

Homework for correlated means t -test.

In StatTool open: HW_t-corr.dat

FOR THE PROBLEM BELOW:

- a. State the scientific hypothesis and skeptical-scientific hypothesis. Also state the PCH of chance.
- b. Is the scientific hypothesis directional or non-directional? Why?
- c. Translate the scientific hypothesis and the PCH of chance into statistical hypotheses--that is, state H_0 and H_1 .
- d. Name the test statistic you will use to decide between the statistical hypotheses.
- e. What is the alpha level (level of significance, p -value) that you will use?
- f. In your own words what does this p -value mean?
- g. Calculate your df .
- h. Is H_1 one- or two-tailed? Why?
- i. Look up the critical value (or values) in the table in your book.
- j. Draw a line representing the range of your test statistic. What is the center value predicted by H_0 ? Draw this center value on the line. Also draw the critical value (or values) on the line. Label the "Reject H_0 " region (or regions). Label the "Do not reject H_0 " region.
- k. Why does H_0 predict a value of zero for your test statistic?

NOW FOR THE DATA:

- l. Does the pattern of data favor the scientific or skeptical-scientific hypothesis?
 - m. Now calculate the value of your test statistic from the data. Take this calculated value of your test statistic and put on the drawing you made in (j). Does it fall in a rejection region?
 - n. Do you reject H_0 or not?
 - o. Verbally summarize the issue of statistical conclusion validity (PCH of chance) in this case. That is, do you think this study has statistical conclusion validity or not?
1. A scientist thought that attitudes toward people are improved by knowing them better. He thought that unfavorable attitudes toward minorities were the result of not knowing them well as humans, and that getting to know minorities better would lead to improved attitudes toward them.

Thirty sets of identical twins (from the predominant culture) were asked to participate

in a one-year study designed to measure social attitudes. One twin from each set was randomly assigned to live in the home of a minority family, while the other twin stayed home. After one year each person was asked to respond to a long questionnaire designed to detect and measure well-defined attitudes toward various minorities. Let "Live away" denote a twin who lived away and "Live home" denote a twin who lived at home. Below are the questionnaire scores; higher values indicate a more favorable attitude toward minorities.

FAVORABLENESS RATINGS TOWARD MINORITIES										
<i>Subject Number</i>	1	2	3	4	5	6	7	8	9	10
Live Away	79	74	68	92	56	77	65	80	97	52
Live Home	71	70	66	85	58	73	57	75	92	55

T-Test for Correlated Means

- la Scientific Attitudes towards minorities (or people in general) are improved by knowing them better
 b Skeptical: Knowing people better would not affect the attitudes toward them
 c POH of chance: Any correlation between attitudes & the level of knowing the person is due to chance
 d Directional: The hypothesis predicts a positive correlation
 e $H_0: \rho_{\text{knowing} - \text{attitude}} = 0$

$$H_1: \rho_{\text{knowing} - \text{attitude}} > 0$$

d. t correlated means

e. $\alpha = .05$

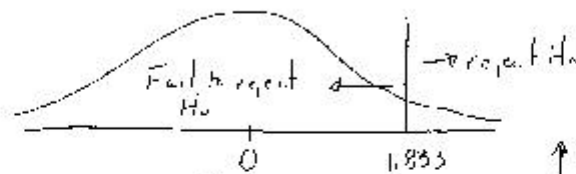
f. The probability of reject H_0 when it is true

g. $df = n - 1 = 10 - 1 = 9$

h. One tailed ~ Directional Hypothesis

i. $\text{crit } t_{(9), .05} = 1.833$

j.



k. Expecting no difference

l. Scientific Hypothesis

↑
3.142 > 1.833

M.	Subj #	Line forward	Line Home	d	d ²
	1	79	71	8	64
	2	74	70	4	16
	3	68	66	2	4
	4	92	85	7	49
	5	56	58	-2	4
	6	77	73	4	16
	7	65	57	8	64
	8	80	75	5	25
	9	97	92	5	25
	10	52	55	-3	9
				38	276

$$S_d = \sqrt{\frac{\sum d^2}{n_d} - M_d^2} = \sqrt{\frac{276}{10} - 3.8^2} = \sqrt{13.16} = 3.6277$$

$$t = \frac{M_d}{\frac{S_d}{\sqrt{N_d - 1}}} = \frac{3.8}{\frac{3.6277}{\sqrt{10-1}}} = 3.142 \quad \text{Falls in Reject } H_0 \text{ Region}$$

∴ Reject H_0

○ if H_0 is true, the chances of obtaining a t value in the reject H_0 region are less than 1 in 20 (5%). Because 5% is improbable, we can assume that the PLH of chance is implausible & there is statistical conclusion validity.

