

Name:





Lesson 4.3: Day 1: Does caffeine increase pulse rate?





Mrs. Gallas and her students decided to perform the caffeine experiment. In their experiment, 10 student volunteers were randomly assigned to drink cola with caffeine and the remaining 10 students were assigned to drink caffeine-free cola. Were their findings statistically significant?

The table shows the change in pulse rate for each student (Final pulse rate – Initial pulse rate), along with the mean change for each group.

	Change in pulse rate									Mean				
	(Final pulse rat								te – Initial pulse rate)					
Caffeine	8	3	5	1	4	0	6	1	4	0	3.2			
No Caffeine	3	-2	4	-1	5	5	1	2	-1	4	2.0			

- 1. Find the difference in mean pulse rate for the groups. Does your initial reaction lead you to believe that they found evidence that caffeine does or does not increase heart rate? Explain.

 $\begin{array}{c} (aff - n) (aff diff = 1.2 \quad 100 \rightarrow \text{that } 1.2 \text{ beat } diff \\ \text{is not that significant} \\ 2. \text{ What are two possible explanations for the difference in mean pulse rate?} \\ \hline O Caffeine dual (aux increak in pulse Rate) \\ \hline \end{array}$ 

2) Cancidence that caff group had large 2 change - assume To try to decide if the difference in pulse rate is big enough to be convincing we will do a simulation with the data.

## Simulation:

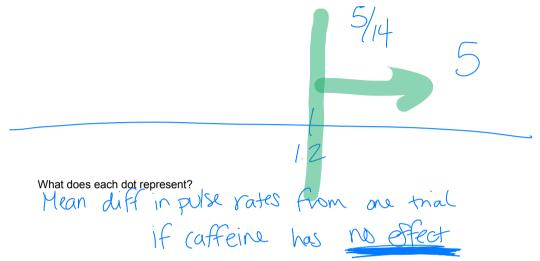
Step 1: Gather 20 index cards to represent the 20 students in this experiment. On each card, write one of the 20 outcomes listed in the table. For example, write "8" on the first card, "3" on the second card, and so on.

Step 2: Shuffle the cards and deal two piles of 10 cards each. This represents randomly assigning the 20 students to the two treatments, assuming that the treatment received doesn't affect the change in pulse rate. The first pile of 10 cards represents the caffeine group, and the second pile of 10 cards represents the nocaffeine group.

Step 3: Fill in the table below with your simulated data.

Caffeine					
No Caffeine					

- 3. Find the mean change for each group in your simulation and subtract the means (Caffeine No caffeine).
- 4. Add your difference in means to the dotplot on the board. Sketch the dotplot below.

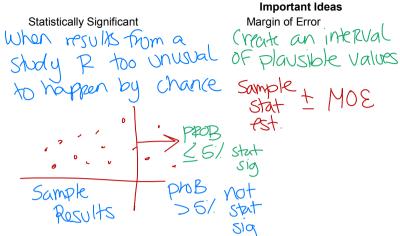


5. What percentage of the dots are greater than or equal to the difference in means of 1.2 found in Mrs. Gallas' experiment?

5/14 = 0.36 -> 36%

Interpret this percentage: Assuming that caffeine has no effect, there is a <u>36</u>? Publicity of getting a difference of 1.2 OP highle public but but has been a but for the caffeine of has it but occurred purely by chance? Explain. E IF / E 5/, it is pretty unlikely that it chance. E happens on its own, so probably due to caffeine FIF / > 5/, then no it is unlikely it would happen by coincidence.





Sampling Variability Different samples yield diff ests. \* larger samples produce more accurate ests.

TheStatsMedic

## Check

How much do National Football League (NFL) players weigh, on average? In a random sample of 50 NFL players, the average weight is 244.4 pounds.

(a) Do you think that 244.4 pounds is the true average weight of all NFL players? Explain your answer,

No, any samples & different since sue don't have the antire pop., don't expect same sample mean.

(b) If another random sample of 50 NFL players was taken, would you expect to an average weight of exactly 244.4 pounds?

No, every sample is a different group, so the mean may not be the earth same.

(c) Estimates are usually given with a margin of error. The margin of error for the estimate on 244.4 pounds is 14.2 pounds. Based on this, would you be surprised if the true average weight of NFL players was 260 pounds? Explain.

2444+142=258 (~ Jes. 260 is above the MOE of 258.6 pands.

(d) Which would be more likely to give an estimate close to the true average weight of all NFL players: a random sample of 50 players or a random sample of 100 players? Explain your answer.

100 -> the more people in your study, the more spread ut Variability, more accurate your resu Hs

A television news editor would like to know how local registered voters would respond to the question "Are you in favor of the school bond measure that will be voted on in an upcoming special election?". A television survey is conducted during a break in the evening news by listing two telephone numbers side by side on the screen, one for viewers to call if they approve of the bond measure and the other to call if they disapprove. This survey method could produce biased results for a number of reasons. Which one of the following is the most obvious reason?

- a. It uses a stratified sample rather than a simple random sample
- D People who feel strongly about the issue are more likely to respond
- Viewers should be told about the issues before the survey is conducted
- d. Some registered voters who call might not vote in the election
- e. The wording of the question is biased

In one study subjects were randomly given either 500 or 1000 milligrams of Vitamin C daily and the number of colds they came down with during a winter season was noted. In a second study people responded to a questionnaire asking about the average number of hours they sleep per night and the number of colds they came down with during a winter season.

- a.) The first study was an experiment without a control group while the second was an observational study
- D. The first study was an observational study while the second was a controlled experiment
- c. Both studies were controlled experiments
- d. Both studies were observational studies
- e. None of the above is a correct statement

The Literary Digest Magazine, in 1936, predicted that Alf Landon would defeat Franklin Roosevelt in the presidential election that year. The prediction was based on questionnaires mailed to 10 million of its subscribers and to names drawn from other public lists. Those receiving the questionnaires were encouraged to mail back their ballot preference. The prediction was off by 19 percentage points. The magazine received back some 2.3 million ballots from the 10 million sent out. What are some of the things that might have caused the magazine to be so wrong (the same techniques had produced accurate predictions for several previous elections?) (Hint: Think about what was going on in the world in 1936.)

subscribed to magazine at the time had · those who they tended to be Republican. Pleaponse - didn't sond surveys back intam " inderestimate In the breat Depression, you want change, so you send buck mailer w/Alf mapping to the overestimate of 19%.

