## Lecture 6 - Correlation

The first inferential statistic we will focus on is correlation. As noted in the text, correlation is used to test the degree of association between variables. All of the inferential statistics commands in SPSS are accessed from the Analyze menu. Let's open SPSS and replicate the correlation between height and weight presented in the text.

✔ **Open** *HeightWeight.sav*. Take a moment to review the data file.

✔ Under **Analyze**, select **Correlate/Bivariate**. Bivariate means we are examining the simple association between 2 variables

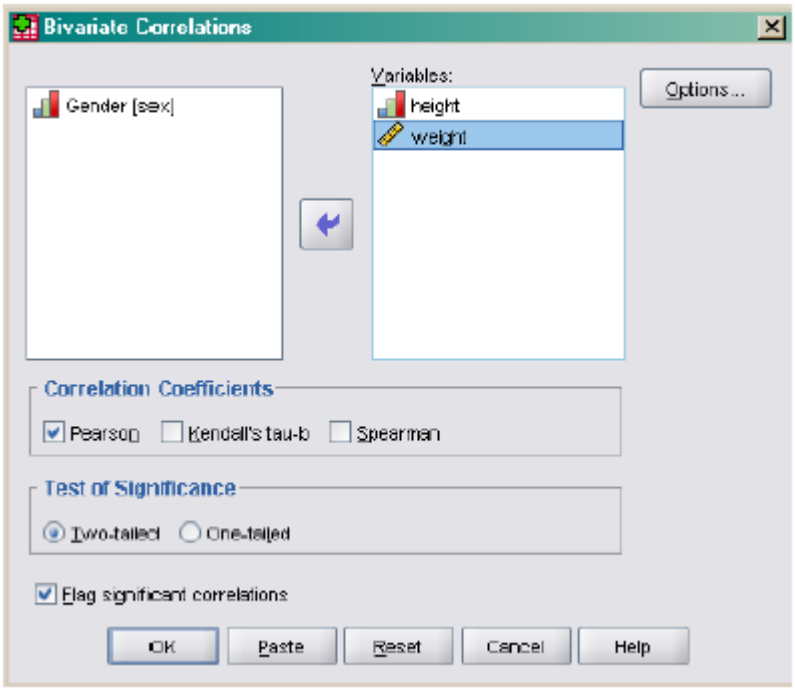



Figure 1

In the dialog box, select height and weight for **Variables**. Select **Pearson** for **Correlation Coefficients** since the data are continuous. The default for **Tests of Significance** is **Two-tailed**. You could change it to One-tailed if you have a directional hypothesis. Selecting **Flag significant correlations** means that the significant correlations will be noted in the output by asterisks. This is a nice feature. Then click **Options**.

Now you can see how descriptive statistics are built into other menus. Select **Means and standard deviations** under **Statistics**. Missing Values are important. In large data sets, pieces of data are often missing for some variables.(Figure 2)

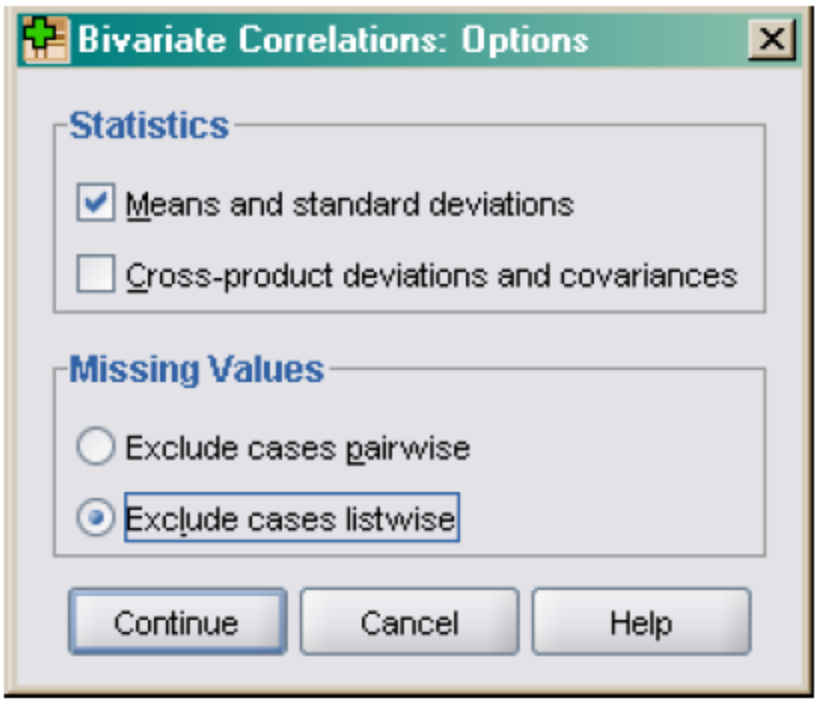



Figure 2

For example I may run correlations between height, weight, and blood pressure. One subject may be missing blood pressure data. If I check **Exclude cases listwise**, SPSS will not include that person's data in the correlation between height and weight, even though those data are not missing. If I check **Exclude cases pairwise,** SPSS will include that person's data to calculate any correlations that do not involved blood pressure. In this case, the person's data would still be reflected in the correlation between height and weight. You have to decide whether or not you want to exclude cases that are missing any data from all analyses. (Normally it is much safer to go with listwise deletion, even though it will reduce your sample size.) In this case, it doesn't matter because there are no missing data. Click **Continue**. When you return to the previous dialog box, click **Ok**. The output follow.

## Correlations

**Descriptive Statistics**

| | Mean | Std. Deviation | N |
|---|---|---|---|
| HEIGHT | 68.72 | 3.66 | 92 |
| WEIGHT | 145.15 | 23.74 | 92 |

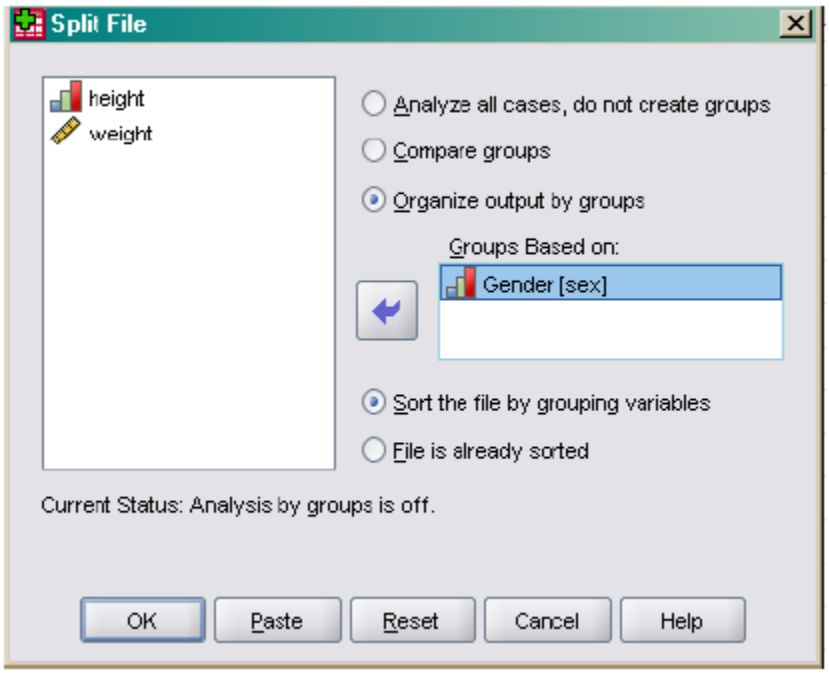
**Correlations**

| | | HEIGHT | WEIGHT |
|---|---|---|---|
| HEIGHT | Pearson Correlation | 1.000 | .785** |
| | Sig. (2-tailed) | . | .000 |
| | N | 92 | 92 |
| WEIGHT | Pearson Correlation | .785** | 1.000 |
| | Sig. (2-tailed) | .000 | . |
| | N | 92 | 92 |

**. Correlation is significant at the 0.01 level

✔ Now you can see how descriptive statistics are built into other menus. Select **Means and standard deviations** under **Statistics**. Missing Values are important. In large data sets, pieces of data are often missing for some variables.
Notice, the correlation coefficient is .785 and is statistically significant, just as reported in the text. In the text, Howell made the point that heterogeneous samples affect correlation coefficients. In this example, we included both males and females. Let's examine the correlation separately for males and females as was done in the text.

**Subgroup Correlations**
We need to get SPSS to calculate the correlation between height and weight separately for males and females. The easiest way to do this is to split our data file by sex. Let's try this together.
✔ In the Data Editor window, select **Data/Split file**.




Figure(3)

Select **Organize output by groups** and **Groups Based on** Gender. This means that any analyses you specify will be run separately for males and females. Then, click **Ok**.

✔ Notice that the order of the data file has been changed. It is now sorted by Gender, with males at the top of the file.

✔ Now, select **Analyze/Correlation/Bivariate**. The same variables and options you selected last time are still in the dialog box. Take a moment to check to see for yourself. Then, click **Ok**. The output follow broken down by males and females.

## Correlations

## SEX = Male

**Descriptive Statistics[a]**

| | Mean | Std. Deviation | N |
|---|---|---|---|
| HEIGHT | 70.75 | 2.58 | 57 |
| WEIGHT | 158.26 | 18.64 | 57 |

a. SEX = Male

**Correlations[a]**

| | | height | weight |
|---|---|---|---|
| height | Pearson Correlation | 1 | .604** |
| | Sig. (2-tailed) | | .000 |
| | N | 57 | 57 |
| weight | Pearson Correlation | .604** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 57 | 57 |

**. Correlation is significant at the 0.01 level (2-tailed).

a. Gender = Male

## SEX = Female

**Descriptive Statistics[a]**

| | Mean | Std. Deviation | N |
|---|---|---|---|
| HEIGHT | 65.40 | 2.56 | 35 |
| WEIGHT | 123.80 | 13.37 | 35 |

a. SEX = Female

**Correlations[a]**

| | | height | weight |
|---|---|---|---|
| height | Pearson Correlation | 1 | .494** |
| | Sig. (2-tailed) | | .003 |
| | N | 35 | 35 |
| weight | Pearson Correlation | .494** | 1 |
| | Sig. (2-tailed) | .003 | |
| | N | 35 | 35 |

**. Correlation is significant at the 0.01 level (2-tailed).

a. Gender = Female

As before, our results replicate those in the text. The correlation between height and weight is stronger for males than females. Now let's see if we can create a more complicated scatterplot that illustrates the pattern of correlation for males and females on one graph. First, we need to turn off split file.

✔ Select **Data/Split file** from the Data Editor window. Then select **Analyze all cases, do not compare groups** and click **Ok**. Now, we can proceed.

**Scatterplots of Data by Subgroups**

✔ Select **Graphs/Legacy/Scatter**. Then, select **Simple** and click

To be consistent with the graph in the text book, select weight as the **Y Axis** and height as the **X Axis**. Then, select sex for **Set Markers by**. This means SPSS will distinguish the males dots from the female dots on the graph. Then, click **Ok**. (Figure 4)

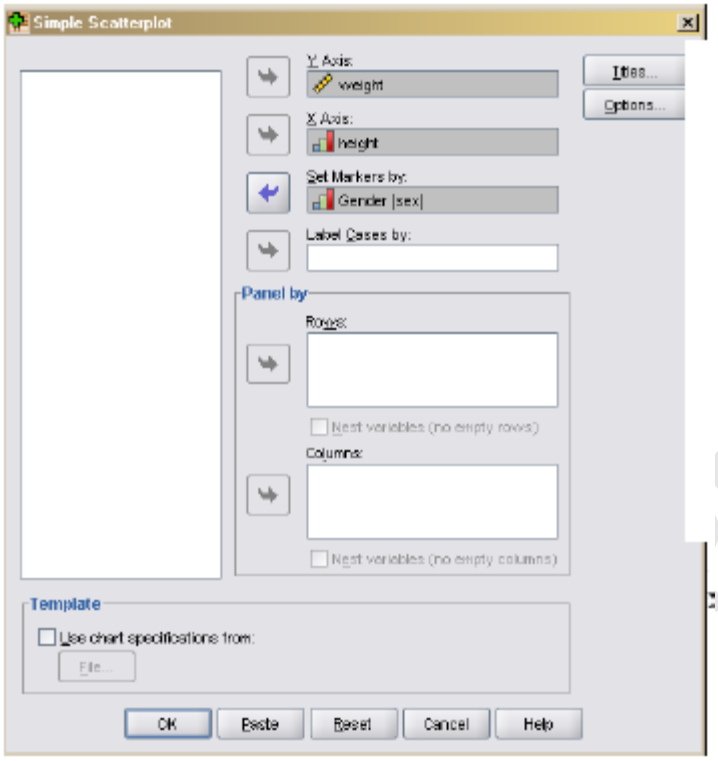



Figure 4.

✔ To be consistent with the graph in the text book, select weight as the **Y Axis** and height as the **X Axis**. Then, select sex for **Set Markers by**. This means SPSS will distinguish the males dots from the female dots on the graph. Then, click **Ok**.
When your graph appears, you will see that the only way males and females are distinct from one another is by color. This distinction may not show up well, so let's edit the graph.
✔ Double click the graph to activate the Chart Editor. Then double click on one of the female dots on the plot. SPSS will highlight them. (I often have trouble with this. If it selects all the points, click again on a female one. That should do it.) Then click the Marker menu.
Select the circle under **Marker Type** and chose a **Fill** color. Then click **Apply**. Then click on the male dots, and select the open circle in **Marker Type** and click **Apply**. Then, close the dialog box. The resulting graph should look just like the one in the textbook.
✔ Click on **Chart/Options**.
✔ Under **Elements, select Fit Line** at **Subgroups**. Then select **Linear** and click **Continue**. (I had to select something else and then go back to Linear to highlight the **Apply** button.) The resulting graph follows. I think it looks pretty good (Figure 5).

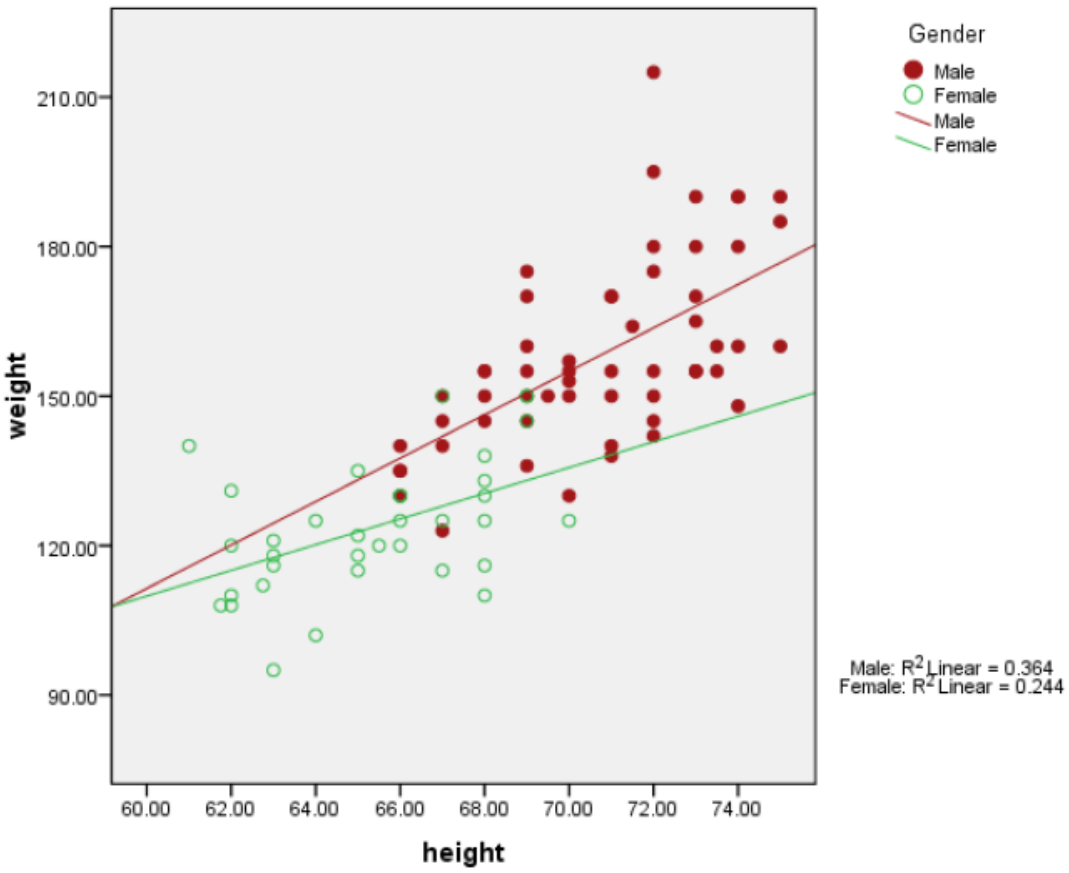



Figure 5.