

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:

1. Name the population: **Standardized concentration test takers**
2. Name the sample: **Participants ages 19-35 from NJ**
3. What is the independent variable? **Zylex, the new antidepressant**
4. What is the dependent variable? **Concentration**
5. What is the appropriate hypothesis test? **Z test**
6. What two means are you comparing in this test? **$\mu = 50$ & $M = 56$**
7. Please calculate the appropriate hypothesis test using all four steps:

Step 1: Name the Hypothesis

H_0 : Zylex will not have an affect on concentration

H_1 : Zylex will have an affect on concentration

Step 2: Set a Critical Region

Alpha waves: $\alpha = .05$

Nondirectional test: two tail

Critical Region = $p < .05$ (-1.96 & 1.96)

Step 3: Math

$Z = M - \mu / \sigma_m$ but first, figure out σ_m

$\sigma_m = \sigma / \sqrt{n} = 12 / \sqrt{16} = 12 / 4 = 3$

$Z = 56 - 50 / 3 = 6 / 3 = 2$

$Z = 2$

Step 4: Make a Decision : Reject the H_0

Write the statistical statement for your results:

$Z=2, p<.05$

Interpret your results (relating back to the hypothesis):

Our study supports that Zylex did have an effect on concentration. The data were significant, $Z=2, p<.05$

Is there a probability of Type I error? Yes

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

Is yes, how could you have decreased that probability?

Is there a probability of Type II error? No

If it is appropriate, please calculate effect size: Answer: 0.5 – Medium effect

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:

1. Name the population: All drivers
2. Name the sample: Rutgers University
3. What is the independent variable? Alcohol
4. What is the dependent variable? Reaction Time
5. What is the appropriate hypothesis test? Z test
6. What two means are you comparing in this test? $\mu= 400$, $M= 412$
7. Please calculate the appropriate hypothesis test using all four steps:

Step 1: Name the Hypothesis

Ho: Alcohol will not increase reaction time

H1: Alcohol will increase reaction time

Step 2: Set a critical region

Alpha waves: $\alpha= .05$

Directional test: One tail

Critical Region= $p < .05$ (1.65)

Step 3: Math

$Z= M-\mu/\sigma_m$ but first, figure out σ_m

$\sigma_m= \sigma/\sqrt{n}= 48/\sqrt{36}= 48/6= 8$

$Z= 412-400/8= 12/8= 1.5$

$Z= 1.5$

Step 4: Make a decision: Fail to reject Ho

Write the statistical statement for the results: $Z= 1.5, p>.05$

Interpret your results (relating back to the hypothesis):

Our study supports that alcohol did not have an effect on reaction times. The data were not significant, $Z= 1.5, p>.05$

Is there a probability of Type I error? No

Is there a probability of Type II error? Yes

If appropriate, please compute effect size: Answer: 0.25 Small effect