Lesson #58 · Topic 4B · Practice

Answer Key

1. a. one-sample t -interval for μ_{diff} where $\mu_{\text{diff}} =$ true mean difference in stress level (meditation – exercise) for all patients
   b. two-sample t -interval for $\mu_1 - \mu_2$ where $\mu_1 - \mu_2 =$ true difference in mean times to complete a 100-meter sprint (heavy weight lifting – light weight lifting)
   c. one-sample t -interval for μ where $\mu =$ true mean satisfaction rating with the Netflix app for all subscribers

2. a. Experiment 1 is a completely randomized design because the treatments (oat milk or regular milk) are assigned to the subjects completely at random, and each subject receives only one treatment.
   b. $\mu_1 - \mu_2 =$ true difference in mean ratings for the flavor of the cappuccino (oat milk – regular milk)
   c. Experiment 2, because each volunteer is receiving both treatments (oat milk and regular milk), which means they are being paired with themselves.
   d. $\mu_{\text{diff}} =$ true mean difference in ratings for the flavor of the cappuccino (oat milk – regular milk)

3. a. These patients experienced improved memory scores after 6 months of playing board games.
   b. $\frac{13}{20} = 65\%$
   c. No. The confidence interval contains 0, which means that it is plausible that the true mean difference in memory scores is 0 (no difference).

4. a. Yes, the score of 98 and the score of 93 are from the same student (paired), so calculating a difference will show the improvement in score for that student.
   b. Mean difference
   c. No, the score of 98 and the score of 93 are two different students.
   d. Difference in means

5. a. CLASSIFY:
Type of study: Experiment
Variables: Type of diet (categorical), cholesterol level for vegan diet (quantitative), cholesterol level omnivore diet (quantitative)

CHOOSE:
one-sample t -interval for μ_{diff} at a 95% confidence level
$\mu_{\text{diff}} =$ true mean difference of cholesterol level for pairs of twins like the ones in the study (vegan diet $-$ omnivore diet)

CHECK:
Random: the vegan diet was randomly assigned to one person in each pair of twins ✓
10%: not needed because there was no sampling without replacement
Normal/Large Sample: The distribution of differences has no strong skewness or outliers ✓

CALCULATE:
$\bar{x}_{\text{diff}} \pm t^* \frac{s_{\text{diff}}}{\sqrt{n_{\text{diff}}}}$
$-13.9 \pm 2.080 \frac{25.8}{\sqrt{22}}, \text{df} = 21$
$(-25.3, -2.5)$

CONCLUDE: We are 95% confident that the interval from -25.3 mg/dL to -2.5 mg/dL captures the true mean difference of cholesterol level for pairs of twins like the ones in the study (vegan diet $-$ omnivore diet).

b. Yes. Because all the plausible values in the confidence interval are negative (do not contain 0), the researchers have convincing statistical evidence that a vegan diet reduces cholesterol levels.

6. C

7. D