

Name _____

One-Way Independent Groups ANOVA

Bransford & Johnson study

If you didn't know the topic, what could you remember of the following passage?

The procedure is actually quite simple. First you arrange things into different groups depending on their makeup. Of course, one pile may be sufficient, depending on how much there is to do. If you have to go somewhere else due to lack of facilities, that is the next step; otherwise you are pretty well set. It is important not to overdo any particular endeavor. That is, it is better to do too few things at once than too many. In the short run this may not seem too important, but complications from doing too many can easily arise. A mistake can be expensive as well. The manipulation of the appropriate mechanisms should be self-explanatory, and we need not dwell on it here. At first the whole procedure may seem complicated. Soon, however, it will become just another facet of life. It is difficult to foresee any end to the necessity for this task in the immediate future, but one can never tell.

That is, knowing the context of the passage [Doing Laundry] allows you to make better sense of the passage, which then leads to better memory for the passage. And the take-home message is that you *don't* want to be in the no-context condition! 😊

Bransford & Johnson did a number of other studies relating to the importance of context for memory of text passages. We'll replicate a portion of one of their classic studies to provide data for analysis. Note that this design could be analyzed with a *t*-test or ANOVA, because there are only two levels to the independent variable.

In conducting the study and interpreting its results, you will need to understand:

Research and Statistical Hypotheses

Independent Variable (IV)

Dependent Variable (DV)

Operational Definitions

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Two concepts are central to ANOVA. One is that the MS_{Error} (MS_{Within}) is an estimate of σ^2 (with the variability due to individual differences and random variability) and is derived from taking the mean of all the sample variances. The other is that the $MS_{Treatment}$ ($MS_{Between}$) is created from the variance of the group means and represents the variability due to treatment effects superimposed on individual differences and random variability.

a. Sampling from a less variable population (3,3,3,3,4,4,4,4,5,5,5,5,6,6,6,6), so $\mu = 4.5$ and $\sigma^2 = 1.25$:

I will first take three samples of $n = 5$ with replacement (take a number, record it, then return it). Once I've drawn the samples, compute the appropriate summary statistics (mean, sum of squares, variance) for each sample.

| | Sample 1 | Sample 2 | Sample 3 | |
|----------------|----------|----------|----------|--|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| ΣX (T) | | | | |
| ΣX^2 | | | | |
| Mean | | | | |
| Sum of Squares | | | | |
| Variance | | | | |

Now you should be able to compute an ANOVA on the three samples.

| Source | SS | df | MS | F |
|-----------|----|----|----|---|
| Treatment | | | | |
| Error | | | | |
| Total | | | | |

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b. Sampling from a more variable population (1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8), so $\mu = 4.5$ and $\sigma^2 = 5.25$:

Now we'll repeat the above procedure, but with a different population. Again, using replacement (take a number, record it, then return it), I'll take three samples of 5 numbers. Compute the appropriate summary statistics on the three samples (mean, sum of squares, variance).

| | Sample 1 | Sample 2 | Sample 3 | |
|----------------|-----------------|-----------------|-----------------|--|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| ΣX (T) | | | | |
| ΣX^2 | | | | |
| Mean | | | | |
| Sum of Squares | | | | |
| Variance | | | | |

Compute an ANOVA on the three samples.

| Source | <i>SS</i> | <i>df</i> | <i>MS</i> | <i>F</i> |
|---------------|------------------|------------------|------------------|-----------------|
| Treatment | | | | |
| Error | | | | |
| Total | | | | |

c. Now, think about what we've just done. What decision should you make regarding H_0 in the two ANOVAs? Why?

