

# Simple Linear Regression Worksheet

*David Gerard*

*2018-12-07*

## LSD

In Wagner, Aghajanian, and Bing (1968), the authors intravenously injected d-lysergic acid diethylamide (better known as LSD) into seven volunteer male subjects. They then instructed the subjects to solve a set of simple arithmetic problems as quickly as possible during a three minute period. These data are available in the data frame `lsd` on Blackboard. You may load the data using (you may need to change the path):

```
load("./lsd.rdata")
lsd
```

The variables in this data frame are: `conc`, the tissue concentration of LSD in nanograms of LSD per mL; and `score`, their performance score on the arithmetic questions as a percent of a control score.

1. What do you think is the explanatory variable? What is the response variable? What are the observational units?
2. Make a plot to see if a linear model would be appropriate to fit to these data.
3. Posit a model that explains the relationship between concentration and score.
4. What assumptions are made about the distribution of the **explanatory** variable in the simple linear regression model?
5. Fit a linear model of score on concentration.
6. Make a residual plot and assess the fit
7. Set up hypotheses to test if concentration is associated with score.
8. Test the above hypotheses and state a conclusion. Include confidence intervals and an interpretation of the slope estimate in this conclusion.
9. Suppose a new individual has a concentration of 4. What would be their predicted test score?
10. What would be a range of likely scores for that new individual?
11. What is the standard error of prediction as the sample size approaches infinity?
12. Suppose a new individual has a concentration of 9. What would you say to a fellow researcher who wanted to predict the test score?

## References

Wagner, John G, George K Aghajanian, and Oscar HL Bing. 1968. "Correlation of Performance Test Scores with "Tissue Concentration" of Lysergic Acid Diethylamide in Human Subjects." *Clinical Pharmacology & Therapeutics* 9 (5). Wiley Online Library: 635–38.