

# PSYC 2317: Statistical Methods for Psychology

Tarleton State University

Exam 2 Practice Problems

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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.

1. 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  $\bar{X} = 4.9$  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  $\mu$ , 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.
2. 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  $\bar{X} = 39$ . 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  $\mu$ , 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.
3. A sample of  $N = 5$  individuals is selected from a population with a mean of 70. A treatment is administered to the individuals in the sample and, after treatment, the sample has a mean of  $\bar{X} = 74$  and  $SS = 50$ .
  - (a) Compute a 95% confidence interval for  $\mu$ , the population mean for the treatment group.
  - (b) Perform a hypothesis test to decide whether the population mean of the treatment group is significantly larger than the mean of the general population.
4. A researcher would like to evaluate the effect of a new reading program for second-grade students. For the past 5 years, a standardized test given at the end of the second grade has produced a mean score of 45. A sample of  $N = 25$  students is placed in the new program, and at the end of the school year, they obtain a mean test score of  $\bar{X} = 51$  with  $SS = 9600$ .
  - (a) Compute a 95% confidence interval for  $\mu$ , the population mean score for students in the reading program.
  - (b) Perform a hypothesis test to decide whether the population mean score for students in the new reading program is significantly different from the mean score for second graders in general.

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5. A psychologist is examining the influence of an older sibling in the development of social skills. A sample of 24 three-year-old children is obtained. Half of these children had no siblings and the others had at least one older sibling who is within 5 years of the child's age. The psychologist records a social skills score for each child and obtained the following data.

No sibling	Older sibling
$N_1 = 12$	$N_2 = 12$
$\bar{X}_1 = 17$	$\bar{X}_2 = 24$
$SS_1 = 580$	$SS_2 = 608$

- (a) Compute a 95% confidence interval for  $\mu_1 - \mu_2$ , the population mean difference in social skills..
- (b) Compute an appropriate effect size (e.g., Cohen's  $d$ ) for the effect of having an older sibling.
- (c) Perform a hypothesis test to decide whether the population mean social skills score for children with no siblings is significantly reduced compared to children with an older sibling.