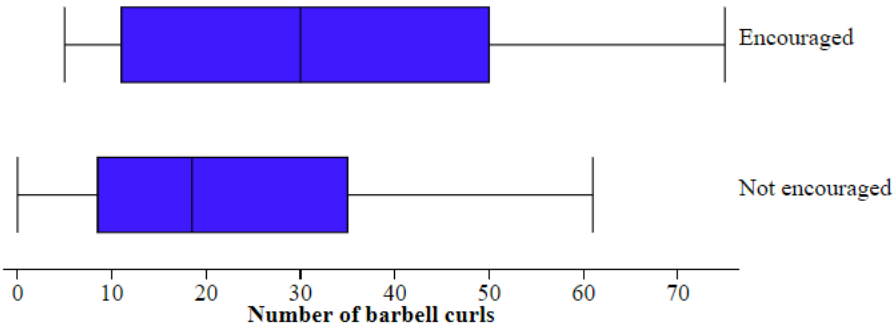
MOCK FRQ #1

Daniel believes that people perform better in the barbell curl, on average, if they are encouraged by a coach. He recruited 29 subjects to participate in an experiment and randomly assigned them into two groups. Daniel gave one group verbal encouragement during the exercise and was quiet during the exercise for the other group. He recorded the total number of barbell curls each subject was able to complete before setting the bar down.

(a) Explain the purpose of random assignment in this experiment.

The purpose of random assignment is to create two groups of subjects that are roughly equivalent in their ability to do barbell curls at the beginning of the experiment. This will allow for a cause-and-effect conclusion if the difference between the two groups is statistically significant.

Here are boxplots that summarize the distribution of number of barbell curls for each group.



(b) Compare these distributions.

The distribution of number of barbell curls is slightly skewed to the right for both groups, with more skew in the distribution for those that weren't encouraged. The median number of curls and the variability in number of curls is greater for the group that received encouragement. Neither distribution has any outliers.

(c) State the hypotheses Daniel should use to test his belief about receiving encouragement during exercise. Make sure to define any parameters you use.

$H_0: \mu_E - \mu_N = 0$

$H_a: \mu_E - \mu_N > 0$

where μ_E is the true mean number of barbell curls that people like the ones in the experiment can do with encouragement and μ_N is the true mean number of barbell curls that people like the ones in the experiment can do with no encouragement.

(d) Identify the significance test Daniel should use to analyze the results of his experiment and show that the conditions for this test are met.

Two-sample t test for $\mu_E - \mu_N$

Conditions:

- Randomness? Treatments randomly assigned
- Normal/Large Sample? Neither distribution shows strong skewness or outliers in the boxplots above

- Independence? Each subjects outcome is independent of another subjects outcome.

(e) The P-value for Daniel's test is 0.107. What conclusion should Daniel make at the $\alpha = 0.05$ significance level?

Because 0.107 > 0.05, Daniel should fail to reject the null hypothesis. This experiment doesn't provide convincing evidence that people like the ones in the experiment can do more barbell curls, on average, when they receive encouragement.