SOC 301 - Relating Confidence Intervals and Hypothesis Tests

In one experiment, 14 researchers trained a random sample of male US liberal arts college students to tap their fingers at a rapid rate. The sample was then divided at random into two groups of 10 students each. Each student drank the equivalent of about two cups of coffee, which included about 200 mg of caffeine for the students in one group but was decaffeinated coffee for the second group. After a 2-hour period, each student was tested to measure finger tapping rate (taps per minute). The students did not know whether or not their drinks included caffeine and the person measuring the tap rates was also unaware of the groups. The goal of the experiment was to determine whether caffeine produces an increase in the average tap rate.

1. What is the response variable for this problem?

(A) Whether or not caffeine was included

(B) Whether or not there was a high tap rate

(C) Number of cups of coffee

(D) Number of students in each group

(E) None of the above

2. What is the explanatory variable?

(A) Type of coffee given

(B) Number of hours after drinking coffee

(C) Whether or not caffeine impacts tap rate

(D) Increases in the average tap rate

(E) None of the above.

3. What is the population in this problem?

(A) All students at colleges in the US

(B) Students at liberal arts colleges in the US

(C) All coffee drinkers

(D) None of the above

4. Why was random sampling used to select the observational units?

(A) Random sampling lets us make inferences to all male US liberal arts college students.

(B) Random sampling lets us make strong conclusions about only the sample selected.

(C) Random sampling ensures that all members of the population are equally likely to be selected in the sample.

(D) Two of the above are correct.

5. Denote μ_c as the mean tap rate for the population of male students with caffeine and μ_n as the similar rate without caffeine. Identify the correct alternative hypothesis.

(A) $\mu_c - \mu_n = 0$

(B) $\mu_n < \mu_c$

(C) The mean tap rates are the same with or without caffeine.

(D) $\mu_c - \mu_n \neq 0$

(E) None of the above

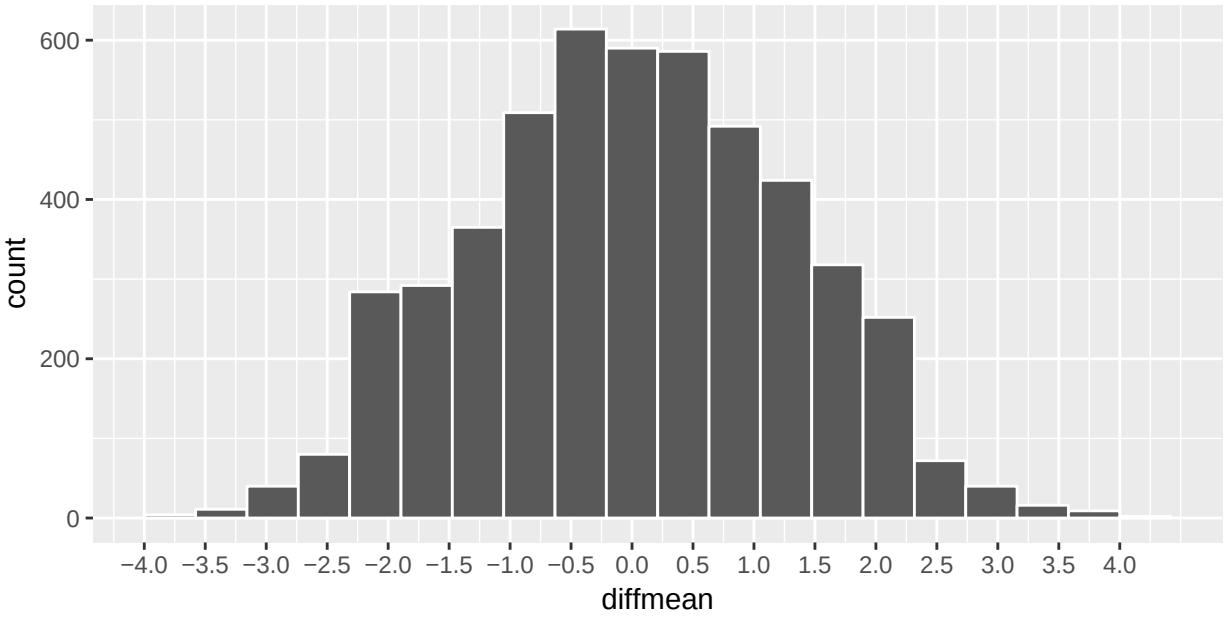
6. For this problem, we have an observed difference in sample means of $\bar{x}_c - \bar{x}_n$ of 3.5. Based on the picture, is there evidence that caffeine increases tap rate?

(A) Yes, the p-value is large.

(B) No, the p-value is small.

(C) No, the p-value is large.

(D) Yes, the p-value is small.



7. Suppose that the goal of the experiment was to determine whether caffeine produces an EFFECT in the average tap rate. What could we say about the corresponding confidence interval for $\mu_c - \mu_n$ based on the size of the p-value?

(A) It will be entirely positive.

(B) It will include 0.

(C) It will include 3.5.

(D) Two of the above are true.

(E) None of the above.