t-tests

Assignment.

G&W Chapters 9, 10, 11

Terms you should know.

t-test

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Independent sample

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Dependent sample

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Homogeneity of variance

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Standard error of the difference between means.

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Pooled estimate of the population variance

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Degrees of freedom

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Independent samples t-test

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Repeated measures t-test . . . .
. . . .
. . . .

Difference score . . . .
. . . .
. . . .

Effect size . . . .
. . . .
. . . .

Cohen's d . . . .
. . . .
. . . .

Formulas and Symbols You Should Know.

t . . . .
. . . .
. . . .

S_p^2 . . . .
. . . .
. . . .

S_{diff} . . . .
. . . .
. . . .

$$\frac{M - \mu}{S_M}$$
. . . .
. . . .
. . . .
. . . .

$$\frac{M_1 - M_2}{S_{diff}}$$
. . . .
. . . .
. . . .
. . . .

$$\sqrt{\frac{S_p^2}{N_1} + \frac{S_p^2}{N_2}}$$

. . . .
. . . .
. . . .
. . . .

D

. . . .
. . . .
. . . .

$S_Đ$

. . . .
. . . .
. . . .

$$d = \frac{M_1 - M_2}{\sqrt{S_{pooled}^2}}$$

. . . .
. . . .
. . . .

$$\frac{M_D}{s}$$

. . . .
. . . .
. . . .

Computations You Should be Able to Perform.

Problem 1.   Anita Bath found that monkeys would solve puzzles that were put into their cages even though they were not reinforced for this behavior. She wanted to see if a food reward would alter the puzzle-solving behavior. There could be several outcomes: the monkeys would continue solving puzzles at the same rate, the monkeys wold solve puzzles faster, or the monkeys would solve puzzles slower. Anita did not know what would happen. She tested a random sample of 16 monkeys and found that the mean puzzle solving time was 32 seconds, the standard deviation was 2 seconds. The average puzzle solving time is 30 seconds.

1. What is your research hypothesis?

2. What is H_o?

3. What is H_A?

4. What is the statistical test and df?

5. What is the significance level and its critical value?

6. What is your best estimate of the population σ?

7. What is the Standard error of the mean?

8. What is your calculated statistic?

9. What is your conclusion?

Problem 2.   Holly Peño thought that men with earrings would be more neurotic than men without earrings. The national average on a test if neuroticism is 32. Using a sample of 16 men with earrings the experimenter found that the mean score was 30.4 and the standard deviation was 2.9. Analyze these results.

1. What is your research hypothesis?

2. What is H_o?

3. What is H_A?

4. What is the statistical test and df?

5. What is the significance level and its critical value?

6. What is your best estimate of the population σ?

7. What is the Standard error of the mean?

8. What is your calculated statistic?

9. What is your conclusion?

Problem 3.   Park N. Lott wanted to decide if maze learning in rats required the animals to actually walk or run through the maze. Lott took two randomized groups or hungry rats. The groups of ten rats each were "trained" in a maze in which food was available in the goal box. One group was permitted to run or walk through the maze. Rats in the other group were placed in a small cart that was pulled through the maze by the experimenter. Both groups were then given five non-reinforced test trials where they were permitted to run or walk through the maze freely. The data $Mean_{walk}$ = 10.9, s_{walk} = 1.20, $Mean_{cart}$ = 13.5, s_{cart} = 1.58.   What is your conclusion?

1. What is your research hypothesis?

2. What is H_o?

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Problem 4. A statistics professor, Dr. Sig Ma, wanted to know if it was better to teach students by giving examples first, then explaining the theory or if was better to give the theory first and then give examples. Dr. Ma collected data from two groups of subjects of randomly chosen subjects. Their results on a statistics test are summarized below. Can the researcher conclude that one teaching strategy was more effective than the other? If "Yes" which one is more effective?

Sample 1 -- Examples first   N=18 Mean = 18.6 s = 1.38
Sample 2 -- Theory first   N = 14   Mean = 17.3 s = 1.414

1. What is your research hypothesis?

2. What is H_o?

3. What is H_A?

4. What is the statistical test and df?

5. What is the significance level and its critical value?

6. What is your best estimate of the population σ?

7. What is the Standard error of the mean?

8. What is your calculated statistic?

9. What is your conclusion?

Problem 5.   Warren Peace wants to test the notion that sunshine has a major positive effect of the mood of people prone to depression. He got a sample of 36 patients who had a history of depression and exposed them to special lights that duplicated sunshine for four hours daily. At the end of the study the average scores for this group on a test of depression was 26.7. The standard deviation was 5.7. The population mean for depressed patients is 28.9. Higher scores on the test mean that the person was more depressed. Did the treatment work?

1. What is your research hypothesis?

2. What is H_o?

3. What is H_A?

4. What is the statistical test and df?

5. What is the significance level and its critical value?

6. What is your best estimate of the population σ?

7. What is the Standard error of the mean?

8. What is your calculated statistic?

9. What is your conclusion?

Problem 6.   Pat A. Kayke wanted to know if people who said a prayer just before answering quiz questions did better on quizzes. A sample of 6 students alternatively prayed and did not pray during a statistics quiz. Their scores are reported below. Did the prayer have an effect?

Subject	Prayer	No Prayer
A	93	98
B	90	94
C	95	96
D	92	91
E	95	97
F	91	97

1. What is your research hypothesis?

2. What is H_o?

3. What is H_A?

4. What is the statistical test and df?

5. What is the significance level and its critical value?

6. What is your best estimate of the population σ?

7. What is the Standard error of the mean?

8. What is your calculated statistic?

9. What is your conclusion?

Concepts and Interpretation.

1. What is the difference between the single sample and independent sample t-test?

2. What is the difference between an independent sample t-test and a repeated measures t-test?

3. What is meant by homogeneity of variance?

4. What is the null hypothesis for

    a. An independent sample t-test?

    b. A repeated measures t-test?

5. What type of t-test would you use for each of the following experiments? Why would you use this test?

    a. An investigation of the effects of sleep deprivation on ability to memorize words comparing a group of subjects who have been deprived of sleep against a the population μ for subjects permitted to sleep an average of 8 hours.

    b. An investigation as to whether girls of boys are more prone to household accidents.

    c. An evaluation of the differential effectiveness of desensitization therapy on introverts and extroverts.

    d. An evaluation of leadership effectiveness training on a group of supervisors in a factory.

SPSS Assignment #2.

NAME: _____

1. Using SPSS compute t-tests for evaluating the difference between men and women on the C-scores for vectors 1 and 2 of the class data set.

   a. For Vector 1.

      i.   Who has higher scores?

      ii. What is the t-score?

      iii. Is this a practically significant value? Why do you say this?

   b. For Vector 2.

      i.   Who has higher scores?

      ii. What is the t-score?

      iii. Is this a practically significant value? Why do you say this?