

Psychology 2101
Discussion Section Problem Set

1. **Transcendental Meditation and Memory.** Transcendental Meditation (TM) is a meditation technique which was publicized widely in the 1970's. Many benefits were claimed by its adherents, and improved memory was one of them. To test the hypothesis that TM improves memory, we conduct a two group experiment, in which one group receives TM training, the other group a similar type of training which is claimed by the skeptical to be equivalent to TM, but which TM adherents claim is clearly an inferior meditation technique. Ten subjects are randomly selected for each group. All subjects receive training, followed by a standard memory recall task. The null hypothesis is

$$H_0 : \mu_1 = \mu_2$$

Suppose we obtained the following data from our experiment:

$$n_1 = n_2 = 10, M_1 = 23, M_2 = 19.8, s_1^2 = 23, s_2^2 = 27$$

- a. What is the t statistic?
- b. What are the degrees of freedom?
- c. Is this a 1-sided or 2-sided test?
- d. What is the critical value if $\alpha = 0.05$?
- e. Construct a 95% confidence interval on the mean difference $\mu_1 - \mu_2$.

2. Suppose you have a hypothesis that, because of the interesting metabolic characteristics of statistics students, consumption of beer has absolutely no effect on their cognitive capacities. You decide to test this hypothesis by having each of 10 randomly selected students play games of "Night-Mission Pinball" either sober, or immediately after consuming 3 beers. (To control for practice effects, order is counterbalanced.) The raw data for the 10 subjects are as follows:

Beer	No Beer	Difference
65	54	+11
60	187	-127
102	99	+3
143	265	-122
97	119	-22
234	445	-211
254	354	-100
45	65	-20
89	111	-22
123	167	-44

- a. Compute a t statistic for testing the hypothesis of no difference.
- b. What are the degrees of freedom?
- c. Is this a 1-sided or 2-sided test?
- d. What is the critical value if $\alpha = 0.05$?
- e. Construct a 95% confidence interval on the $\mu_{Beer} - \mu_{NoBeer}$ mean difference.

3. Given the following data for two variables X and Y .

$$M_x = 40.23, M_y = 33.10, S_x = 13.44, S_y = 12.12, r_{y,x} = 0.60, n = 114$$

a. Calculate the values of a and b in the linear regression equation

$$\hat{Y} = bX + a$$

for predicting Y from X .

b. What is the predicted score for an individual whose X score is 45?

c. Suppose a third variable W has a correlation of 0.37 with X and 0.38 with Y . What is the partial correlation between X and Y with W partialled out, i.e., $r_{x,y \cdot w}$

4. Given the same data as in problem 3, test the hypothesis that $\rho_{y,x} = 0$.

a. What is the t statistic?

b. What are the degrees of freedom?

c. Is this a 1-sided or 2-sided test?

d. What is the critical value if $\alpha = 0.05$?