# Week 5

Goal: In these assignments, analyze data from their experimental data collected in week 4. Students learn how to interpret statistical results, particularly confidence intervals, *p*-values, and relative differences. Students consider the nature of statistical significance and the importance of clinical significance. Students complete Parts 2 and 3 in small groups of 4-5 students.

## Part 1

Use your data you collected in Week 4 to answer the following analysis questions.

#### DATA ANALYSIS

(1) Review the sampling procedure from Week 1. What is your population of interest? Is this a random sample? Explain whether or not we can generalize results from our sample to our population of interest, and why.

(2) Use the One Quantitative and One Categorical Variable tool in StatKey under Descriptive Statistics and Graphs to create a side-by-side boxplot and summary table to describe the distribution of change in pain tolerance in each group.

(3) What is the average change in pain tolerance (from pre- to post-) in the experimental group? What is the average change in pain tolerance in the control group? What is the difference between these two averages? Compare this average difference to the average pre- measurement for all participants. Do you believe there is a practically significant difference between the groups?

(4) One explanation for why there is a difference between groups is that sampling variability has caused the difference even though stretching has no effect. Thus, in studies where we compare groups, we almost always use a null hypothesis that there is no difference between groups. Use the Randomization Test for a Difference in Means tool in StatKey to assess whether there is a statistically significant difference in the change in pain tolerance between the experimental group and the control group. Use the change in pain tolerance as your quantitative variable and group as your qualitative variable. Report the p-value for the test (and a screenshot of the randomization test). Does the test show a statistically significant difference between the groups? Interpret the p-value in terms of whether or not you believe stretching may affect pain tolerance.

(5) Estimate the difference in the change in pain tolerance between the groups by using the 2\*SE method. Report the lower and upper limit of the 95% confidence interval (you do not need to include a screenshot). Hint: Is 0 in your interval? If so, 0 is a plausible value for the true mean difference. What does this mean?

**due Thursday:** Submit a single .docx or .pdf file with your completed work, including screenshots of StatKey, written out equations, and explanations as appropriate.

## Part 2

Does stretching affect pain tolerance? Specifically, can stretching help to increase pain tolerance?

Consider the Part 1 activity. Answer this question in a medium length paragraph. Be sure to justify your position with evidence based on your statistical analyses. Explain how you collected your evidence, and why this evidence can be used to help support your position.

#### Include the following components:

(1) mean change in pain tolerance in each group, and the difference between the mean

(2) The ratio of the difference between the mean change in each group divided by the average pre- measurement

(3) The p-value for the randomization test for a difference between means

(4) the CI for the difference in the mean

(5) Your summary of whether or not you think stretching makes a difference considering both statistical significance and practical significance.

#### Hints:

* Remember to always think of sampling variability when making your estimate.
* Your paragraph should generally have the same flow as the prompt for the Week 2 discussion. However, this week, try to focus on communicating the information as if you are speaking to a friend or writing for the news, as opposed a formal scientific or statistical summary laden with jargon.

Post your answer (with explanation and justification) to the discussion board by **Thursday**.

## Part 3

Respond to at least two other colleagues' posts. Comment on the information they included in their summary, any holes in their justification, or their communication of statistical information. Ask clarifying questions. This is your chance to practice and improve your statistical communication and understanding.

Answer any questions that your classmates or instructors ask about your post.

due **Sunday.**