

PS11

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November 27, 2018

When we speak sets of words, the more words we speak, the longer it takes. The spokenduration data set describes data from speeded spoken duration of words. Each column describes whether a particular word was on the list they spoke, but we will ignore those columns for the moment. The last column tells how long it took to speak the word.

subject	cult	dare	fate	guess	hint	mood	oath	plea	rush	verb	zeal	time
s02	1	1	0	1	0	0	0	1	1	0	1	4.886719
s02	1	1	0	0	0	1	1	0	0	0	0	2.738281
s02	0	0	1	0	1	1	1	1	0	1	0	4.179688
s02	1	0	0	1	0	0	1	1	0	0	1	3.628906

Read in the data, and compute a list-length using the following function:

```
data <- read.csv("spokenduration.csv")
data$length <- as.factor(rowSums(data[,2:12]))
```

1. Categorical effect of length

First, we'd like to determine whether there is a significant relationship between list length and spoken duration. Create an anova model and test this relationship, treating list length as a factor. On the basis of the anova model, compute the effect size of this relationship. Also, compute a post-hoc Tukey HSD test and describe which differences are significant at a $p=.05$ level. Finally, compute the effect size for length, and describe what that means. Run both lm and aov models so you can examine the coefficients or the factor effects.

2. Subject effects

Next, we might expect that different people speak more quickly or more slowly. We'd like to incorporate an overall speed-by-subject factor. To do so, reset the contrasts of subject to use sum-to-zero coding (so that they will all be coded with respect to the mean), and add subject to the model. Use a type-II ANOVA to test whether subject accounts for a significant proportion of variance. Compute the effect sizes (η^2 and ω^2). Then do a post-hoc Tukey test to determine whether any individual participants were significantly faster or slower than you'd expect. Describe your findings in words.

3. Subject x length interactions

Not everyone pronounces words the same. It may be true that individuals interacts with word-length. Add the subject by length interaction to the model. Do this in an lm and examine the coefficients. Describe the effects—which people are slower, or which length:subject interaction terms are significantly different than the baseline? Perform a post-hoc tukey test and determine which participants have significantly different durations for 6-item lists (e.g., the result for 6:s06-6:s01 shows whether participants s06 and s01 differed in how they pronounced 6-item lists)

4. ANCOVA

Finally, run the interaction model again, but use length as a continuous predictor instead of a categorical run both the regression and anova models. Look at and interpret the sets of coefficients in the regression model, and interpret the results of a Type-II ANOVA. Run a post-hoc test on subject, and compute η^2 and ω . describe in words how you would interpret each part of this.