

AS2 (Assignment 2, Unit 4): Computing the Z-test Statistic

Research Scenario #1

A researcher hypothesizes that zylex, a new antidepressant, will affect concentration. It is known that scores on a standardized concentration test is normally distributed with a $\mu = 50$ and a $\sigma = 12$. A random sample of $n=16$ participants, aged 19-35, are chosen from the State of New Jersey. The sample is put on a six month dosage plan of zylex. After six months, all the participants are given a standardized concentration test. The researcher records the data and calculates a sample mean of $M=56$. Are the data sufficient to conclude that the drug, zylex, does have an effect on concentration?

Based on the above research scenario, please answer the following questions:

- Name the population: Residents of New Jersey
- Name the sample: the 16 participants ages 19-35
- What is the independent variable? Zylex
- What is the dependent variable? Concentration
- What is the appropriate hypothesis test? Z-test
- What two means are you comparing in this test? Population and sample mean
- Please calculate the appropriate hypothesis test using all four steps:

Step 1:

Ho: zylex will not have an effect on concentration

H1: zylex will have an effect on concentration

Step 2:

Critical value of z at $\alpha = 0.05$, non directional: critical region -1.96 to 1.96

Step 3: $Z = \frac{M - \mu}{\sigma_m}$ $\sigma_m = \frac{\sigma}{\sqrt{n}}$

$Z = \frac{56 - 50}{12 / \sqrt{16}}$ $\sigma_m = \frac{12}{\sqrt{16}}$

$Z = \frac{(56 - 50)}{(12 / \sqrt{16})}$

Z=2

P-value= 0.00455

P-value<0.05

Step 4: reject null hypothesis

Write the statistical statement for your results: Our study supports that zylex did have an effect on concentration. The data showed, $z=2$, $p<.05$

Interpret your results (relating back to the hypothesis):

The null hypothesis was rejected, therefore there is an effect on the dependent variable (concentration) on the independent variable (zylex). The z score was out of the critical region values, as well as the p score big smaller than the alpha value of 0.05.

Is there a probability of Type I error? Yes No

If yes, what is the probability of a Type I error? 5%

Is yes, how could you have decreased that probability? Using a lower alpha value

Is there a probability of Type II error? Yes No

If it is appropriate, please calculate effect size: Answer: _____

Research Scenario #2:

A researcher wanted to study the effect of alcohol on reaction time. She hypothesized that alcohol will INCREASE reaction time (participants will take longer to react). She selected a sample of $n=36$ participants from Rutgers University. The 36 participants each consumed a 6-ounce glass of wine. Thirty minutes later, the researcher measured each participant's reaction time, using a standardized driving simulation task for which the regular population has a $\mu = 400$ msec reaction time with a $\sigma = 48$. The reaction time mean for the sample was $M= 412$ msec. Are the data sufficient to conclude that the alcohol significantly increased reaction time?

Based on the above research scenario, please answer the following questions:

- Name the population: population at Rutgers University
- Name the sample: 36 participants
- What is the independent variable? alcohol
- What is the dependent variable? Reaction time
- What is the appropriate hypothesis test? Z-test
- What two means are you comparing in this test? Population and Sample means
- Please calculate the appropriate hypothesis test using all four steps:

Step 1:

Ho: Alcohol will not have an effect on reaction time

H1: Alcohol will increase reaction time

Step 2:

Critical Value of z at $\alpha=0.05$, right-tailed test- 1.645

Step 3:

$Z = \frac{M - \mu}{\sigma_m}$ $\sigma_m = \frac{\sigma}{\sqrt{n}}$

$Z = \frac{412 - 400}{48/\sqrt{36}}$

$Z = \frac{12}{48/6}$

$Z = 12/8 = 1.5$

Z=1.5

Step 4: fail to reject null hypothesis

Write the statistical statement for the results: Our study supports that alcohol did not have an effect on increasing reaction time. The results reflected $z=1.5$.

Interpret your results (relating back to the hypothesis):

Failed to reject the null hypothesis, showing that there was no increasing effect on the dependent variable (reaction time) from the independent variable (alcohol). The z score was less than the right-tailed critical region of 1.645.

Is there a probability of Type I error? Yes ____ No

Is there a probability of Type II error? Yes No ____

If appropriate, please compute effect size: Answer: $(412-400)/48=0.25$