

You may work with one partner on this assignment, submitting one report with both names, provided that both students contribute substantially to the work. Word-processed reports are preferred to hand-written ones. Please copy/paste relevant computer output into your report as appropriate.

### **Pulling All-Nighters, and Writing Cursively?**

A study published in the January 2008 issue of the journal *Behavioral Sleep Medicine* involved a survey of 120 students at St. Lawrence University, a small liberal arts college in upstate New York. Researchers found that students who claimed to have never pulled an all-nighter have average GPAs of 3.1, compared to 2.9 for those students who do claim to have pulled all-nighters.

a) Identify the explanatory and response variables in this study. Classify each as categorical or quantitative.

The explanatory variable is whether or not the student has ever pulled an allnighter. This is a categorical variable, also binary. The response variable is the student's GPA. This is a quantitative variable.

b) Is this an observational study or a randomized experiment? Explain how you know.

This is an observational study, because the students were not randomly assigned to pull an allnighter or not.

c) Suppose that the difference between these two averages is shown to be statistically significant. Can you legitimately conclude that pulling all-nighters causes a student's GPA to decrease? If so, explain why. If not, identify a potential confounding variable, and explain how it provides an alternative explanation for why the all-nighter group would have a significantly lower average GPA.

No, we cannot conclude that pulling an allnighter causes a student's GPA to decrease. A potential confounding variable is the student's interest in academics. It seems plausible that students who are more interested in academics have less need to pull allnighters and also tend to have higher GPA's than students with less interest in academics.

An article about handwriting appeared in the October 11, 2006 issue of the *Washington Post*. The article mentioned that among students who took the essay portion of the SAT exam in 2005-06, those who wrote in cursive style scored significantly higher on the essay, on average, than students who used printed block letters.

d) Identify the explanatory and response variables in this study. Classify each as categorical or quantitative.

The explanatory variable is writing style: cursive or block letters. This is a categorical variable, also binary. The response variable is score on the SAT essay, which is a quantitative variable.

e) Is this an observational study or an experiment? Explain briefly.

This is an observational study, because the students were not randomly assigned to write with a particular style.

f) Would you conclude from this study that using cursive style causes students to score better on the essay? If so, explain why. If not, identify a potential confounding variable, and explain how it provides an alternative explanation for why the cursive writing group would have a significantly higher average essay score.

No, we cannot conclude that writing with a cursive style causes a student to score higher on the SAT essay. A potential confounding variable is the student's verbal ability. It seems plausible that students with higher verbal aptitude are more prone to write with cursive style and also to score higher on the essay.

The article also mentioned a different study in which the identical essay was shown to many graders, but some graders were randomly chosen to see a cursive version of the essay and the other graders were shown a version with printed block letters. Researchers randomly decided which version the grader would receive. The average score assigned to the essay with the cursive style was significantly higher than the average score assigned to the essay with the printed block letters.

g) What conclusion would you draw from this second study? Be clear about how this conclusion would differ from that of the first study, and why that conclusion is justified.

This study is a randomized experiment, because the graders were randomly assigned to read a particular writing style. From this study we can conclude that graders tend to give higher scores to an essay written in cursive style rather than block letters, because of the writing style. In other words, a cause/effect conclusion between writing style and essay score is warranted from this second study.