Chapter 4: Exploring data with graphs

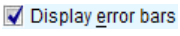
Smart Alex's Solutions

Task 1

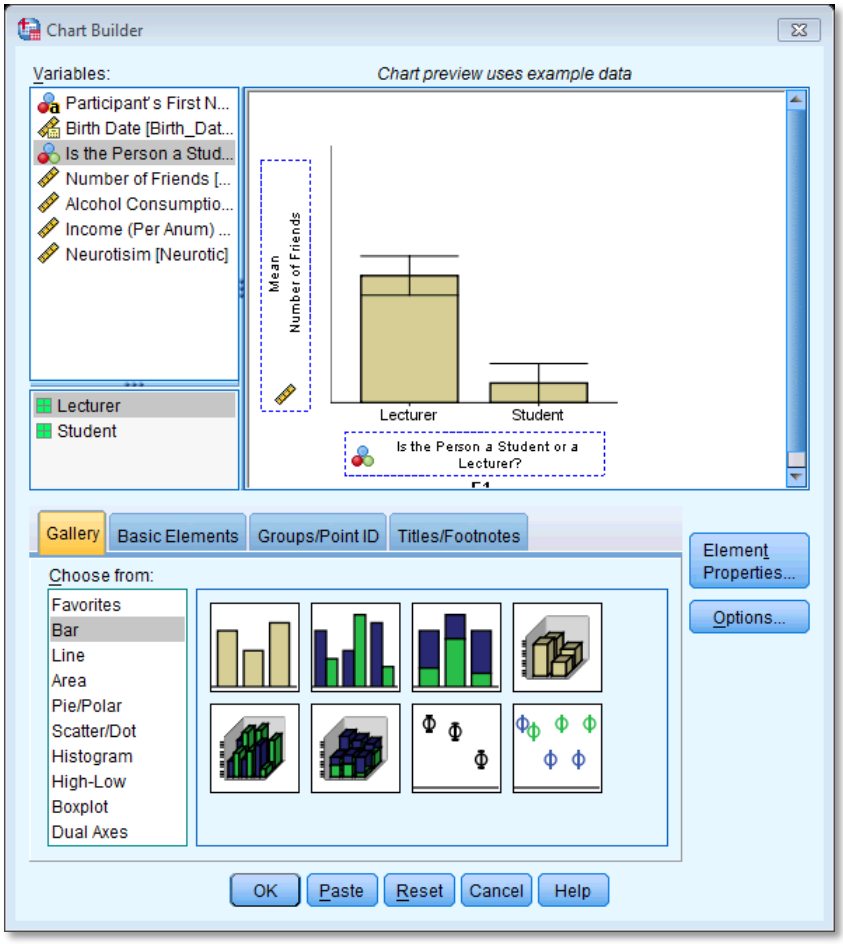
> *Using the data from Chapter 2 (which you should have saved, but if you didn't, re-enter it), plot and interpret an error bar chart showing the mean number of friends for students and lecturers.*

First of all access the Chart Builder and select a simple bar chart. The *y*-axis needs to be the dependent variable, or the thing you've measured, or more simply the thing for which you want to display the mean. In this case it would be **number of friends**, so select this variable from the variable list and drag it into the *y*-axis drop zone (

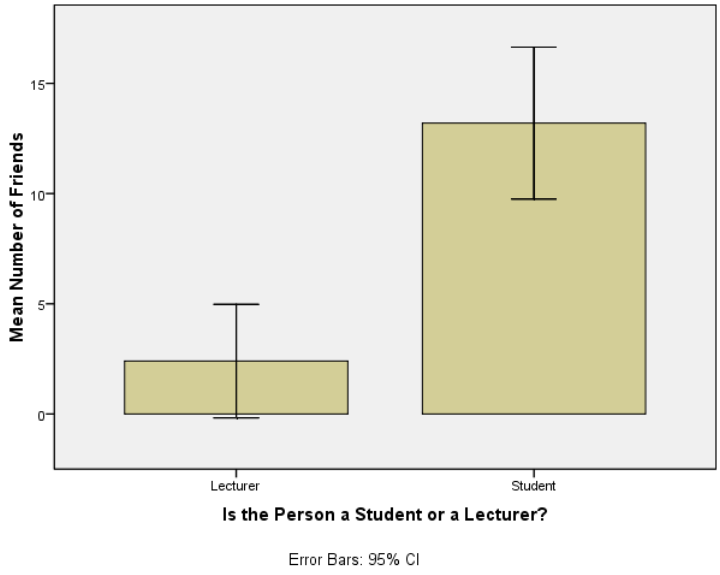
). The *x*-axis should be the variable by which we want to split the arousal data. To plot the means for the students and lecturers, select the variable **Group** from the variable list and drag it into the drop zone for the *x*-axis (

). Then add error bars by selecting 

in the *Element Properties* dialog box. The finished Chart Builder will look like this:



The error bar chart will look like this:

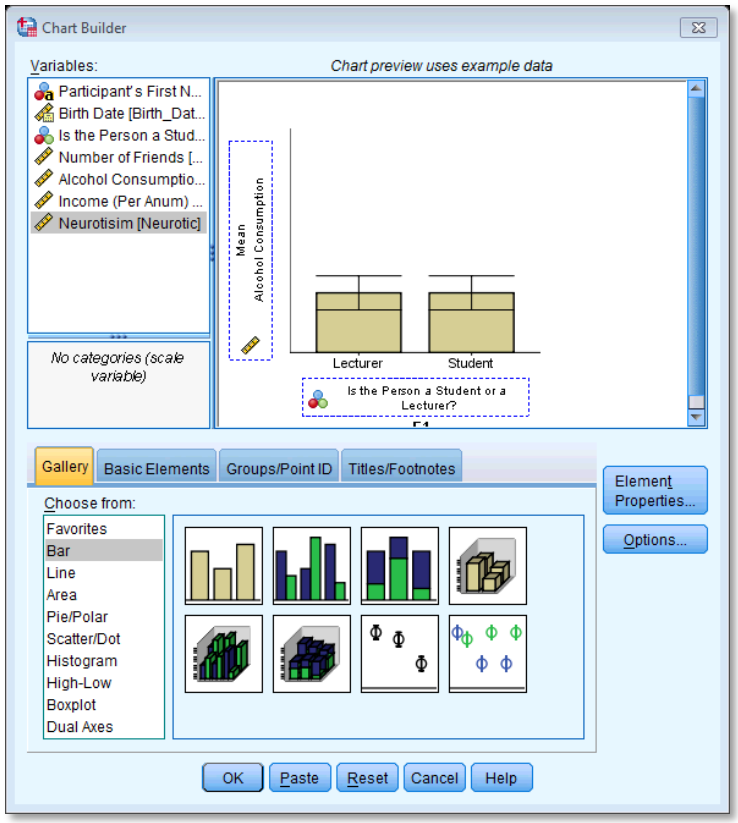


We can conclude that, on average, students had more friends than lecturers.

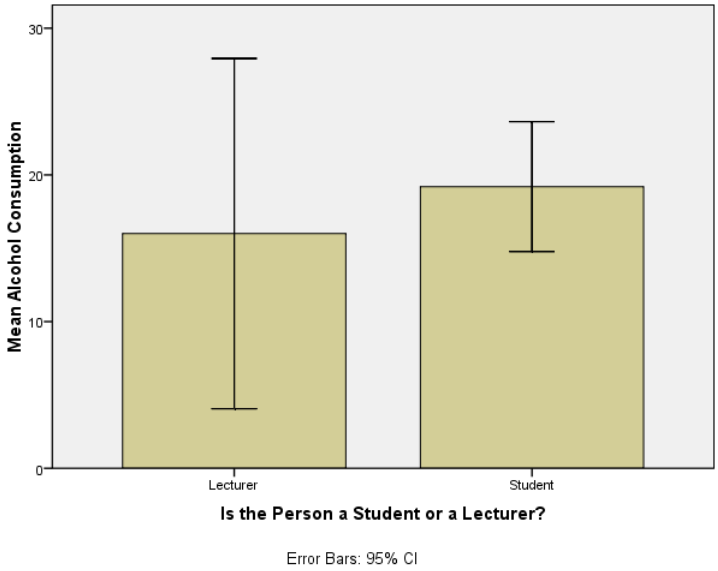
Task 2

Using the same data, plot and interpret an error bar chart showing the mean alcohol consumption for students and lecturers.

Access the Chart Builder and select a simple bar chart. The *y*-axis needs to be the thing we've measured, which in this case is **alcohol consumption**, so select this variable from the variable list and drag it into the *y*-axis drop zone ( ). The *x*-axis should be the variable by which we want to split the arousal data. To plot the means for the students and lecturers, select the variable **Group** from the variable list and drag it into the drop zone for the *x*-axis ( ). Add error bars by selecting Display error bars in the *Element Properties* dialog box. The finished Chart Builder will look like this:



The error bar chart will look like this:

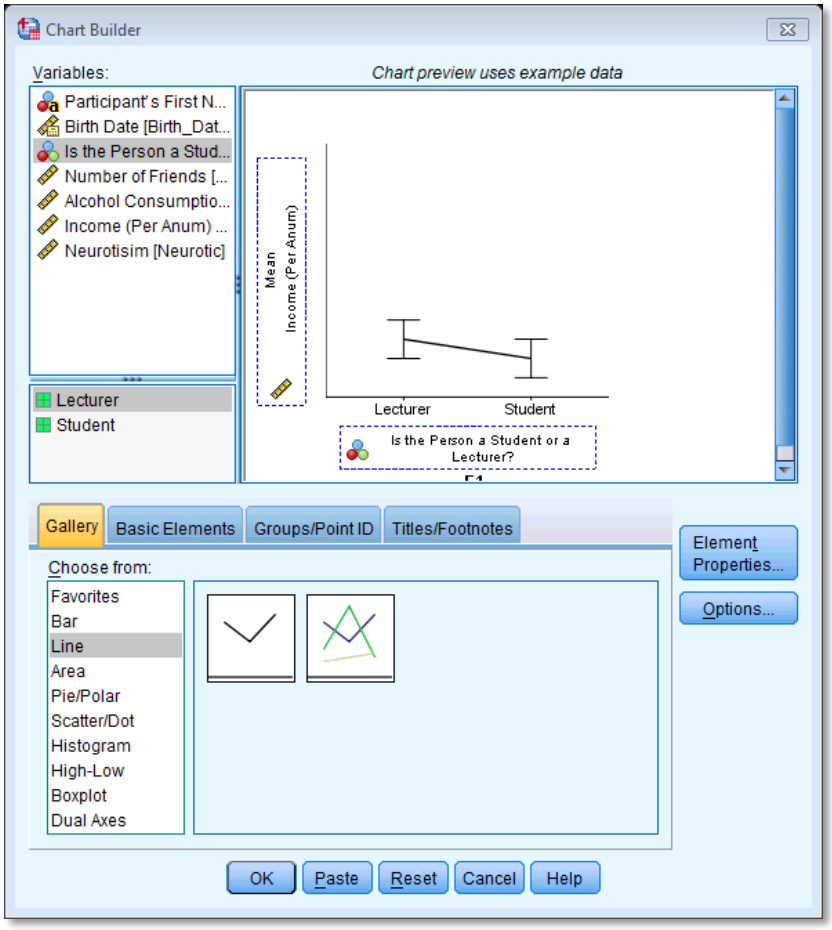


We can conclude that, on average, students and lecturers drank similar amounts, but the error bars tell us that the mean is a better representation of the population for students than for lecturers (there is more variability in lecturers' drinking habits compared to students').

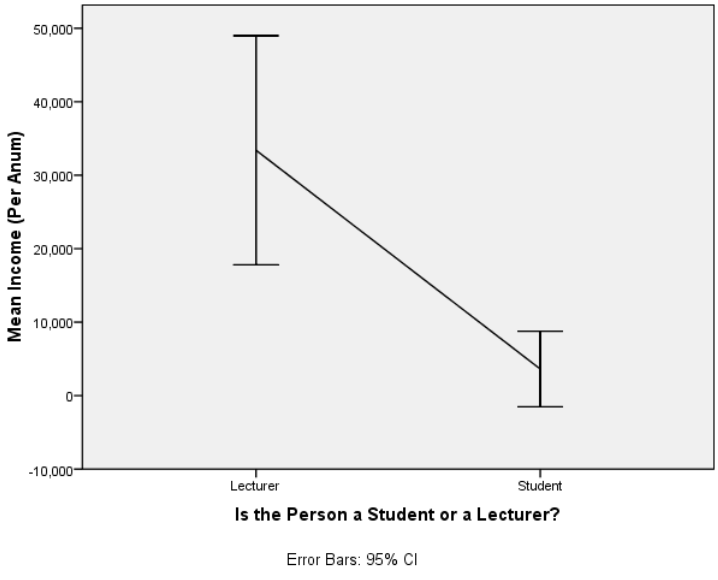
Task 3

Using the same data, plot and interpret an error line chart showing the mean income for students and lecturers.

Access the Chart Builder and select a simple line chart. The *y*-axis needs to be the thing we've measured, which in this case is **income**, so select this variable from the variable list and drag it into the *y*-axis drop zone ( ). The *x*-axis should again be students vs. lecturers, so select the variable **Group** from the variable list and drag it into the drop zone for the *x*-axis ( ). Add error bars by selecting Display error bars in the *Element Properties* dialog box. The finished Chart Builder will look like this:



The error line chart will look like this:

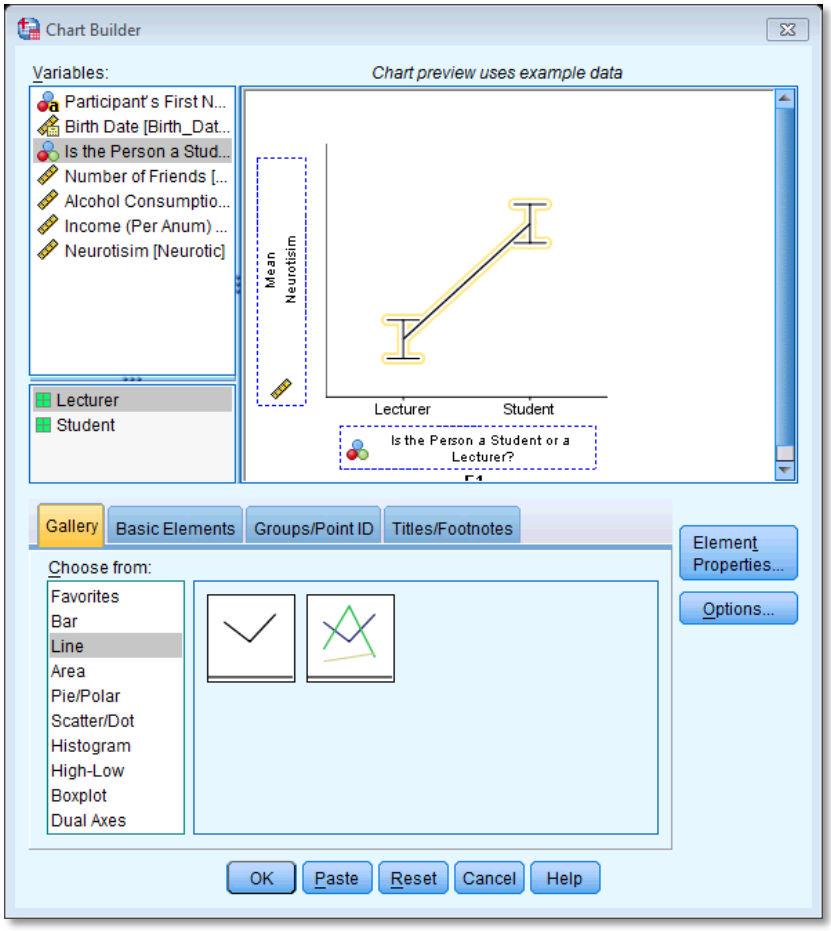


We can conclude that, on average, students earn less than lecturers, but the error bars tell us that the mean is a better representation of the population for students than for lecturers (there is more variability in lecturers' income compared to students').

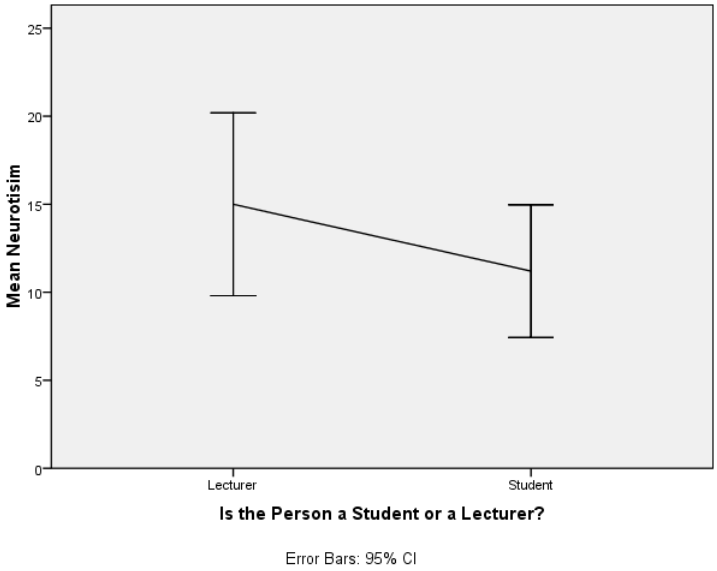
Task 4

Using the same data, plot and interpret error a line chart showing the mean neuroticism for students and lecturers.

Access the Chart Builder and select a simple line chart. The *y*-axis needs to be the thing we've measured, which in this case is **neurotic**, so select this variable from the variable list and drag it into the *y*-axis drop zone (Y-Axis?). The *x*-axis should again be students vs. lecturers, so select the variable **Group** from the variable list and drag it into the drop zone for the *x*-axis (X-Axis?). Add error bars by selecting ☑ Display error bars in the *Element Properties* dialog box. The finished Chart Builder will look like this:



The error line chart will look like this:



We can conclude that, on average, students are slightly less neurotic than lecturers.

Task 5

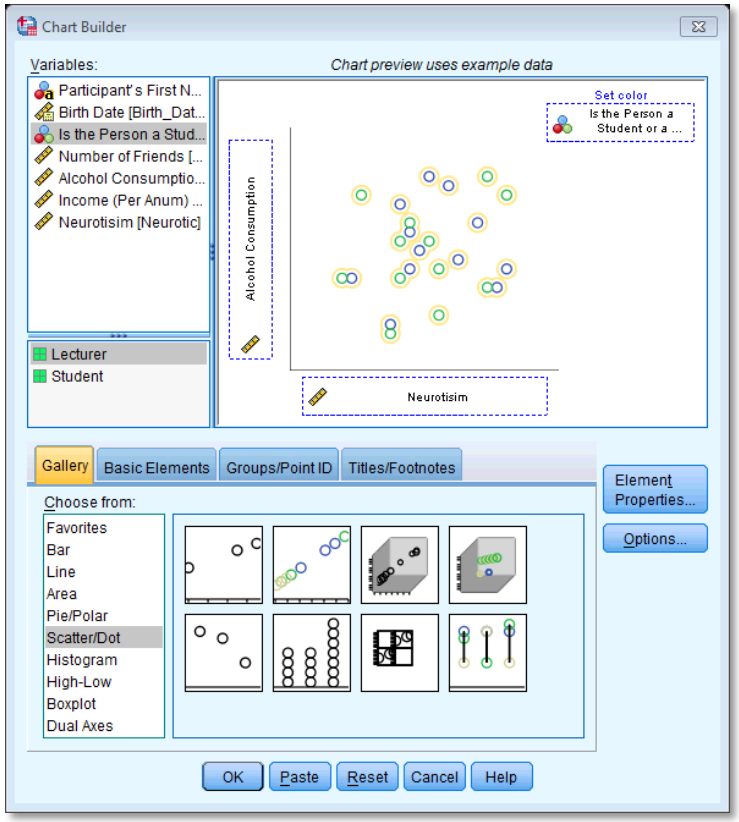
Using the same data, plot and interpret a scatterplot with regression lines of alcohol consumption and neuroticism grouped by lecturer/student.

Access the Chart Builder and select a grouped scatterplot. It doesn't matter which way around we plot these variables, so let's select **alcohol consumption** from the variable list and drag it into the *y*-axis 

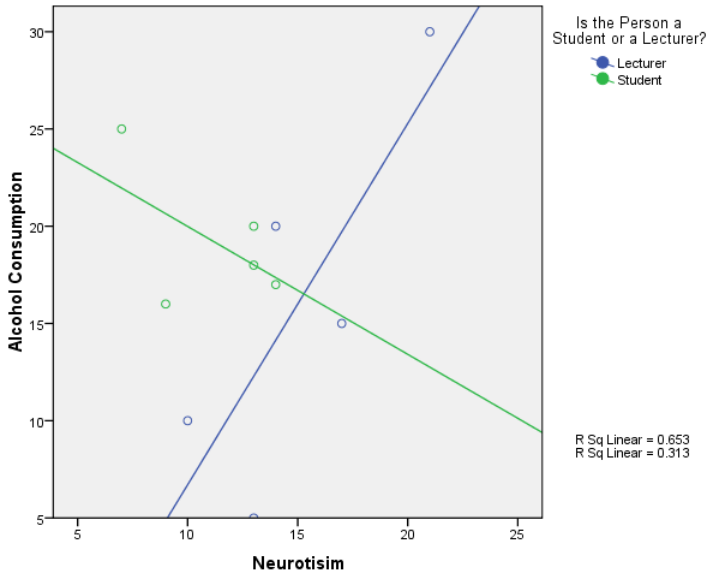
drop zone, and then drag **neurotic** from the variable list and drag it into the 

drop zone. We then need to split the scatterplot by our grouping variable (lecturers or students), so select **Group** and drag it to the 

drop zone. The completed Chart Builder dialog box will look like this:

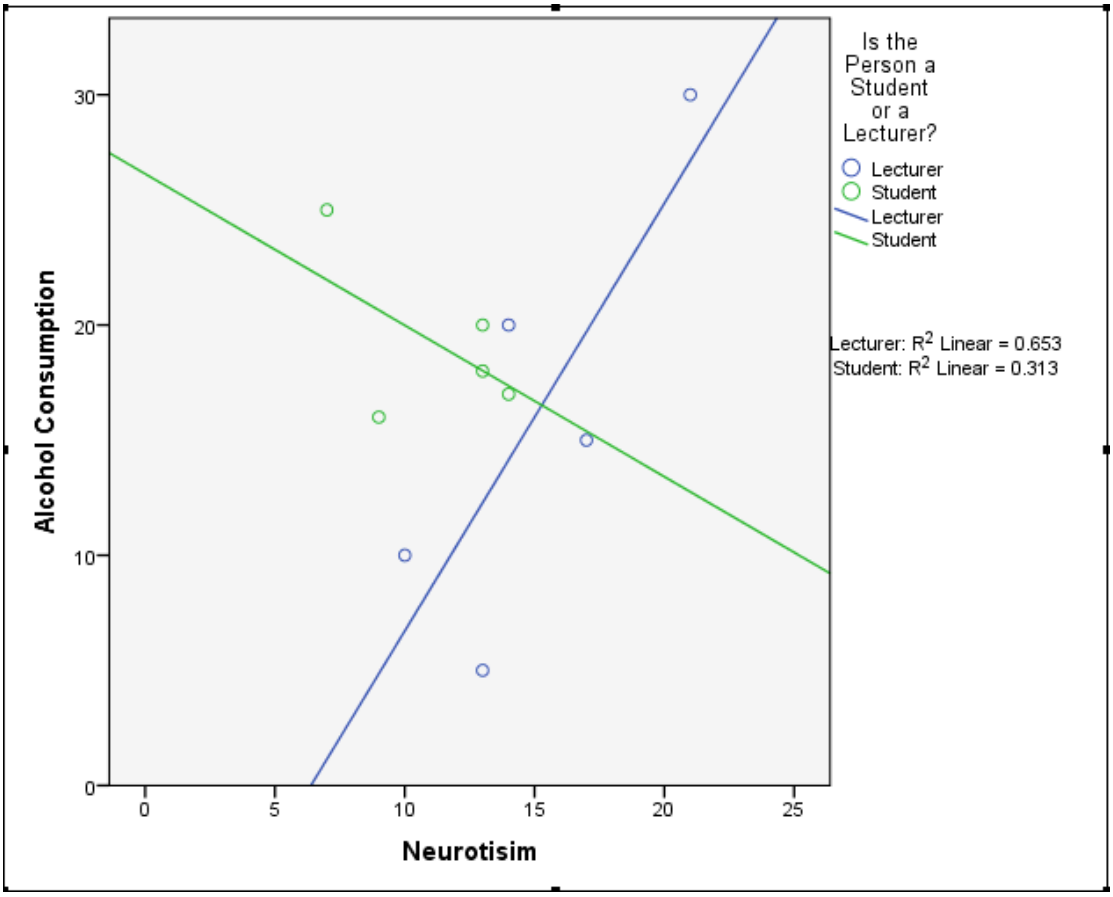


Click on OK to produce the graph. To fit the regression lines double-click on the graph in the SPSS Viewer to open it in the SPSS Chart Editor. Then click on  in the Chart Editor to open the properties dialog box. In this dialog box, ask for a linear model to be fitted to the data (this should be set by default). Click on Apply to fit the lines:



We can conclude that for lecturers, as neuroticism increases so does alcohol consumption (a positive relationship), but for students the opposite is true, as neuroticism increases alcohol consumption decreases. Note that SPSS has scaled this graph oddly

because neither axis starts at zero; as a bit of extra practice, why not edit the two axes so that they start at zero? You can do this by first double-clicking on the *x*-axis to activate the properties dialog box and then in the custom box set the minimum to be 0 instead of 5. Repeat this process for the *y*-axis. The resulting graph will look like this:

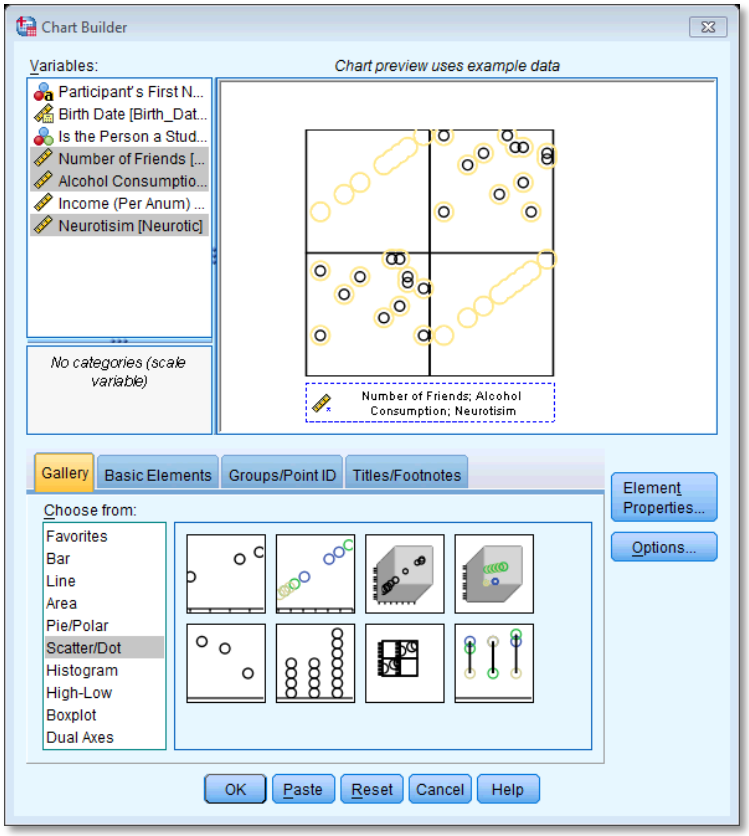


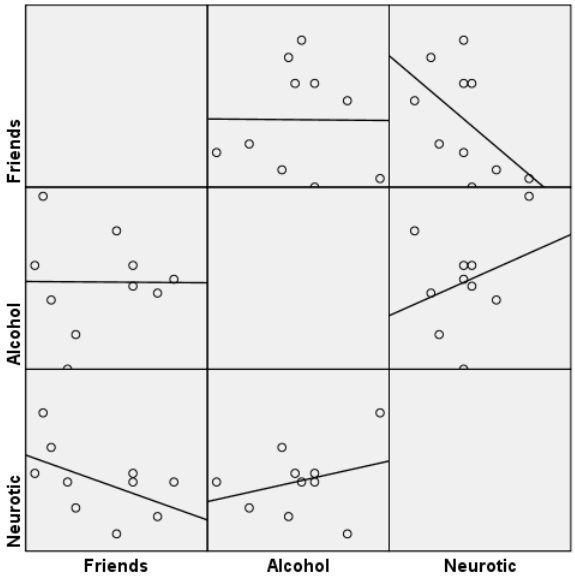
Task 6

Using the same data, plot and interpret a scatterplot matrix with regression lines of alcohol consumption, neuroticism and number of friends.

Access the Chart Builder and select a scatterplot matrix. We have to drag all three variables into the Scattermatrix? drop zone. Select the first variable (**Friends**) by clicking on it with the mouse. Now, hold down the *Ctrl* key on the keyboard and click on a second variable (**Alcohol**). Finally, hold down the *Ctrl* key and click on a third variable (**Neurotic**). Once the three variables are selected, click on any one of them and then drag them into Scattermatrix?. Click on OK to produce the graph. To fit the regression lines double-click on the graph in the SPSS Viewer to open it in the SPSS Chart Editor. Then click on in the Chart Editor to open the properties dialog box. In this dialog box, ask for a linear model to be fitted to the data (this should be set by default). Click on Apply to fit the lines.

We can conclude that there is no relationship (flat line) between the number of friends and alcohol consumption; there was a negative relationship between how neurotic a person was and their number of friends (line slopes downwards); and there was a slight positive relationship between how neurotic a person was and how much alcohol they drank (line slopes upwards).

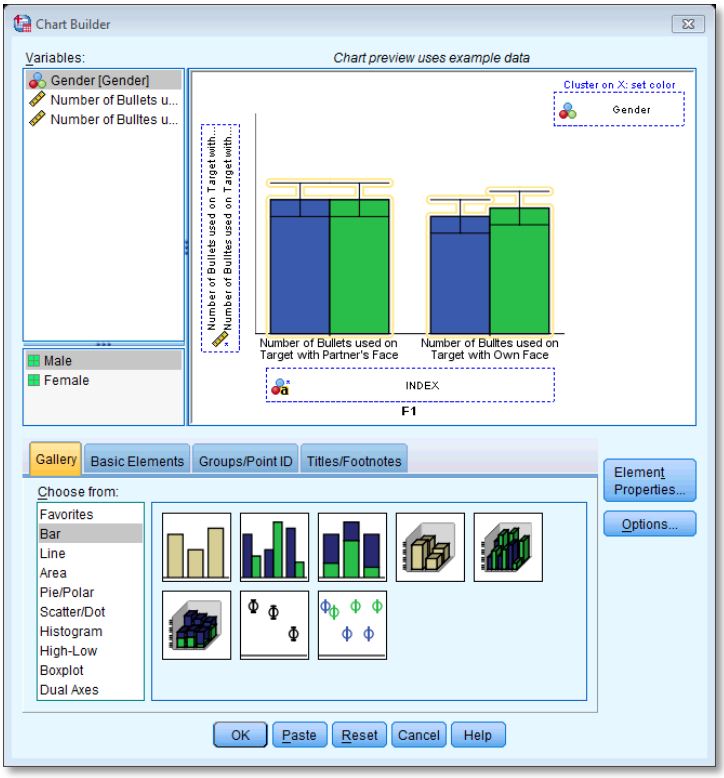




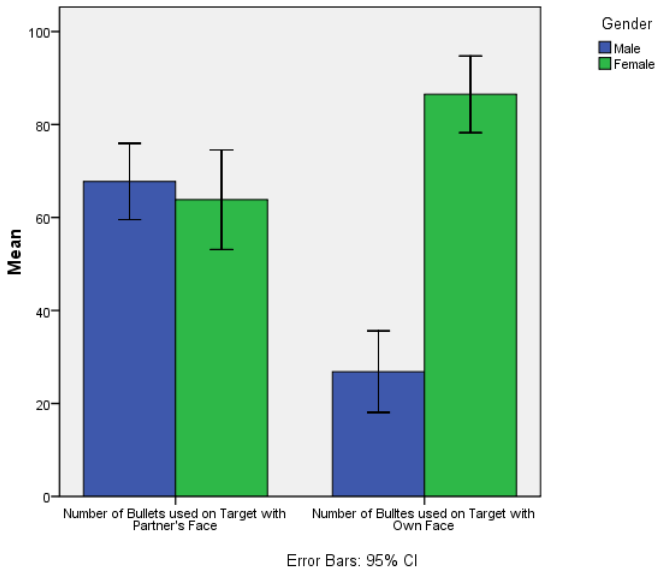
Task 7

*Using the **Infidelity.sav** data from Chapter 3, plot a clustered error bar chart of the mean number of bullets used against the self and the partner for males and females.*

To graph these data we need to select a clustered bar chart in the Chart Builder. We have one repeated-measures variable, which is whether the target had the person's face on it or the face of their partner and is represented in the data file by two columns. In the Chart Builder you need to select these two variables simultaneously by clicking on one and then holding down the *Ctrl* key on the keyboard and clicking on the other. When they are both highlighted click on either one and drag it into Y-Axis?. The second variable (whether the participant was male or female) was measured using different people (obviously) and so is represented in the data file by a grouping variable (**Gender**). This variable can be selected in the variable list and dragged into Cluster on X: set color. The two groups will now be displayed as different-coloured bars. Add error bars by selecting ☑ Display error bars in the *Element Properties* dialog box. The finished Chart Builder will look like this:



The resulting graph looks like this (the labels on both axes could benefit from some editing!):

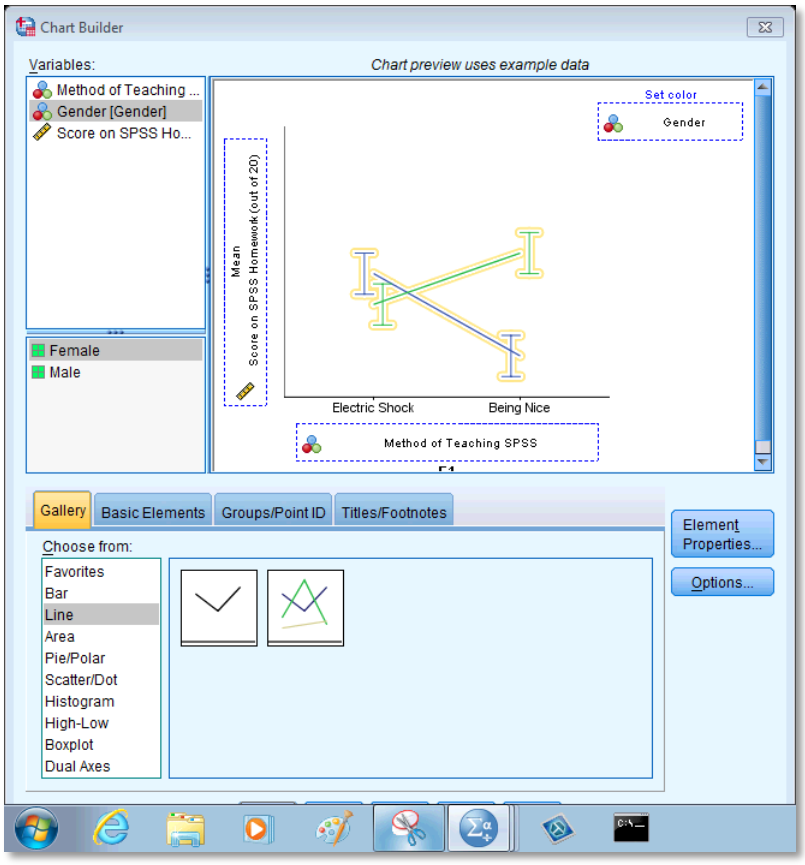


The graph shows that, on average, males and females did not differ much in the number of bullets that they shot at the target when it had their partner's face on it. However, men used fewer bullets than women when the target had their own face on it.

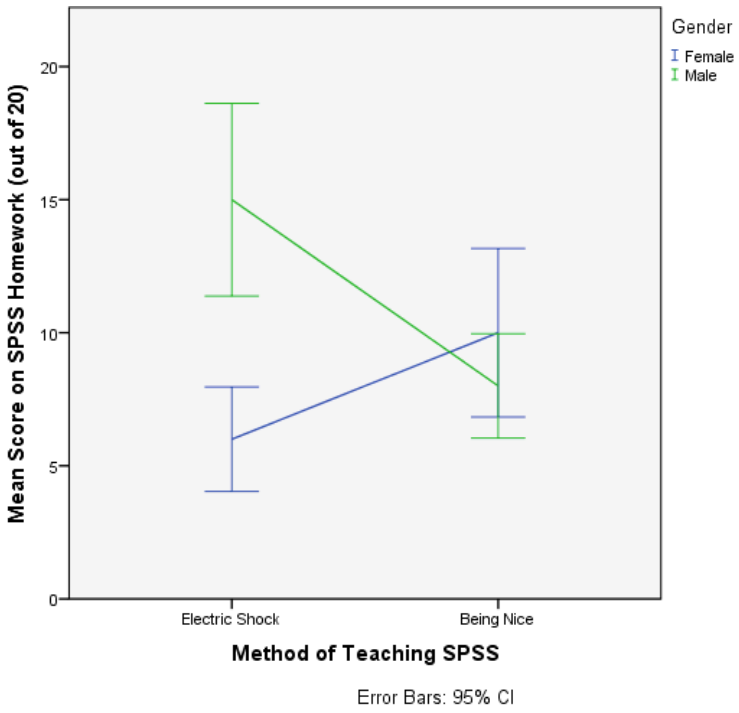
Task 8

*Using the **Method Of Teaching.sav** data from Chapter 3, plot a clustered error line chart of the mean score when electric shocks were used compared to being nice, and plot males and females as different-coloured lines.*

To graph these data we need to select a multiple line chart in the Chart Builder. In the variable list select the method of teaching variable and drag it into X-Axis?. Then highlight and drag the variable representing score on SPSS homework into Y-Axis?. Next, highlight and drag the grouping variable **Gender** into Cluster on X: set color. The two groups will now be displayed as different-coloured bars. Add error bars by selecting Display error bars in the *Element Properties* dialog box. The finished Chart Builder will look like this:



The resulting graph looks like this:

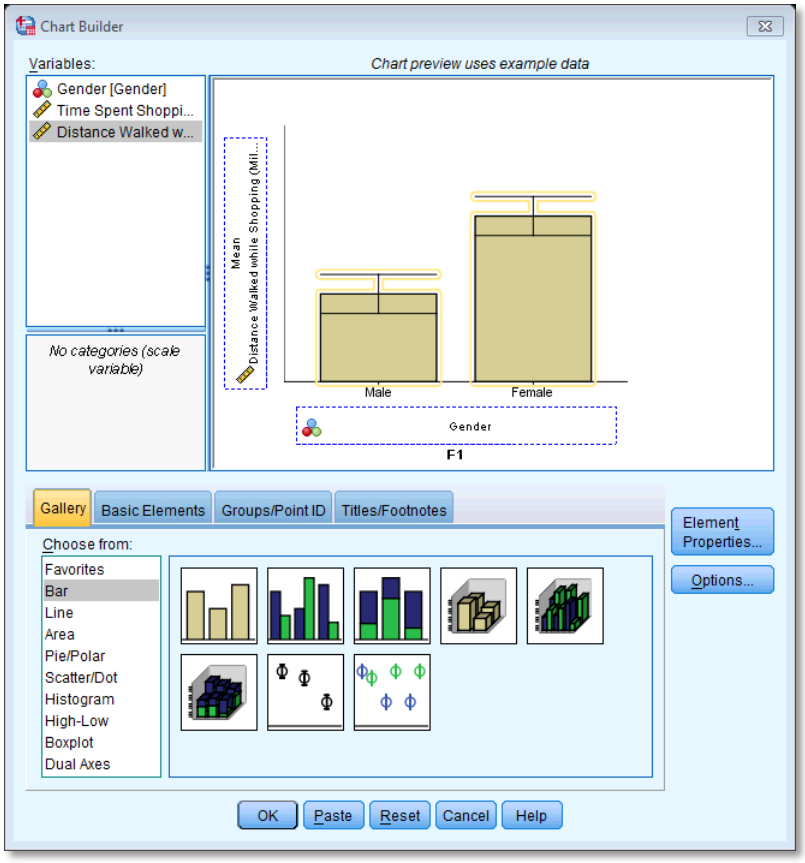


We can see that when the being nice method of teaching is used, males and females have comparable scores on their SPSS homework, with females scoring slightly higher than males on average, although their scores are also more variable than the males' scores as indicated by the longer error bar). However, when an electric shock is used, males score higher than females but there is more variability in the males' scores than the females' for this method (as seen by the longer error bar for males than for females). Additionally, the graph shows that females score higher when the being nice method is used compared to when an electric shock is used, but the opposite is true for males. This suggests that there may be an interaction effect of gender.

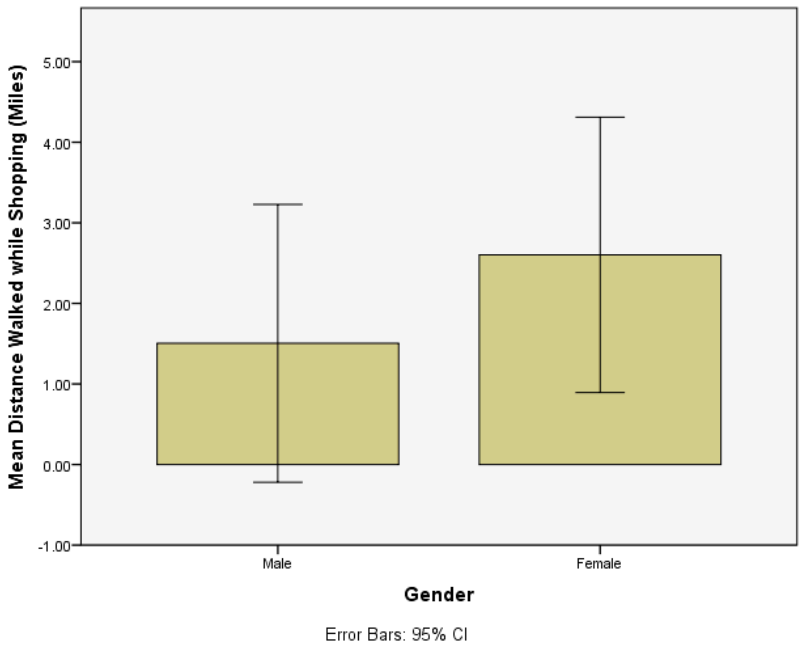
Task 9

*Using the **Shopping Exercise.sav** data from Chapter 3, plot two error bar graphs comparing men and women (x-axis): one for the distance walked, and the other of the time spent shopping.*

Let's first do the graph for distance walked. In the Chart Builder double-click on the icon for a simple bar chart, then select the **Distance** variable from the variable list and drag it into the *y*-axis drop zone ( ). The *x*-axis should be the variable by which we want to split the data. To plot the means for males and females, select the variable **Gender** from the variable list and drag it into the drop zone for the *x*-axis ( ). Finally, add error bars to your bar chart by selecting ☑ Display error bars in the element properties dialog box. The finished Chart Builder will look like this:

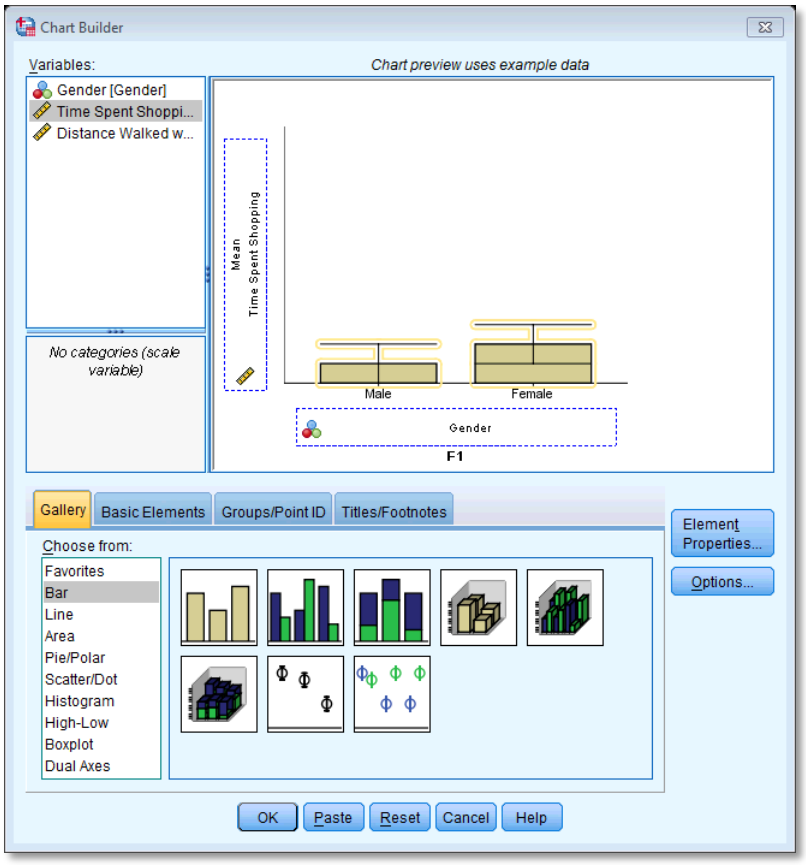


The resulting graph looks like this:

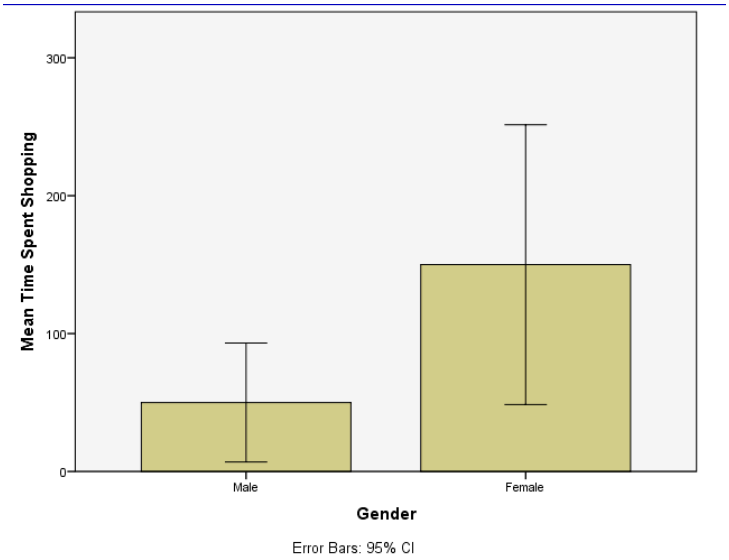


Looking at the graph above, we can see that, on average, females walk longer distances while shopping than males.

Next we need to do the graph for time spent shopping. In the Chart Builder double-click on the icon for a simple bar chart. Select the **Time** variable from the variable list and drag it into the *y*-axis drop zone ( ). The *x*-axis should be the variable by which we want to split the data. To plot the means for males and females, select the variable **Gender** from the variable list and drag it into the drop zone for the *x*-axis ( ). Finally, add error bars to your bar chart by selecting Display error bars in the element properties dialog box. The finished Chart Builder will look like this:



The resulting graph looks like this:

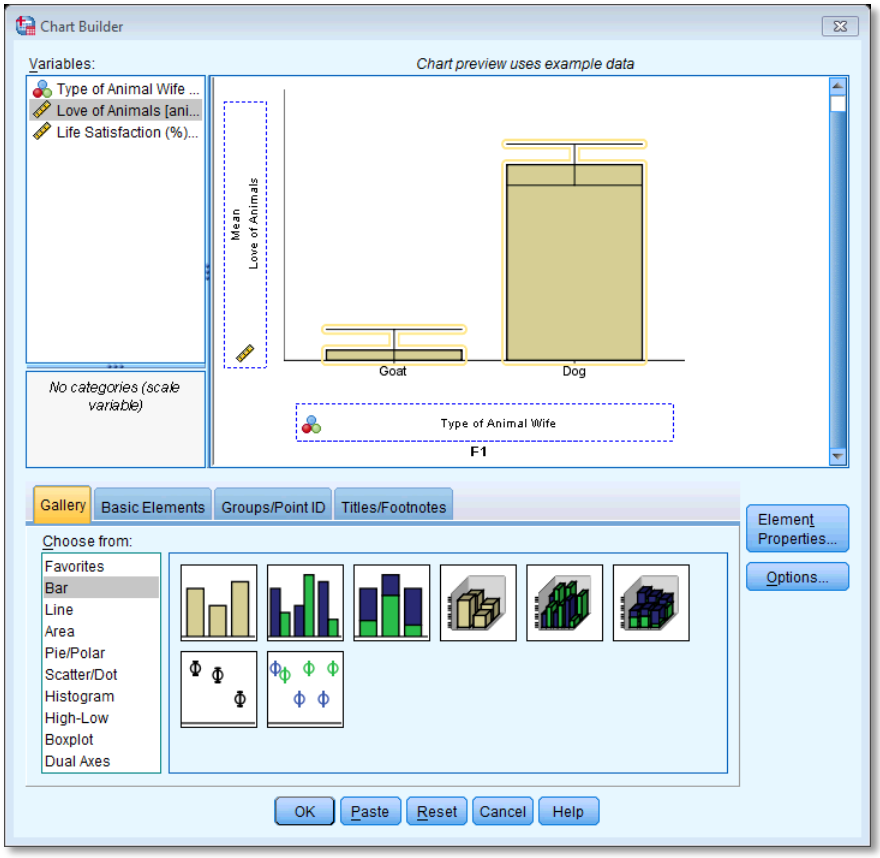


Looking at the graph above, we can see that, on average, females spend more time shopping than males. The females' scores are more variable than the males' scores (longer error bar).

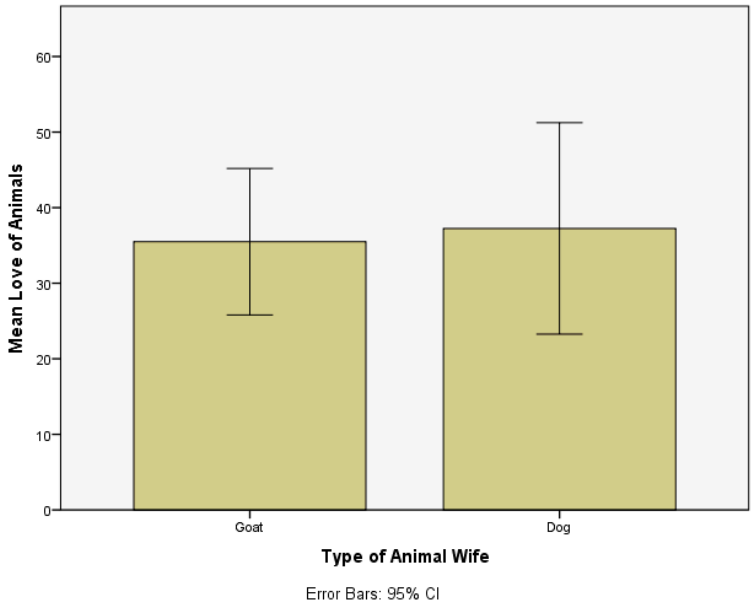
Task 10

> *Using the **Goat or Dog.sav** data from Chapter 3, plot two error bar graphs comparing scores when married to a goat or a dog (x-axis): one for the animal liking variable, and the other of the life satisfaction.*

Let's first do the graph for the animal liking variable. In the Chart Builder double-click on the icon for a simple bar chart, then select the **animal** variable from the variable list and drag it into the *y*-axis drop zone ( ). The *x*-axis should be the variable by which we want to split the data. To plot the means for males and females, select the variable **wife** from the variable list and drag it into the drop zone for the *x*-axis ( ). Finally, add error bars to your bar chart by selecting ☑ Display error bars in the *Element Properties* dialog box. The finished Chart Builder will look like this:



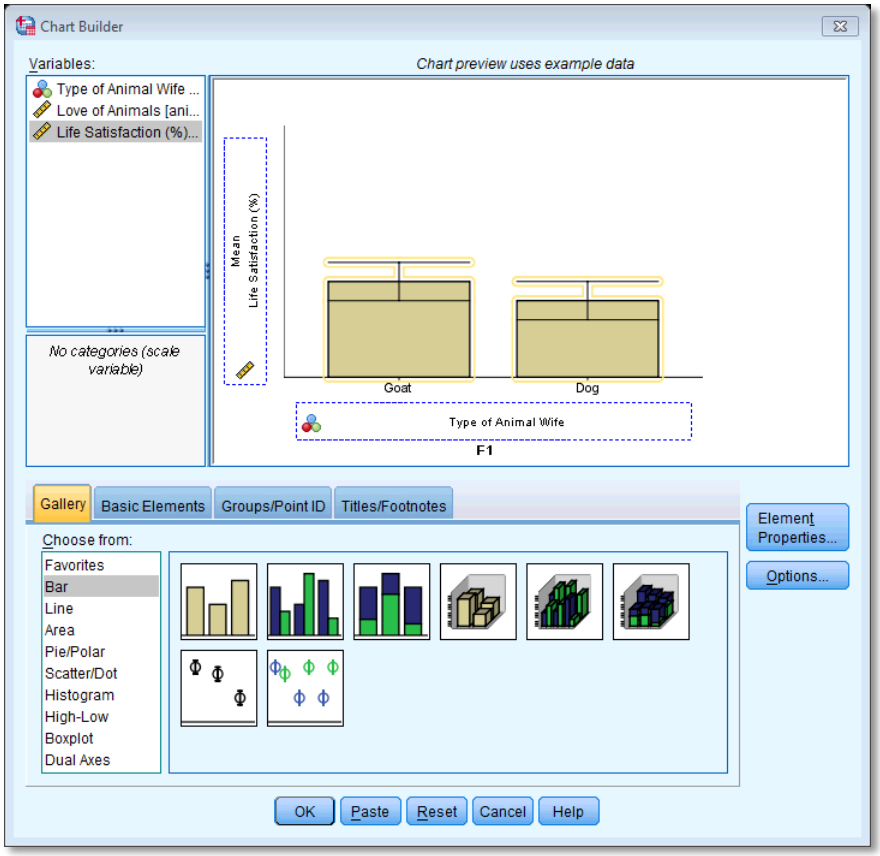
The resulting graph looks like this:



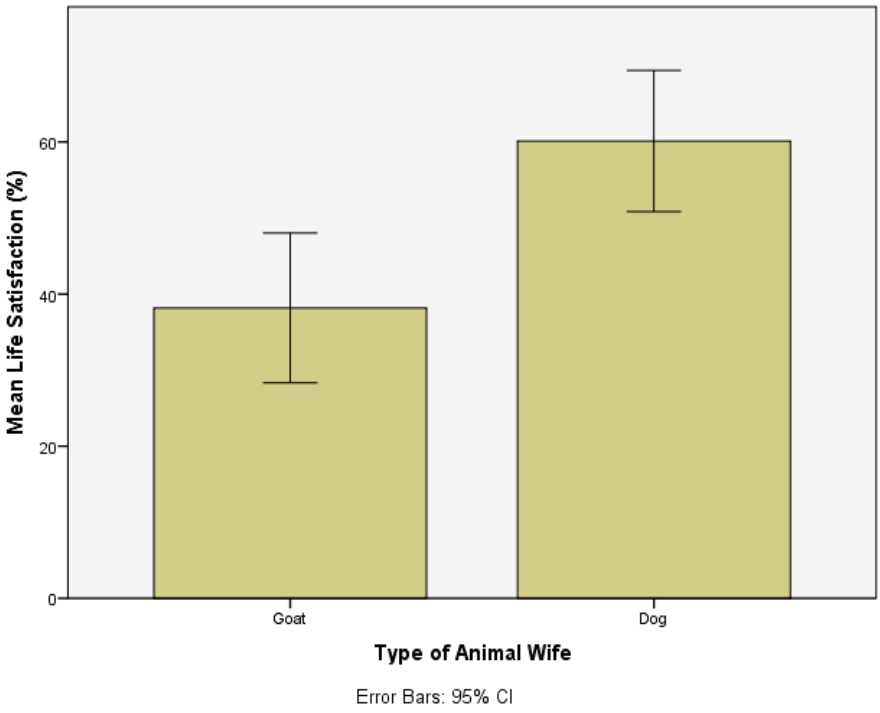
Looking at the graph above, we can see that the mean love of animals was the same for men married to a goat as for those married to a dog.

Next we need to do the graph for life satisfaction. In the Chart Builder double-click on the icon for a simple bar chart. Select the **life_satisfaction** variable from the variable list and drag it into the *y*-axis drop zone ( ). The *x*-axis should be the variable by which we

want to split the data. To plot the means for males and females, select the variable **wife** from the variable list and drag it into the drop zone for the *x*-axis ( ). Finally, add error bars to your bar chart by selecting Display error bars in the *Element Properties* dialog box. The finished Chart Builder will look like this:



The resulting graph looks like this:

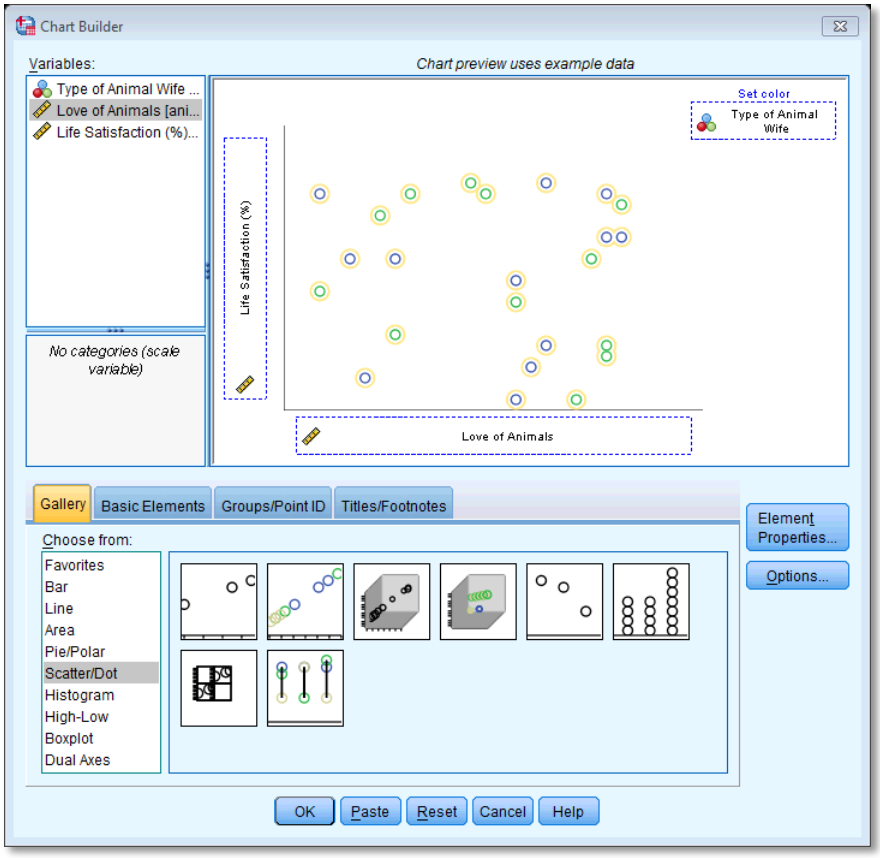


Looking at the graph above, we can see that, on average, life satisfaction was higher in men who were married to a dog compared to men who were married to a goat.

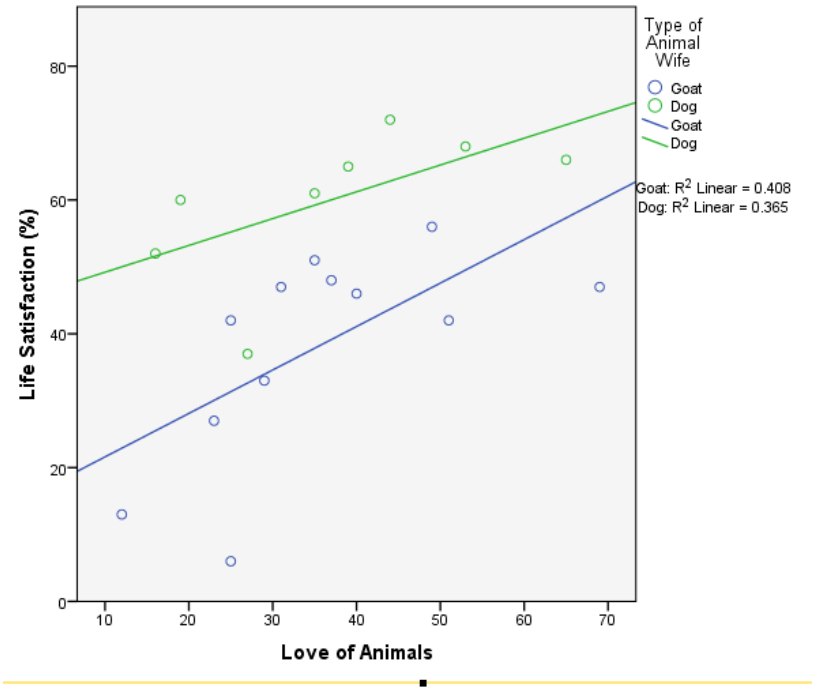
Task 11

Using the same data as above, plot a scatterplot of animal liking scores against life satisfaction (plot scores for those married to dogs or goats in different colours).

Access the Chart Builder and select a grouped scatterplot. It doesn't matter which way around we plot these variables, so let's select **Life Satisfaction** from the variable list and drag it into the *y*-axis drop zone (Y-Axis?), and then drag **Love of Animals** from the variable list and drag it into the drop zone for the *x*-axis (X-Axis?). We then need to split the scatterplot by our grouping variable (dogs or goats), so select **Wife** and drag it to the Set color drop zone. The completed Chart Builder dialog box will look like this:



Click on OK to produce the graph. Let's fit some regression lines to make the graph easier to interpret. To do this, double-click on the graph in the SPSS Viewer to open it in the SPSS Chart Editor. Then click on  in the Chart Editor to open the properties dialog box. In this dialog box, ask for a linear model to be fitted to the data (this should be set by default). Click on Apply to fit the lines:

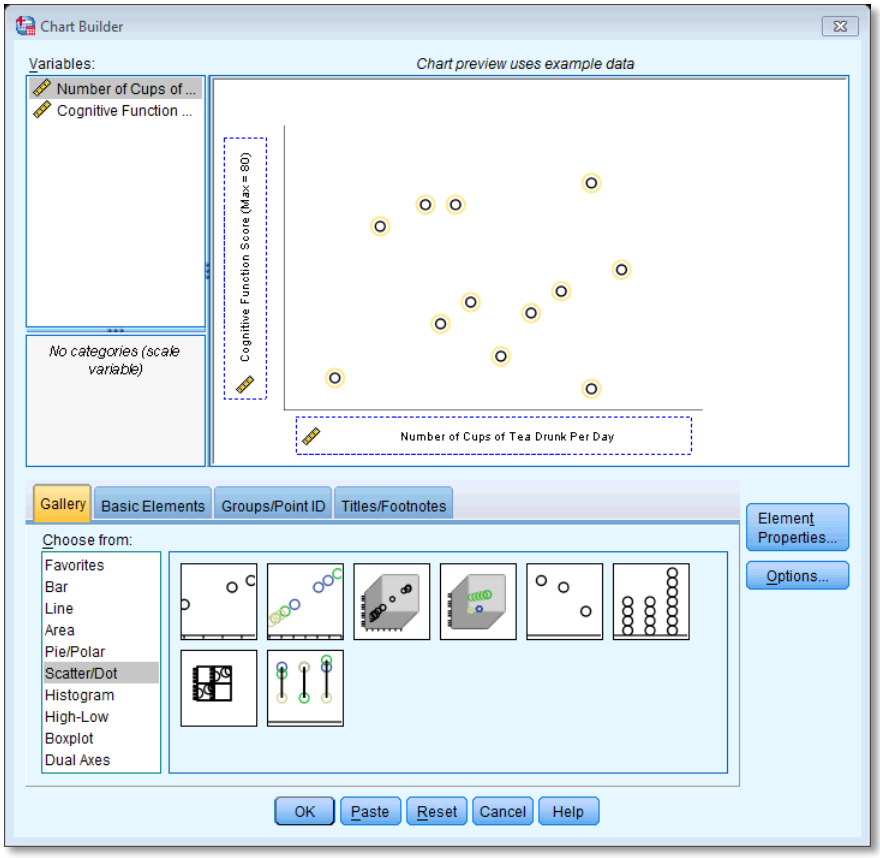


We can conclude that for men married to both goats and dogs, as love of animals increases so does life satisfaction (a positive relationship). However, this relationship is more pronounced for goats than for dogs (steeper regression line for goats than for dogs).

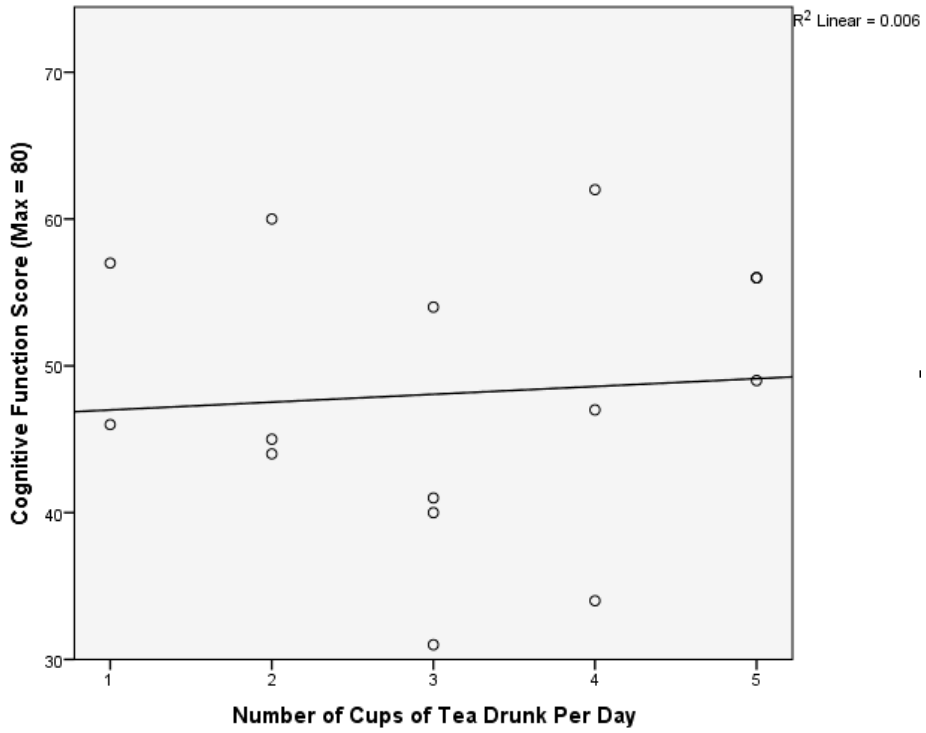
Task 12

*Using the **Tea Makes You Brainy 15.sav** data from Chapter 3, plot a scatterplot showing the number of cups of tea drunk (x-axis) against cognitive functioning (y-axis).*

In the Chart Builder double-click on the icon for a simple scatterplot. Select the cognitive functioning variable from the variable list and drag it into the *y*-axis drop zone (Y-Axis?). The horizontal axis should display the independent variable (the variable that predicts the outcome variable). In this case is it is the number of cups of tea drunk, so click on this variable in the variable list and drag it into the drop zone for the *x*-axis (X-Axis?). Click on OK to produce the graph.



Let's fit a regression line to make the graph easier to interpret. To do this, double-click on the graph in the SPSS Viewer to open it in the SPSS Chart Editor. Then click on  in the Chart Editor to open the properties dialog box. In this dialog box, ask for a linear model to be fitted to the data (this should be set by default). Click on Apply to fit the line. The resulting graph should look like this:



The scatterplot tells us that there is no relationship between the number of cups of tea drunk per day and cognitive function. This is indicated by the flat line.