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 μ= 50 and a σ= 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: Residents of the state of New Jersey.

2. Name the sample: 16 Participants, aged 19-35 and are chosen from NJ.

3. What is the independent variable? Zylex a new antidepressant

4. What is the dependent variable? Concentration

5. What is the appropriate hypothesis test? Z-test, Right-tailed Directional

6. What two means are you comparing in this test? Population mean; μ=50 and sample mean; M=56

7. Please calculate the appropriate hypothesis test using all four steps:

Step 1:   Ho: Zylex will not affect concentration   H1: Zylex will affect concentration

Step 2:   Critical value: p-value= 1.753 < 2
                    $Alpha$ = 0.05

Step 3: $Z= \dfrac{m-\mu}{\sigma_m} = \dfrac{56-50}{\sqrt[12]{16}} = \dfrac{6}{3} = 2$ Z=2

z= m-u/om = 56-50/12/square root of 16= 6/3= 2

Step 4:   Decision: Reject the null hypothesis

Write the statistical statement for your results: At 0.05 level we reject Ho

Interpret your results (relating back to the hypothesis): We can conclude that the antidepressant, Zylex, does have an effect on concentration.

Is there a probability of Type I error? Yes

If yes, what is the probability of a Type I error? <u>Alpha = 0.05</u>

Is yes, how could you have decreased that probability? Decreasing alpha

Is there a probability of Type II error? <u>No</u>

If it is appropriate, please calculate effect size: Answer: <u>d=</u> $\dfrac{56-50}{12}=0.5$

<u>d= 56-50/12 = 0.5</u>

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: <u>Rutgers University</u>

2. Name the sample: <u>36 Participants of Rutgers University</u>

3. What is the independent variable? <u>Consumption of 6 ounce glass of wine</u>

4. What is the dependent variable? <u>Dependent variable</u>

5. What is the appropriate hypothesis test? <u>Z-test for on population mean</u>

6. What two means are you comparing in this test? Sample mean with population mean

7. Please calculate the appropriate hypothesis test using all four steps:

Step 1:   Ho: The alcohol did not significantly increase reaction time

   H1: The alcohol significantly increased reaction time

Step 2:   alpha = 0.05   One tail Right side directional test   Critical value z=1.64
Reject Ho if z > 1.64

Step 3: $z = \dfrac{412 - 400}{{}^{48}\!/\!\sqrt{36}} = 1.50$ z= 1.50

Step 4:   Decison: fail to reject null hypothesis

Write the statistical statement for the results: At level 0.05 we fail to reject Ho

Interpret your results (relating back to the hypothesis): We can conclude that the data does not support the claim that alcohol significantly increased reaction time.

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: Not appropriate