Lab Assignment: Inference for Paired Data

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## Exercise 1

To reduce ankle injuries, restrictive appliances such as taping and spatting (applying tape over the shoe and sock) have been employed. As part of a study at UW-L, subjects also completed a 5-point Likert-type scale survey regarding their perceptions of the movement of each ankle appliance during exercise.

Researchers would like to compare the central values for perceptions of the movement of taped ankles compared to spatted ankles using and to estimate the difference with 90% confidence.

### Part 1a

Load the data set AnkleMovement.rda

### -|-|-|-|-|-|-|-|-|-|-|- Answer 1a -|-|-|-|-|-|-|-|-|-|-|-

library(DS705data)  
data(AnkleMovement)

### Part 1b

Create a new variable of the differences, with the perceptions of the spatted ankle (spat) subtracted from the perceptions of the taped ankle (tape).

### -|-|-|-|-|-|-|-|-|-|-|- Answer 1b -|-|-|-|-|-|-|-|-|-|-|-

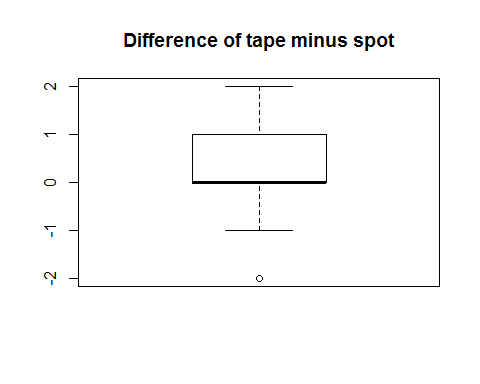
AnkleMovement['diff'] = with(AnkleMovement, tape-spat)

### Part 1c

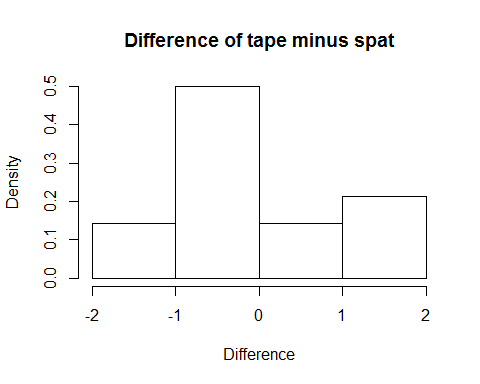
Create boxplots and histograms for the sample of differences.

### -|-|-|-|-|-|-|-|-|-|-|- Answer 1c -|-|-|-|-|-|-|-|-|-|-|-

with(AnkleMovement, boxplot(diff, main='Difference of tape minus spot'))



with(AnkleMovement, hist(diff, prob=TRUE, main='Difference of tape minus spat', xlab='Difference'))



### Part 1d

Comment on the suitability of this data for the paired t-test, the Wilcoxon signed rank test, and the sign test.

### -|-|-|-|-|-|-|-|-|-|-|- Answer 1d -|-|-|-|-|-|-|-|-|-|-|-

For a paired t-test, the sampling distribution of the differences in a normal distribution and the differences are independent.

For a Wilcoxon signed rank test, the sampling distribution of the differences must be symetrical about the median. Also, must be random sample of distributions.

For the Wilcoxon rank sum test, the two populations must be identical in shape, just with one possibly shifted over. This is is not paired data.

I am most inclined to use the Wilcoxon signed rank test. We know the data is paired. The boxplot does not seem to indicate the data is a normal distribution.

### Part 1e

Conduct an appropriate test to compare the central values for subject's perceptions of the movement of taped ankles compared to spatted ankles using .

#### Step 1

Define the parameters in words in the context of the problem.

#### -|-|-|-|-|-|-|-|-|-|-|- Answer 1e.step1 -|-|-|-|-|-|-|-|-|-|-|-

is the mean difference in ratings of tape vs. spat or the population of all people. tape

#### Step 2

State the null and alternative hypotheses for the test.

#### -|-|-|-|-|-|-|-|-|-|-|- Answer 1e.step2 -|-|-|-|-|-|-|-|-|-|-|-

#### Step 3

Use R to generate the output for the test you selected.

#### -|-|-|-|-|-|-|-|-|-|-|- Answer 1e.step3 -|-|-|-|-|-|-|-|-|-|-|-

# Insert your R code here.

#### Step 4

State both a statistical conclusion at and interpret it in the context of the problem.

#### -|-|-|-|-|-|-|-|-|-|-|- Answer 1e.step4 -|-|-|-|-|-|-|-|-|-|-|-

Replace this text with your answer here.

### Part 1f

Write an interpretation in the context of the problem for the 90% CI.

### -|-|-|-|-|-|-|-|-|-|-|- Answer 1f -|-|-|-|-|-|-|-|-|-|-|-

Replace this text with your answer here.

### Part 1g

Which test and interval did you use? Justify your choice, including some discussion of how well the conditions for the inference procedures were met.

### -|-|-|-|-|-|-|-|-|-|-|- Answer 1g -|-|-|-|-|-|-|-|-|-|-|-

Replace this text with your answer here.

## Exercise 2

One hundred and twenty apparently healthy subjects volunteered to participate in this investigation. All subjects completed pre- and post-tests measuring lumbar strength, and the treatment group trained on the BackUpâ„¢ Lumbar Extension Dynamometer (1 set of 20 reps twice per week) for 10 weeks.

Researchers would like to compare the central values for the pre- and post-training measurements for lumbar strength at and estimate the difference in lumbar strength with 95% confidence.

### Part 2a

Load the data BackUp.rda

### -|-|-|-|-|-|-|-|-|-|-|- Answer 2a -|-|-|-|-|-|-|-|-|-|-|-

# Insert your R code here.

### Part 2b

Create a new variable of the differences, with the post-training values (post) subtracted from the pre-training values (pre).

### -|-|-|-|-|-|-|-|-|-|-|- Answer 2b -|-|-|-|-|-|-|-|-|-|-|-

# Insert your R code here.

### Part 2c

Create boxplots and histograms for the sample of differences.

### -|-|-|-|-|-|-|-|-|-|-|- Answer 2c -|-|-|-|-|-|-|-|-|-|-|-

# Insert your R code here.

### Part 2d

Comment on the suitability of this data for the paired t-test, the Wilcoxon signed rank test, and the sign test.

### -|-|-|-|-|-|-|-|-|-|-|- Answer 2d -|-|-|-|-|-|-|-|-|-|-|-

Replace this text with your answer here.

### Part 2e

Conduct an appropriate test to compare the central values for the pre- and post-training measurements for lumbar strength using . Since you're simply comparing the central values, a two-tailed test is appropriate.

#### Step 1

Define the parameters in words in the context of the problem.

#### -|-|-|-|-|-|-|-|-|-|-|- Answer 2e.step1 -|-|-|-|-|-|-|-|-|-|-|-

Replace this text with your answer here.

#### Step 2

State the null and alternative hypotheses for the test.

#### -|-|-|-|-|-|-|-|-|-|-|- Answer 2e.step2 -|-|-|-|-|-|-|-|-|-|-|-

Replace this text with your answer here.

#### Step 3

Use R to generate the output for the test you selected.

#### -|-|-|-|-|-|-|-|-|-|-|- Answer 2e.step3 -|-|-|-|-|-|-|-|-|-|-|-

# Insert your R code here.

#### Step 4

State both a statistical conclusion at and interpret it in the context of the problem.

#### -|-|-|-|-|-|-|-|-|-|-|- Answer 2e.step4 -|-|-|-|-|-|-|-|-|-|-|-

Replace this text with your answer here.

### Part 2f

Write an interpretation in the context of the problem for a 95% CI.

### -|-|-|-|-|-|-|-|-|-|-|- Answer 2f -|-|-|-|-|-|-|-|-|-|-|-

Replace this text with your answer here.

### Part 2g

Which test and interval did you use? Justify your choice, including some discussion of how well the conditions for the inference procedures were met.

### -|-|-|-|-|-|-|-|-|-|-|- Answer 2g -|-|-|-|-|-|-|-|-|-|-|-

Replace this text with your answer here.