Psychology 122

Practice Midterm Exam #1

The starred questions are kind of hard, so don’t sweat it if you struggle a bit with them.

1. Careful data collection from EVERY STUDENT AT AMHERST COLLEGE indicates that Amherst College students leave the Valentine with an average of 1.4 pieces of glassware and cutlery per day (shame!); σ = .75. Imagine that you constructed a sampling distribution from this population with n = 100.
	1. Determine the mean and standard deviation of the sampling distribution (i.e., the standard error).

μ = 1.4; σ = 0.075

* 1. Would you expect the sampling distribution to be normally distributed? Explain.

Yes. According to the Central Limit Theorem, the sampling distribution will be approximately normal if n > 30.

1. You have a firm rule not to date anyone who is a member of σμσ because anyone who joins a Stats Honor Fraternity must be a geek! Describe each of the following situations as either a Type I Error, a Type II Error or no error in particular. Be sure to maintain the same null hypothesis for each part (i.e., H0: σμσ = geek), and explain your answer.
	1. An attractive member of σμσ asks you out, but you say no. Your friend goes out with this person and they turn out to be the exact opposite of a geek. Not only is this person not a geek, they turn out to be the only heir to the Solo Cup Company fortune, so your friend lives happily ever after in a big mansion.

Type II Error: Null is false, but you failed to reject it.

* 1. After witnessing your friend's good fortune, you decide to go out with the next σμσ person who asks you out. Unfortunately, this person asks you to help collect specimens for an experiment to determine whether earthworms can be used as a cheap alternative to breakfast cereal.

Type I Error: Null is true, but you rejected it.

* 1. Just to be mean, you give the "Earthworm Experimenter" (EE) your younger sibling's phone number and explain how much your sib likes digging around in the mud. But, your sib rejects the EE request for a date because of the EE's affiliation with σμσ.

No error. Null is true and your sib failed to reject.

1. A researcher is interested in whether moderate consumption of caffeine by pregnant women affects the birth weight of their children. She samples 100 women who drank 2 cups of coffee per day and finds that the average birth weight of their children was 7.5 pounds.
	1. Construct the 60 and 95% CIs for the true average birth weight of mothers who consumed moderate amounts of caffeine if σ = 3. (3 pts each)

 

  

* 1. Does the 95% CI lead you to conclude that moderate caffeine consumption affects birth weight if the population parameter equals 8 pounds? Explain. (2 pts)

The CI leads me to conclude that caffeine consumption does not affect birth weight. Because the CI includes the value 8, I cannot be sure that the population parameter for women who have consumed moderate amounts of caffeine is different from the expected value of 8.

* 1. \*What percentage of newborns would you expect to fall within the 95% CI? (2 pts)

 

Area (Body -.20) – Area (Tail .20) = .5793 - .4207 = .1586

1. The governor of Arkansas is considering using "Our Trout are Larger than Average" as the state's slogan for the big summer tourist season. To avoid the stain and scandal of previous administrations, the governor decides to commission a study to determine whether this claim is accurate. Officers at the State Fish & Wildlife Commission catch and measure one trout from each of Arkansas' 750 streams, rivers and lakes. The mean of the sample was 5.3 pounds; we know from previous work that σ = 3 pounds. The governor wants you to conduct a hypothesis test to determine whether these data provide enough evidence to conclude that the tourism slogan is accurate if we know that μ (the mean weight for all full-grown adult trout) = 5 pounds. Because the governor is concerned about avoiding any appearance of impropriety, you are asked to conduct a two-tailed test with ­­­­­­­­α = .01.
	1. Your answer should include a statement of the null and alternative hypotheses, the critical value for your test statistic, the observed value of your test statistic, your decision regarding the null, and a statement of what this means about the size of Arkansas trout, and the appropriateness of the tourism slogan. Finally, please report Cohen’s d. (12 pts)

Ho: μ = 5

Ha: μ ≠ 5

Zcrit = 2.57

   

$$Cohen^{'}s D= \frac{M-μ\_{0}}{S}=\frac{5.3-5}{3}=\frac{.3}{3}=.1$$

Zobs > Zcrit. Therefore, I would REJECT the null. This would lead me to conclude that tourism slogan is accurate. Arkansas’ trout are indeed larger than average, z = 2.74, p < .05, d = .10.

* 1. What is the p-value for your test? (2 pts)

p-value = 2 \* (Tail 2.74)

= 2 \* .0031

= .0062

1. Moike, a start-up pharmaceutical company, has developed a new heartburn medication called Xanadu. They run clinical trials to determine how well the drug works relative to Zantac. So, the Moike scientists give 10 people Zantac and 10 people Xanadu, and measure how long it takes for the drug to eliminate heartburn symptoms. The data for each subject appears below.

|  |  |  |
| --- | --- | --- |
|  | Mean | SD |
| Zantac | 2 | 3 | 5 | 1 | 4 | 7 | 7 | 3 | 5 | 3 | 3 | 1.7 |
| Xanadu | 1 | 2 | 3 | 2 | 4 | 5 | 6 | 2 | 4 | 1 | 4 | 2.0 |

Conduct a hypothesis test to determine whether these data provide enough evidence to conclude that the two drugs differ in terms of effectiveness (­­­­­­­­α = .05). Your answer should include a statement of the null and alternative hypotheses, the critical value for your test statistic, the observed value of your test statistic, your decision regarding the null, and a statement of what this means about the relative effectiveness of the two drugs. (14 pts)

Ho: μz = μx

Ha: μz ≠ μx Tcrit = 2.101





 

Tobs < Tcrit. Therefore, I would FAIL TO REJECT the null. This would lead me to conclude that thethere is not enough evidence to conclude that one drug is more effective than another, t (18) = 1.20 p > .05.

1. Let's now assume that Moike conducted its clinical trial in the following way. 10 subjects were asked to consume a chili dog. After the inevitable heartburn started, they were given a dose of Zantac and the time that it took for the drug to take effect was measured. A week later, the same 10 men came back and repeated the procedure, only this time, they took Xanadu. The data in table below, are exactly the same as the data for question 10.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | SS1 | SS2 | SS3 | SS4 | SS5 | SS6 | SS7 | SS8 | SS9 | SS10 |
| Zantac | 2 | 3 | 5 | 1 | 4 | 7 | 7 | 3 | 5 | 3 |
| Xanadu | 1 | 2 | 3 | 2 | 4 | 5 | 6 | 2 | 4 | 1 |
| d | 1 | 1 | 2 | -1 | 0 | 2 | 1 | 1 | 1 | 2 |
| d2 | 1 | 1 | 4 | 1 | 0 | 4 | 1 | 1 | 1 | 4 |

Conduct a hypothesis test to determine whether these data provide enough evidence to conclude that the two drugs differ in terms of effectiveness (­­­­­­­­α = .05). Your answer should include a statement of the null and alternative hypotheses, the critical value for your test statistic, the observed value of your test statistic, your decision regarding the null, and a statement of what this means about the relative effectiveness of the two drugs. Finally, please report Cohen’s d. (14 pts)

Σ(x) = 10

Σ(x2) = 12 + 12 + 22 + -12 + 02 + 22 + 12 + 12 + 12 + 22 = 18

Mean Diff = 10 / 10 = 1



Ho: μd = 0 Tcrit = 2.262

Ha: μd ≠ 0



Because Tobs > Tcrit, I would reject the null. This suggests that Xanadu is more effective than Zantac; that is, relief came more quickly with the former, than with the latter, t (9) = 3.35, p < .05. Cohen’s d was ..06, which is a relatively large effect.