

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: all people
2. Name the sample: 16 selected people age from 19-35 in NJ
3. What is the independent variable? Zylex
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? mean from population (μ is 50 here) and mean from sample (M is 56 here)
7. Please calculate the appropriate hypothesis test using all four steps:

Step 1:

Ho: Null Hypothesis

Zylex will NOT effect the concentration

H1: Research Hypothesis

Zylex will have effect on concentration

Step 2:

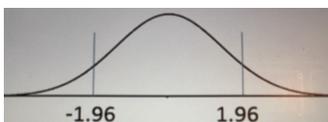
-Set a critical region (low probability outcome)

-With $\alpha = .05$

-Non-directional (two tails)

-testing the null hypothesis

-Critical region are the on the side of low probability outcomes, which fall on right or left side of the distribution. setting the line by -1.96 and 1.96



Step3:

$$Z = \frac{M - \mu}{\sigma_m} = \frac{56 - 50}{3} = 2$$

$$\sigma_m = \frac{12}{\sqrt{16}} = 3$$

The Z-test statistic is 2

Step 4: Since Z-test = 2, fall inside the critical region, we reject the null hypothesis.

Write the statistical statement for your results: Z=2, p < .05

Interpret your results (relating back to the hypothesis): The study support that zylex has an effect on concentration. The data were significant.

Is there a probability of Type I error? Yes v No _____

If yes, what is the probability of a Type I error? when reject the null hypothesis, there are probability to be no effect, and with the alpha .05. there is 5% chance of having type 1 error.

Is yes, how could you have decreased that probability? we could reducing by minimize by choosing the smaller alpha, for instance using α : .01 instead of .05 to lower the chance of having type I error.

Is there a probability of Type II error? Yes _____ No v

If it is appropriate, please calculate effect size: Answer: d = 0.5

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 people _____
2. Name the sample: _____ 36 selected people from 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? _____ mean from population (μ is 400 here) and mean from sample (M is 412 here) _____
7. Please calculate the appropriate hypothesis test using all four steps:

Step 1:

Ho: Null Hypothesis

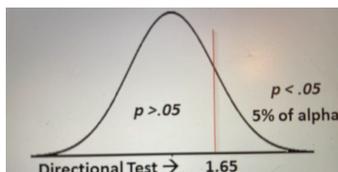
alcohol will NOT INCREASE reaction time

H1: Research Hypothesis

alcohol will INCREASE reaction time

Step 2:

Set critical region: since its research hypothesis is the increase of reaction time, It is the directional test (one tail), that its critics region is at the right side of the distribution: setting the line by standard deviation 1.65 (with alpha .05)



Step 3 :

$$Z = \frac{M - \mu}{\sigma_m} = \frac{412 - 400}{8} = 1.5$$

$$\sigma_m = \frac{48}{\sqrt{36}} = 8$$

The Z-test statistic is 1.5

Step 4: since Z-test= 1.5, fall outside the critical region, we fail to reject the null hypothesis

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

Interpret your results (relating back to the hypothesis): The test support that alcohol will Not increase the reaction time, the data were not significant.

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: d = 0.25