itd`.
2. Confirm that `itd` is an ordered factor and ist the contrasts that are linked with `itd`.
3. Verify that the contrasts for `itd` are orthogonal.
4. Use `aov` to perform an ANOVA to evaluate the null hypothesis that performance is the same in all groups.
5. Take the result of your `aov` command and then split the between-groups sum-of-squares to evaluate the linear, quadratic, and cubic trends. What null hypotheses are being evaluated by the $F$ tests?
6. Use `lm` to perform an ANOVA to evaluate the null hypothesis that performance is the same in all groups.
7. Take the result of your `lm` command and evaluate the linear, quadratic, and cubic trends using $t$ tests. What null hypotheses are being evaluated by the $t$ tests?
8. How are the $F$ and $t$ values in 5 and 7 related?
9. Why is the $t$ value for the quadratic trend in 7 less than zero?
10. What happens to our trend analyses if our weights are multiplied by a constant (e.g., 3)?
Figure 1: Group means.