PSYC 2317: Statistical Methods for Psychology

Tarleton State University | Exam 2 Practice Problems | Fall 2019

Note: for any problem involving hypothesis testing, you will need to justify your answer by explicitly defining your null hypothesis $\mathcal{H}_0$ and alternative hypothesis $\mathcal{H}_1$ and reporting an appropriate p-value, either exact or a range, depending on the test statistic that is being used.

1. A researcher conducts a hypothesis test to evaluate the effect of a treatment. The hypothesis test (a single sample z-test) produces a z-score of $z = 2.37$. Compute the exact p-value, assuming that the test is:

   (a) one-tailed

   (b) two-tailed

2. Recent results suggest that children with ADHD also tend to watch more TV than children who are not diagnosed with the disorder. To examine this relationship, a researcher obtains a random sample of $N = 36$ children, 8 to 12 years old, who have been diagnosed with ADHD. Each child is asked to keep a journal recording how much time each day is spent watching TV. The average daily time for the sample is $\overline{x} = 4.9$ hours. It is known that the average time for the general population (without ADHD) is 4.1 hours, with $\sigma = 1.8$.

   (a) Compute a 95% confidence interval for μ, the population mean for children with ADHD.

   (b) Perform a hypothesis test to decide whether children with ADHD spend significantly more time watching TV than the general population.

3. A researcher is testing the effectiveness of a new herbal supplement that claims to improve memory performance. A sample of $N = 25$ college students is obtained and each student takes the supplement daily for six weeks. At the end of the 6-week period, each student is given a standardized memory test and average score for the sample is $\overline{x} = 39$. For the general population of college students, the distribution of test scores is normal with a mean of 35 and $\sigma = 15$.

   (a) Compute a 95% confidence interval for μ, the population mean memory score for college students who have taken the supplement.

   (b) Perform a hypothesis test to decide whether students taking the supplement have significantly better memory scores than the general population.

4. Twenty-five women between the ages of 70 and 80 were randomly selected from the general population of women their age to take part in a special program to decrease reaction time (speed). After the course, the women had an average reaction time of 1.5 seconds. Assume that the mean reaction time for the general population of women of this age group is 1.8 with a standard deviation of 0.5 seconds.

   (a) Compute a 95% confidence interval for μ, the population mean reaction time for women who have taken part in the program.

   (b) Perform a hypothesis test to decide whether the course had a significant effect on reaction times.

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5. A new over-the-counter cold medication includes a warning label stating that it may cause drowsiness. A researcher would like to evaluate this effect. It is known that under regular circumstances the distribution of reaction times is normal with a mean of 250 milliseconds. A sample of $N = 9$ participants is obtained. Each person is given the new cold medication, and 1 hour later, reaction time is measured for each individual. The average reaction time for this sample is $\overline{X} = 206$ milliseconds with $SS = 648$. Can we conclude that the medication significantly increases reaction times? Explain.

6. A researcher is investigating the effectiveness of acupuncture treatment for chronic back pain. A sample of $N = 4$ participants is obtained from a pain clinic. Each individual ranks the current level of pain and then begins a 6-week program of acupuncture treatment. At the end of the program, the pain level is rated again and the researcher records the amount of difference between the two ratings. For this sample, pain level decreased by an average of $\overline{X} = 6$ points with $SS = 27$. Are these data sufficient to conclude that acupuncture has a significant effect on back pain? Explain.

7. A sample of freshmen takes a reading comprehension test and their scores are summarized below. If the mean for the general population on this test is 12, can you conclude that this sample is significantly different from the population?

   Sample scores: $16, 8, 6, 9, 11, 13, 9, 10$

8. The following data represent the results from a repeated-measures study comparing two treatment conditions. Each participant completes *both* treatments. Do the data indicate a significant difference between the two treatments?

Participant	Treatment 1	Treatment 2
#1	8	14
#2	6	11
#3	10	10
#4	9	11
#5	7	12
#6	10	16