The Effects of Caffeine on Word Memorization
(The “D+” Version)

Note: Comments in red explain what the mistakes are.

A Project for COGS 14
Summer Session I, 2006

By:
Larry (Introduction)
Curly (Methods)
Moe (Results)
Shep (Results)
Thelma (Discussion)
Louise (Discussion)
INTRODUCTION:
Caffeine is one of the most commonly consumed psychoactive chemicals in the world. Lots of people drink caffeine on a daily basis, including many of us in this group. That’s why we thought it would be interesting to study the effects of caffeine on the ability to memorize words.

The fact that caffeine is so popular is a justification for studying caffeine, however this introduction does not explain why it is interesting to study the effect of caffeine on memorization. They might as well have been studying the effect of caffeine on toenail growth. Furthermore, the introduction does not explain why the researchers expected to find an effect of caffeine on memorization, nor does it explain why the researchers expected the difference to be in a particular direction (i.e., that caffeine improves memorization abilities).

METHODS:
Our group recruited 20 volunteers to participate in our study. Volunteers were either given a cup of caffeinated coffee or decaffeinated coffee. After volunteers drank their coffee, they were given a list of words to study. The next day, the volunteers were asked to name all the words they could remember.

This does not give nearly enough detail to reproduce the study. What type of people were the volunteers and how were they recruited? How many and what words were the volunteers given to study? How and in what environment were the test and recall phases of the experiment carried out?

In conclusion, our research study was an experiment.

What were the independent and dependent variables? What level of measurement were they (nominal, ordinal, interval/ratio)?

RESULTS:
An “accuracy score” was computed for each volunteer by awarding one point for each correctly recalled word and subtracting one point for each false positive (i.e., a word the volunteer thought was on the list, but really was not). The mean accuracy score for each experimental group is presented in Figure 1.
The graph should be a bar graph (i.e., there should be a gap between the caffeinated and decaffeinated bars) rather than a histogram. Also there should be error bars.

On average, the volunteers who had caffeinated coffee had an accuracy score of 12.7. In contrast, volunteers who drank decaffeinated coffee had a mean accuracy score of 10.9. However, a one-tailed $t$-test found that this difference failed to exceed our .05 level of significance.

You should give a measure of dispersion (e.g., standard error) along with the means. You should report the $t$-score, $p$-value, and Cohen’s $d$ of your data. You should also report 95% confidence intervals for the mean difference between the Caffeinated and Decaffeinated groups.
This section is missing the data from each volunteer. You need to report your raw data so that we can check your computations.

### Hypothesis Test:

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>$\mu_1 = \mu_2$; both groups have equal variance and come from normal distributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative Hypothesis</td>
<td>$\mu_1 &gt; \mu_2$</td>
</tr>
<tr>
<td>Tail of the Test</td>
<td>Upper tailed</td>
</tr>
<tr>
<td>Type of Test</td>
<td>Independent Samples t-test</td>
</tr>
</tbody>
</table>

You should also provide the Alpha Level, Critical Score(s), the Test Statistic of your data (e.g., the $t$-score of your data), Decision (Reject or Retain the Null Hypothesis), $p$-value, and Cohen’s $d$.

### Computations:

$$t = \frac{(\bar{X}_1 - \bar{X}_2) - 0}{s_{\bar{X}_1 - \bar{X}_2}} = \frac{2.30}{2.05} = 1.122$$

You should provide intermediate computations as well so that we can assign partial credit.
DISCUSSION:
Based on our results we can conclude that caffeine does not affect memorization. A possible problem with our study is that we only tested college students. College students may not be representative of the general population, and thus our results might not generalize to the general population.

First of all, it is incorrect to say that this study proves that caffeine does not affect memorization. The hypothesis test only showed that the null hypothesis is consistent with the data, but doesn’t prove it. It may be that with more volunteers or a better controlled experiment, you could reveal the effect of caffeine on memorization. Secondly, the critique of their study though true isn’t well justified. They needed to explain why the effect of caffeine on the memorization abilities of college students might be different than it’s effect on non-college students. Thirdly, this is not a very thoughtful discussion section. There needs to be more content.