AS1 (Assignment 1, Unit 4) Logic of Hypothesis Testing

Please write “true” if the statement is true and “false” is the statement is false in the space provided:

T 1. A statistical hypothesis test tests the null hypothesis rather than the researcher’s hypothesis

F 2. In most research situations, the goal is to reject the researcher’s hypothesis

T 3. A decision to reject the null hypothesis means that the data do provide evidence of a treatment effect: the independent variable did have an effect on the dependent variable

T 4. If the data provide convincing evidence that the treatment does have an effect, then the correct statistical decision is to reject the null hypothesis

T 5. For a hypothesis test, the critical region is defined as the set of test statistics that are very unlikely (very low probability) of being obtained if the null hypothesis is true

T 6. If the obtained sample data (test statistic value) is inside the critical region, then we have provided support for the null hypothesis

F 7. When the Z-test statistic, obtained from the sample data, falls inside the critical region, we reject the null hypothesis

T 8. If the obtained sample data (test statistic value) are not in the critical region, the correct statistical decision is “fail to reject the null hypothesis.”

T 9. If you fail to reject the null hypothesis, it means that the data provide sufficient evidence to say that the treatment has an effect: the independent variable had an effect on the dependent variable

T 10. Whenever the statistical decision is to reject the null hypothesis, there is a probability that the decision is incorrect and this probability is known as a Type I error

T 11. The probability of committing a Type I error is equal to alpha

T 12. A Type II error occurs when a treatment actually does have an effect but the effect fails to show up in a research study

T 13. One way to reduce the risk of Type I error, saying there is an effect when in fact there is not an effect, is to lower the alpha level from .05 to .01

F 14. Type II error is to fail to reject a null hypothesis that is actually false

T 15. In a research report, the term “statistically significant” is used to indicate that the null hypothesis was rejected

T 16. In a research report, the notation $p < .05$ is used when the null hypothesis is rejected and the IV is shown to have a significant effect using an alpha level = .05

F 17. Alpha (α) is the probability of committing a Type II error

T 18. In a Type II error, the experimenter concludes that there is evidence for an effect when in fact an effect does not exist

T 19. Changing the level of significance from .01 to .05 increases the risk of Type I error

F 20. When a researcher report demonstrates a significant treatment effect at the .05 alpha level, you can be more confident that the effect is real than if the researcher had reported a significant effect with an alpha level of only .01

T 21. There is always a possibility that the decision in a hypothesis test is incorrect

T 22.To be more confident that a treatment actually does have a real effect, a researcher should use a large value for alpha

T 23. The following hypothesis: “Nicotine should increase memory ability” requires a one-tail, directional test with the entire critical region located on the right side of the distribution

T 24. The following hypothesis: “Nicotine should decrease memory ability” requires a one-tail, directional test with the entire critical region located on the left side of the distribution

T 25. The following hypothesis: “Nicotine will have an effect on memory” requires a two-tail, non-directional test with the critical region divided between both tails of the distribution

T 26. In the following hypothesis: “Nicotine will have an effect on memory,” the dependent variable is nicotine

T 27. In the following hypothesis: “Nicotine will have an effect on memory,” the independent variable is memory

T 28. Researchers collect data by measuring the dependent variable in their studies

T 29. Independent variables are the variables that researchers manipulate in their studies

T 30. In a directional (one-tail) hypothesis test, the entire critical region is located in either one of the other tail of the distribution, but not in both tails of the distribution

T 31. The reason for computing Cohen’s d is that a hypothesis test, per se, does not measure the size of the effect

T 32. Cohen’s d or any other “d” measures effect size

T 33. Standard error is the discrepancy or difference, on average, that you should expect between your sample mean (M) and the population mean (μ)

T 34. All hypotheses tests analyze (or compare) two main differences. These differences are the differences between or among means due to the IV, and difference between or among means due to chance.

35. What mean differences are you comparing when you compute a Z-test statistic?

The Z-test deals with whether two population means are different when the variances are known and the sample size is large.

36. Name the four steps of a hypothesis test:

1. State the hypotheses (H_0 and $H_{1)}$
2. Set a critical region with an alpha level (α)
3. Do the math (largely explained in this lecture)
4. Make a decision (reject the null hypothesis or fail to reject the null hypothesis)