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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 (Final pulse rate – Initial pulse rate)										Mean change
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

- 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.
- What are two possible explanations for the difference in mean pulse rate?

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 no-caffeine group.

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

Caffeine											
No Caffeine											

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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.

What does each dot represent?

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

Interpret this percentage:

6. Do you think the difference in means we found from our experiment is due to the caffeine or has it occurred purely by chance? Explain.

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Lesson 4.3: Day 1: Inference for Experiments

Big Ideas:

Check Your Understanding:

1. 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.

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

 - (c) 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.