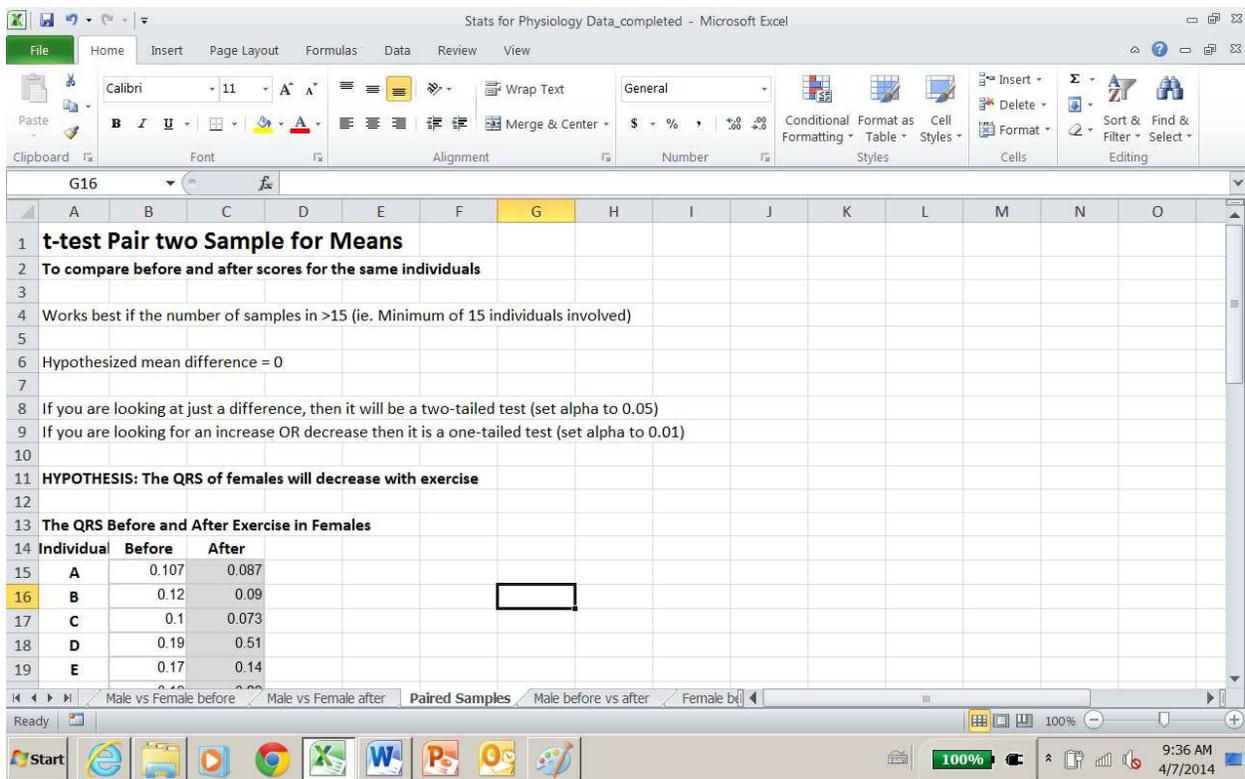


## TO COMPARE BEFORE AND AFTER SCORES FOR THE SAME INDIVIDUAL

If you want to compare the before and after exercise scores for the same individual (eg. QRS interval), you can use these instructions and the corresponding MS Excel spreadsheet. Included in the spreadsheet is an example.

The first step to performing data analysis using MS Excel is to ensure that the Data Analysis add-in package has been added. See the **Instructions for Adding Data Analysis ToolPak for Excel** before proceeding.

I am going to show you how to use a **t-test: Pair two sample for means** to compare means for the same individual. Organize your data into columns according to the groups you wish to compare. Make sure that you pair your data (eg. the before and after scores for Individual A should be in cells side-by-side). This test works best if the number of samples is  $>15$  (ie. minimum of 15 individuals involved).



The screenshot shows a Microsoft Excel spreadsheet titled "Stats for Physiology Data\_completed". The spreadsheet contains the following text and data:

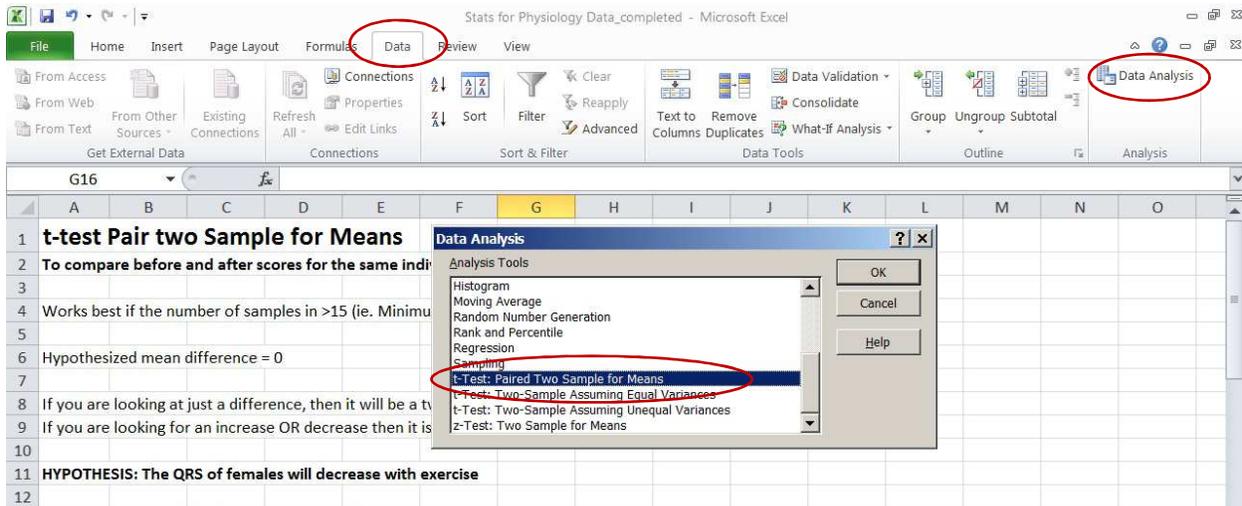
**t-test Pair two Sample for Means**  
To compare before and after scores for the same individuals  
Works best if the number of samples in  $>15$  (ie. Minimum of 15 individuals involved)  
Hypothesized mean difference = 0  
If you are looking at just a difference, then it will be a two-tailed test (set alpha to 0.05)  
If you are looking for an increase OR decrease then it is a one-tailed test (set alpha to 0.01)  
**HYPOTHESIS: The QRS of females will decrease with exercise**

**The QRS Before and After Exercise in Females**

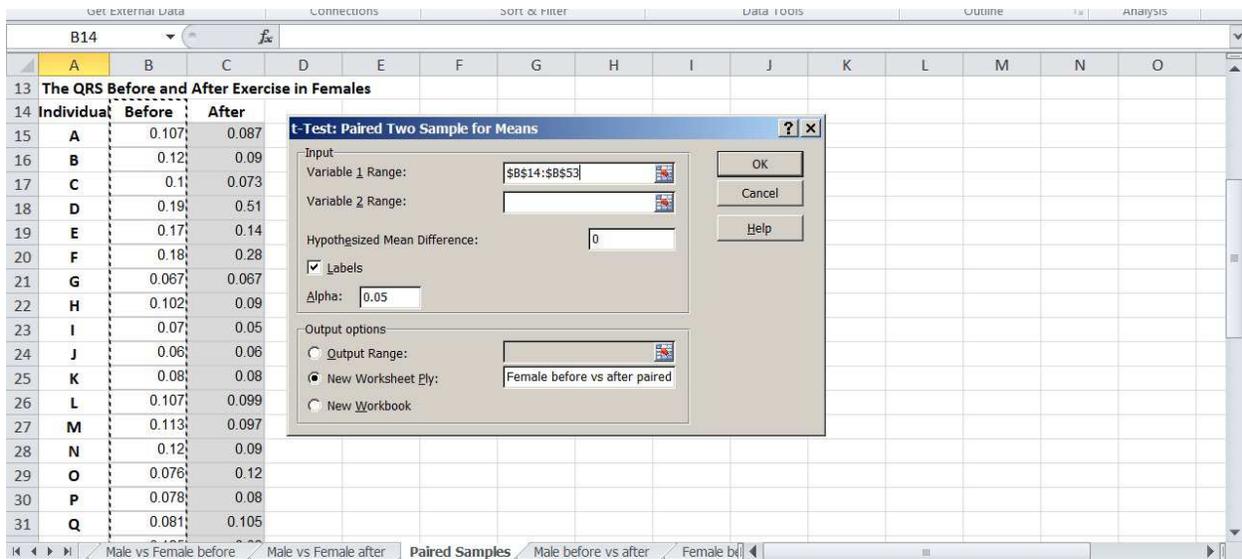
Individual	Before	After
A	0.107	0.087
B	0.12	0.09
C	0.1	0.073
D	0.19	0.51
E	0.17	0.14

The spreadsheet also shows the Excel ribbon with the "Data" tab selected, and the "Data Analysis" toolpak options. The status bar at the bottom indicates "Ready" and "100%".

Click on the **Data** tab and select **Data Analysis**. A window pops up with choices for data analysis. Scroll down and select **t-test: Pair two sample for means** and click **OK**.



A window opens and now we can select the parameters for running a t-test for paired means. Place your cursor in the **Variable 1 Range** box and select all of the data including labels in the before column. Place your cursor in the **Variable 2 Range** box and select all of the data including labels in the after column. Your hypothesized mean difference is zero because our null hypothesis for this test is that the means of the before group will be the same as the means of the after group, therefore, the difference between mean(before) and mean(after) is equal to zero. Check the box for **Labels**. Set your **alpha** to **0.05** if you are looking for a difference between the paired scores (two-tailed test – we will see this term when we get our results). Set your alpha value to **0.01** if you are expecting a decrease OR increase in your paired scores with exercise (one-tailed test – we will see this term when we get our results). **It is generally best to just look for a difference (ie. two-tailed test) rather than look for an increase or decrease (on-tailed test)**. Output options allow you to determine where you want the t-test to go. If you want to keep the t-test output in the same worksheet as your data then select **Output Range** and put your cursor in the box beside and then click a cell in your worksheet. I prefer to make a new worksheet.



Here is what the results of a **t-test: Pair two sample for means** will look like. The most important parameter to look at is the **P-value**. You will see that there are two P-values listed in this table; the first P-value is for a one-tail and the second is for a two-tail. If you are looking at just a difference between before and after scores, then it will be a **two-tailed test** (and you set alpha to 0.05). If you are looking for an increase OR decrease in the before and after scores, then it is a **one-tailed test** (set alpha to 0.01).

**To interpret your P-values:** If the P-value is greater than the **alpha value (0.05 or 0.01 depending on the number of tails in your test)** then there is no statistically significant difference between paired scores. If the P-value is less than the alpha value (0.05 or 0.01) then there is a statistically significant increase or decrease between the paired scores after exercise.

	Before	After	
Mean	0.110487	0.125462	
Variance	0.002797	0.006831	
Observations	39	39	
Pearson Correlation	0.626352		
Hypothesized Mean Difference	0		
df	38		
t Stat	-1.45123		
P(T<=t) one-tail	0.077461		P-value>alpha value (0.077>0.01) therefore there is no significant decrease
t Critical one-tail	2.428568		in the QRS of females before and after exercise
P(T<=t) two-tail	0.154921		
t Critical two-tail	2.711558		