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Introduction to SPSS – A Tutorial for SPSS v20

As with any software package, there are **multiple ways to perform any task**. In order to avoid confusion for the beginning user, in most cases only one method of performing a task is explained. This does not mean that this is the only way to perform the task; just that it is the easiest way to either explain or learn.

Accessing the SPSS Software

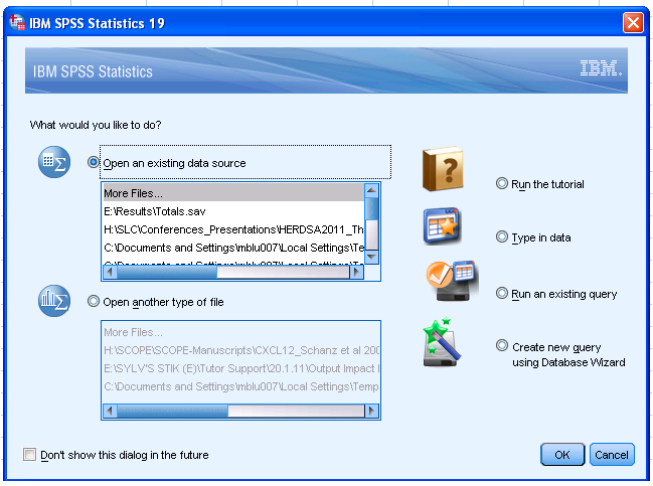
The University of Auckland has a site licence for SPSS Statistics. This means that you will be able to use the software anywhere on campus. If SPSS is not installed on your UoA office/laboratory computer, please contact your departmental IT support team to discuss access. University of Auckland staff and postgraduate students are eligible to install SPSS on one personal computer for work at home purposes. An installation DVD is available for purchase from the IC Helpdesk, Level 2, Kate Edger Information Commons, City Campus. A small cost will apply for the CD. Staff and postgrad students are required to produce their staff / student ID and sign the SPSS Use Terms form prior to receiving the media kit. Undergraduate students wishing to install SPSS on their home computer can purchase a licence for the IBM *SPSS Statistics Standard Grad Pack v20* at www.studentdiscounts.com.au. You must be a currently enrolled student (proof is required) and intend to use the product for educational purposes only. Installation on a network or in an academic lab is strictly prohibited by the license agreement. The student version expires after 13 months.

Getting Further Assistance

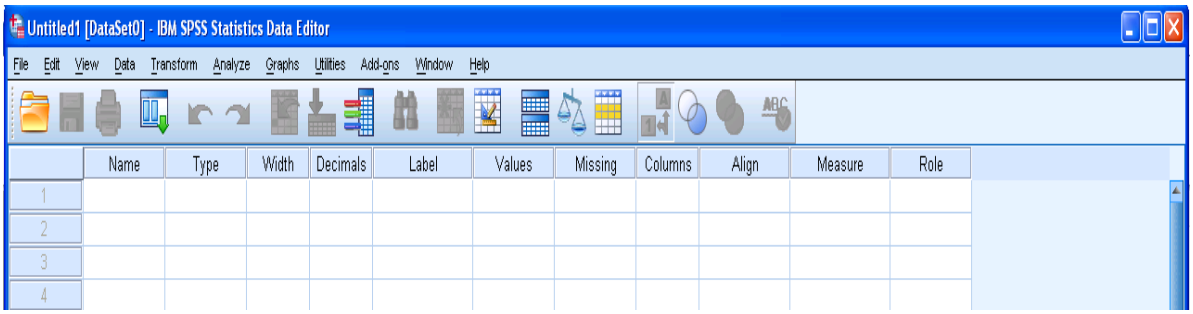
Postgraduate students who require further assistance with SPSS software in order to analyze own data sets, can contact the Student Learning Centre (SL) reception and ask for a one-to-one tutoring appointment with a respective tutor, however, our role is merely advisory. Please do not ask us to analyze your data for you, as refusal may offend.
For further information about basic facts and FAQs on SPSS go to: http://cad.auckland.ac.nz/index.php?p=data_analysis. This link also takes you to our examples and the survey data set we are using in this workshop.
For advanced courses using SPSS you may like to attend the workshops *SPSS Intermediate for Postgraduates I: Comparing Means* and/or *SPSS Intermediate for Postgraduates II:Correlations and Related Procedures* which cover statistical theory with hands on experience in relation to SPSS.
Finally, please keep in mind that it is your supervisor's responsibility to advise you on your statistical analysis approach.

Opening the SPSS Program

SPSS is likely to be located on the **Programs** menu from the **Start** button. When SPSS opens, the following dialog box appears:

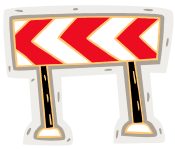


Once this occurs, click on the **Cancel** button. You should now be in the SPSS Statistics Data Editor - this will resemble a spreadsheet and is where you will enter, edit, and display, the contents of your data file.



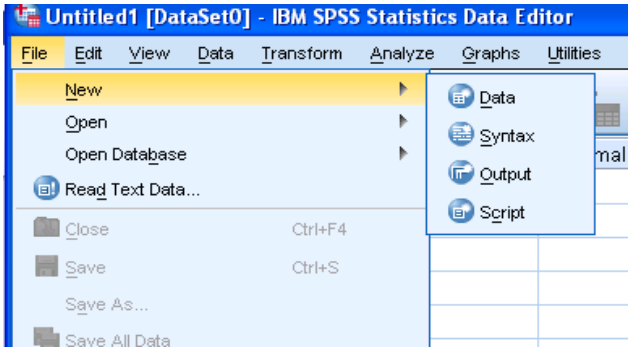
Opening a File in SPSS

The data that will be used for today's tutorial is based on a questionnaire. During the workshop all sample files are available from your local computer under SLC Share➔Student Files➔In Class Files ➔spss_tut_file.



If you like to practice further after completion of this workshop you may want to access a copy of this file or other examples from the SLC website at another time:
http://www.cad.auckland.ac.nz/content/files/slc/computer_spss_tut_file.sav

To open a new file, from the SPSS menu bar, select:



To open a blank file for entering a new data set from the menu bar select
File ➔ New➔Data
or click on the open file icon of the SPSS data editor menu bar:

What can we see in this data set?

Once the **'spss_tut_file'** file is open, we will see the following screen in the Variable View:

Variable View

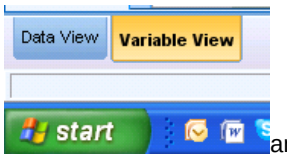
spss_tut_file.sav [DataSet1] - IBM SPSS Statistics Data Editor

File Edit View Data Transform Analyze Graphs Utilities Add-ons Window Help

	Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align	Measure	Role
1	id	String	8	0	Identification N...	None	None	8	Left	Nominal	Input
2	age	Numeric	8	2	Age	None	None	8	Right	Scale	Input
3	var00001	Numeric	8	2		None	None	8	Right	Scale	Input
4	var00002	Numeric	8	2		None	None	8	Right	Scale	Input
5	var00003	Numeric	8	2		None	None	8	Right	Scale	Input
6	ams1	Numeric	8	2	AMS Item 1	None	None	8	Right	Scale	Input
7	ams2	Numeric	8	2	AMS Item 2	None	None	8	Right	Scale	Input
8	ams3	Numeric	8	2	AMS Item 3	None	None	8	Right	Scale	Input
9	ams4	Numeric	8	2	AMS Item 4	None	None	8	Right	Scale	Input
10	ams5	Numeric	8	2	AMS Item 5	None	None	8	Right	Scale	Input
11	ams6	Numeric	8	2	AMS Item 6	None	None	8	Right	Scale	Input
12	ams7	Numeric	8	2	AMS Item 7	None	None	8	Right	Scale	Input
13	ams8	Numeric	8	2	AMS Item 8	None	None	8	Right	Scale	Input
14	ams9	Numeric	8	2	AMS Item 9	None	None	8	Right	Scale	Input
15	ams10	Numeric	8	2	AMS Item 10	None	None	8	Right	Scale	Input
16	ams11	Numeric	8	2	AMS Item 11	None	None	8	Right	Scale	Input
17	ams12	Numeric	8	2	AMS Item 12	None	None	8	Right	Scale	Input
18	sr1	Numeric	8	2	Social Resp Ite...	None	None	8	Right	Scale	Input
19	sr2	Numeric	8	2	Social Resp Ite...	None	None	8	Right	Scale	Input
20	sr3	Numeric	8	2	Social Resp Ite...	None	None	8	Right	Scale	Input
21	sr4	Numeric	8	2	Social Resp Ite...	None	None	8	Right	Scale	Input
22	sr5	Numeric	8	2	Social Resp Ite...	None	None	8	Right	Scale	Input
23	motnow2	Numeric	8	2	Post Motivation	None	None	8	Right	Scale	Input
24	whatnow	Numeric	8	2	Do what now?	{1.00, Study...	None	8	Right	Scale	Input

Variable and Data View

In SPSS there are two different 'views', the *Data View* and the *Variable View.*

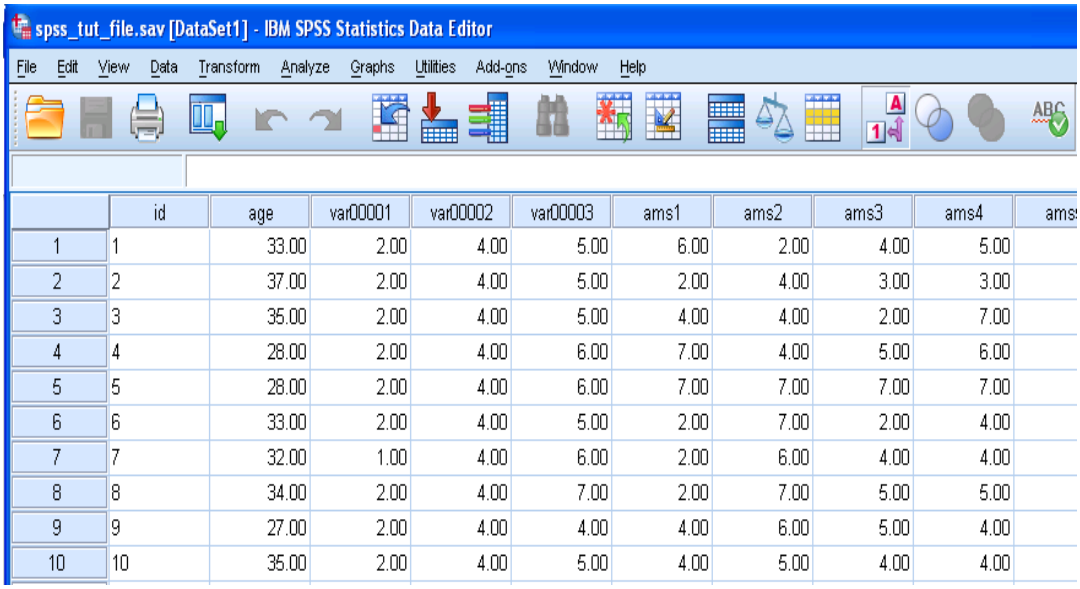


You can alternate between these two views by clicking on their tabs at the bottom left-hand side of your screen.

In the *Variable View* (above) each row corresponds to a variable in your data set. The variable is named in the first column of this view and following this, every column contains specific information about this variable such as the number of decimal places.

In the *Data View* (below) you will see a spreadsheet type set-up, with each row corresponding to a case and each column corresponding to a variable. Variables are named in the light blue box at the top of each column.

Data View

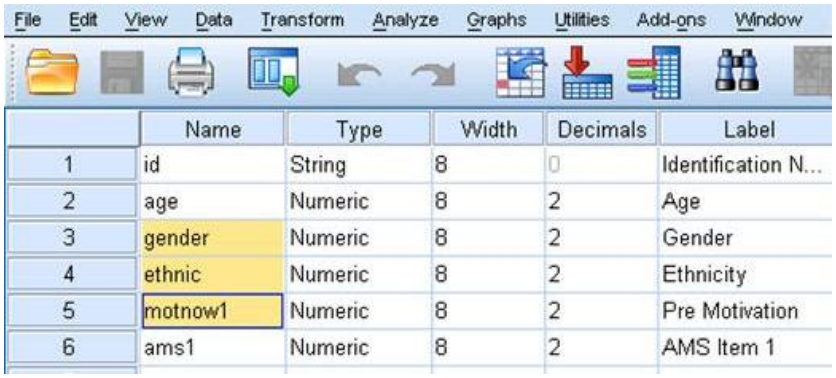


	id	age	var00001	var00002	var00003	ams1	ams2	ams3	ams4	ams
1	1	33.00	2.00	4.00	5.00	6.00	2.00	4.00	5.00	
2	2	37.00	2.00	4.00	5.00	2.00	4.00	3.00	3.00	
3	3	35.00	2.00	4.00	5.00	4.00	4.00	2.00	7.00	
4	4	28.00	2.00	4.00	6.00	7.00	4.00	5.00	6.00	
5	5	28.00	2.00	4.00	6.00	7.00	7.00	7.00	7.00	
6	6	33.00	2.00	4.00	5.00	2.00	7.00	2.00	4.00	
7	7	32.00	1.00	4.00	6.00	2.00	6.00	4.00	4.00	
8	8	34.00	2.00	4.00	7.00	2.00	7.00	5.00	5.00	
9	9	27.00	2.00	4.00	4.00	4.00	6.00	5.00	4.00	
10	10	35.00	2.00	4.00	5.00	4.00	5.00	4.00	4.00	

Entering Data

Adding Variable Names

When you enter data into a cell (whilst in the *Data View)*, you create a variable, which is given a default name, *var00001*. This will be displayed at the top of the column. It is important to replace these default variable names with something more meaningful for further analysis. To change the variable name, double click on the default variable name **var00001**, or alternatively, click on the *Variable View* tab and select the data cell by this name. Type over the current variable name –variable var00001 is now **'gender'**. Next, replace the other two default variable names in a similar manner: **var00002** stands for ethnicity, call this **'ethnic'** and **var00003** is **'motnow1'** (Pre Motivation)



	Name	Type	Width	Decimals	Label
1	id	String	8	0	Identification N...
2	age	Numeric	8	2	Age
3	gender	Numeric	8	2	Gender
4	ethnic	Numeric	8	2	Ethnicity
5	motnow1	Numeric	8	2	Pre Motivation
6	ams1	Numeric	8	2	AMS Item 1

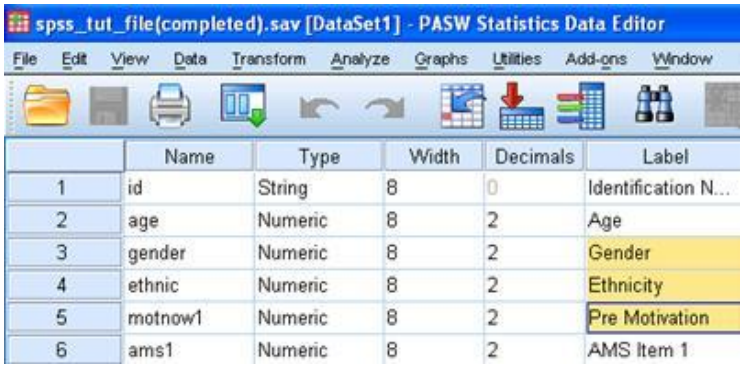
There are rules that govern what we can actually call a variable. These rules are outlined below:

- Each variable name must be unique; duplication is not allowed.
- Variable names can be up to 64 bytes long, and the first character must be a letter or one of the characters @, #, or $. Subsequent characters can be any combination of letters, numbers, non-punctuation characters, and a period (.). In code page mode, sixty-four bytes typically means 64 characters in single-byte languages (for example, English, French, German, Spanish, Italian, Hebrew, Russian, Greek, Arabic, and Thai) and 32 characters in double-byte languages (for example, Japanese, Chinese, and Korean).
- Reserved keywords cannot be used as variable names. Reserved keywords are ALL, AND, BY, EQ, GE, GT, LE, LT, NE, NOT, OR, TO, and WITH.
- The period, the underscore, and the characters $, #, and @ can be used within variable names. For example, A._$@#1 is a valid variable name.
- Variable names cannot contain spaces

Often variable names are truncated or abbreviated and *Variable Labels* are assigned which give a more detailed description of the variable or a more meaningful name.

Assigning Variable Labels

While still in the *Variable View*, click in the *Label* column in the row that matches the 'gender' variable. Gender is pretty self-explanatory so we don't really need to lengthen this but we may want to capitalise this, as we couldn't do so earlier. Type **Gender** in the selected cell, and then type **Ethnicity** in the 'ethnic' row.In the 'motnow1' row, we want to put something t more meaningful so type **Pre Motivation** in the cell matching the row and column for this variable. This corresponds to the participant's motivation before completing the questionnaire.



	Name	Type	Width	Decimals	Label
1	id	String	8	0	Identification N...
2	age	Numeric	8	2	Age
3	gender	Numeric	8	2	Gender
4	ethnic	Numeric	8	2	Ethnicity
5	motnow1	Numeric	8	2	Pre Motivation
6	ams1	Numeric	8	2	AMS Item 1

In Data View, if you hold your mouse over the short variable names in the blue boxes at the top of each column, the full variable name will appear.

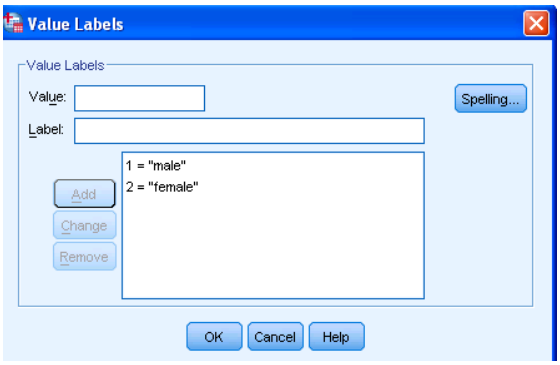
Assigning Value Labels

Our data with respect to gender and ethnicity are actually made up of numbers that correspond to 'groupings' or categorical data. For example, for the 'Gender' variable we have males and females in our study. In SPSS we assign 1=male and 2=female.

It is also possible to enter actual words i.e. 'string' variables into SPSS, but if we entered 'Male' and 'Female' in this way we would not be able to use them in statistical analyses. If you do wish to enter words as part of your data set however, in the Variable View, in the 'Type' column for your variable, click on the blue box (with the three dots) that appears, and change to 'String' then click 'OK' button.

Whilst still in the *Variable View,* click on the row for Gender and the column that is headed *Values.* Click on the blue box with the three dots and this will open the *Value Labels* dialog box.

Type **1** in the *Value* text box and **Male** in the *Value Label* text box. Click on **Add.**
Type **2** in the *Value* text box. Type **Female** in the *Value Label* text box. Click on **Add**.
Click on **OK.**



Now assign value labels for the **ethnicity** variable using a similar procedure. The value labels for this variable are as follows:

1=Pakeha
2=NZ Maori
3=Pacific Island
4=Asian
5=Other

In data view, display the value labels for **gender** and **ethnicity** by clicking on  to switch between numbers or labels in our data set. Any output will show the labels as opposed to the somewhat meaningless numbers.

Entering Data

Data are entered into SPSS in the *Data View* mode. For example start with the ID number of a single participant in the selected cell then move within that row to the next cell by pressing the right arrow key i.e. enter the data for age, gender, ethnicity etc in this manner. When you come to enter variables that we assigned 'value labels' for (eg gender,

ethnicity), you can choose the appropriate label from a drop-down list if you have SPSS set to show the labels  as opposed to the numbers.

Saving Your Data Files

Use the 'Save As' command from the file menu and then save the amended version of your spss_tut_file under an alternative name (eg 'motivation data) on the desktop.
Choose 'Save' from the file menu to save the most recent version of your file, and 'Save As' if you wish to save an alternative version. It is wise to save your data periodically in case your computer crashes. Always remember to keep back-up copies!

Other Points Regarding Data Entry

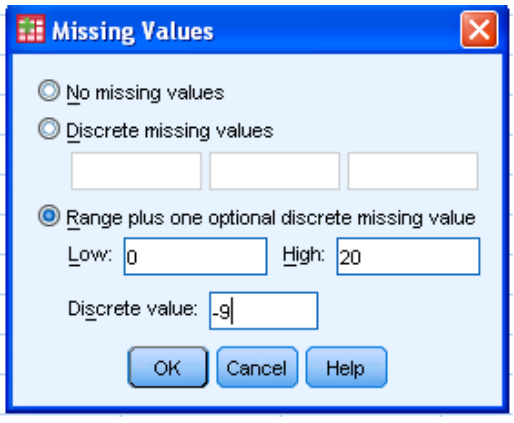
Missing Values

It is unlikely that you will receive a full set of data for all your cases. Inevitably, people accidentally miss questions, refuse to answer them, or generally don't read instructions. This means not every cell in every row and every column has something in them. It is possible to just leave these cells empty; SPSS treats these missing values as **system-missing.** SPSS will exclude **system-missing** values from its calculations of means, standard deviations and other statistics.

However, you can also assign missing value codes if you wish to know why a value is missing. For example, suppose in an exam, some students either walked out as soon as they saw the paper or, having at least attempted to answer some questions but have earned only a very low mark (say 20% or less). You might wish to treat these occurrences (**user-missing values**) in the following way so that you have an idea about the relative frequencies in your data output later on (**missing value analysis**):

1. Any marks between 0-20
2. Cases who did not attempt to answer any exam questions (walk-out)

To assign missing value codes, whilst in *Variable View* select the appropriate 'Missing' cell for the row matching the appropriate variable. Once the appropriate cell is selected, click on the small grey box with the three dots (...) that appears. This will bring up a dialog box that allows you to assign missing values.



A walk-out could be coded as an arbitrary number such as '-9'; the negative sign helps to stand out as an impossible real value. For a Likert Type Scale from 1-7 one could use a '9' for a missing value. However if you are expecting data between 5 to 65 for the age of a participant in your study, '9' would not be suitable as a user-missing value and a '99' or

'999' is more appropriate as it is outside any naturally occurring value specific to your data set.
Select the appropriate option by clicking on its radio button (see above) and enter the missing value(s) you have decided on (note that you don't need to enter in more than one). Click on **OK** to return to the *Variable View*. All empty cells with respect to exam mark will now be replaced with a '-9' in your data set.

Other Properties of Variables

In the 'Variable View' we can also set a number of other 'properties' such as the number of decimal places shown, the variable type, and measurement level (data type i.e. nominal, ordinal or scalar).

Inserting and Deleting Variables and Cases

To insert a new case between existing cases in "Data View" select a cell in the case (row) below where you wish the new case to appear, and choose: Edit→Insert Case

To insert a new variable between existing variables select a cell in the variable (column) to the right of where you wish the new variable to appear, choose Edit→Insert Variable

To delete a case or variable in *Data View* select the case number on the far left side of the row(s) or the variable name at the top of the column(s) you wish to delete, and from the menu bar choose: Edit→Clear

Creating a New SPSS File

In the following drug experiment example where we look at performance (score) and under three different treatments (group) we are creating a new SPSS file using the data presented in the table below. From the menu bar in the Data Editor choose:
File→New (data)

In *Variable View* define your variables first, then in *Data View* enter your values row by row accordingly using the data set below.

- Ensure that you name and label your variables appropriately.
- Assign value labels for 'Gender' (1=male and 2=female) and 'Group'(1=Placebo, 2=Drug A, 3=Drug B).
- For unknown 'Score', assign '99' as a missing value.

Case#	Name	Age	Gender	Group	Score
1	Smith	38	Male	Placebo	9.51
2	Taylor	28	Female	Placebo	6.45
3	Myers	25	Female	Drug A	8.88
4	Bungle	37	Male	Drug B	5.92

- Insert a new participant with the name of 'Baldwin' between case 3 and 4 using the following details: Case# 5, 30 year old female treated with Drug B resulting in a score of 5.87. Save your data file as 'Drug Experiment' on the desk top.

Finding and Correcting Errors in Data Entry

Mistakes occurring during data entry can have detrimental effects on your analysis (outliers for example). A good way to find mistakes in your data is to run descriptive statistics over them. For example, if your age groups are only meant to range from 15 to

25 and you have values below and higher than this, then you know you have made mistakes that need to be fixed! Make sure you hunt out these errors before running any final analyses. To correct a mistake, simply select the cell in which there is an error, and type over it.

Data in Non-SPSS Formats

Excel, SAS and other file formats can be opened in SPSS directly (you may need to change the 'Files of Type' box to 'All Files' before you can see your file to open it). If your file is in another spreadsheet type package which is not supported by SPSS then you may first need to save your file in 'Tab Delimited' format before attempting to open it in SPSS. Upon opening, an import wizard guide you through the steps needed to open your tab-delimited file. Note that when your file is opened in SPSS, any variable names that do not conform to the naming rules will be altered. Also keep in mind that you can copy and paste your data, but your variable names will not transfer across with your data if you do so. Often some recoding needs to be done and value labels have to added in SPSS.

Working with Data

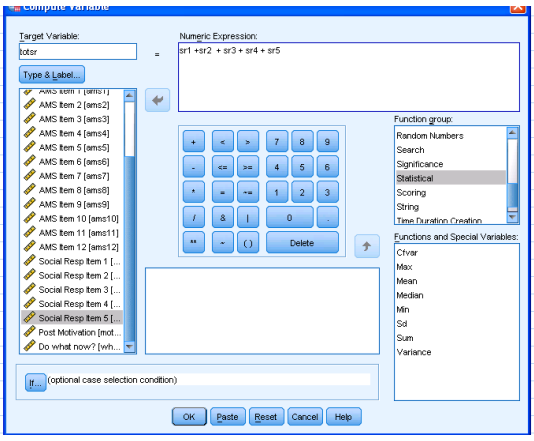
Compute a new variable using the calculator pad

SPSS has a 'Compute' function that allows us to calculate new variables very quickly. In the data set we are presently using, we wish to add the individual items for Social Responsibility together to give us a 'Total Social Responsibility' score. From the menu bar choose: Transform→Compute

The *Compute Variable* box will appear. Enter the target variable name. For the purposes of this tutorial this name will be **totsr**.

Next click the **Type & Label** box underneath this name and enter the label **Total Social Responsibility** followed by **Continue**.

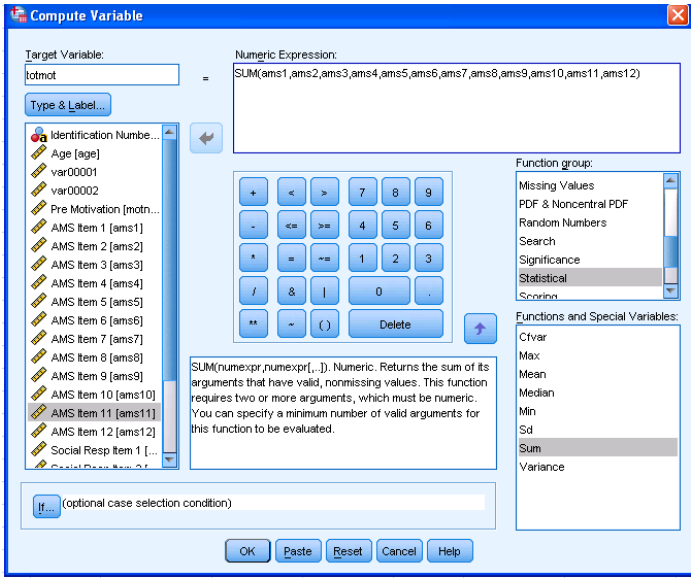
From the variable list (the box on the far left of the *Compute Variable* box) select the variable **'sr1'** or **'Social Resp Item 1'**. Now add this variable into your numerical expression by clicking on the small arrow to the right of the variable list. Next, click on '**+**' on the calculator pad. This sign should also have appeared in your *Numeric Expression* box. Keep adding the social responsibility items separated by the '**+**' sign until all five are added in this manner. Your dialog box should look as follows:



Compute a new variable using a function

To add up the motivation items into a **'Total Motivation Score'**, we will use the SUM function. From the menu bar select: **Transform→Compute**

The *Compute Variable* box will appear. Enter the target variable name **totmot**. To add a label for this variable, click on the **Type & Label** button.
Enter the numerical expression for this target variable. From the list of functions in the pane on the right hand side, select **Sum** from the **statistical function group**. Using the upwards pointing arrow add **Sum** into your *Numeric Expression* box.
Replace the question marks by moving all twelve motivation items (**ams1** to **ams12**) into the brackets. Each item needs to be separated by a comma. Use the arrow pointing towards the right to add the motivation items into the numeric expression box. Alternatively, double click on the variable while the cursor is located in the bracket.



Click on **OK** and your target variable will appear in your data set (located at far right).

Recoding Variables

It is also possible for us to recode variables. We are going to recode our age data into three groups for the purposes of a later analysis. The ages in this data set range from 21 years upwards (these students were postgraduates, hence the slightly older age bracket). We want to split these ages into the following groups:

21 years	to	28 years
29 years	to	35 years
36 years	onwards	

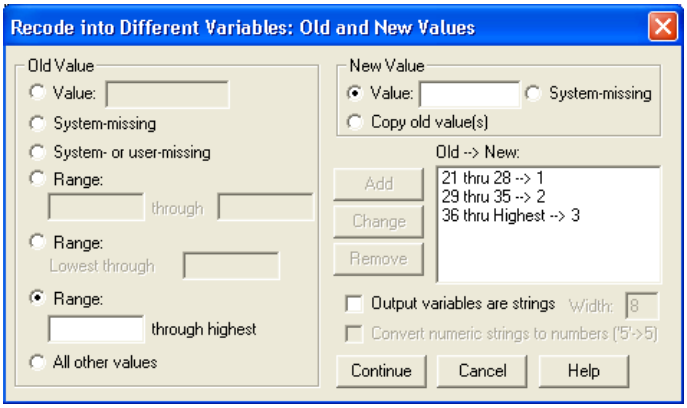
From the menu bar, select: **Transform→Recode→Into Different Variables**

Select the **age** variable and add it into the *Input Variable -> Output Variable box*. Next, in the *Output Variable* Name box type **agegrp** and for the label type **Age Group**. Now click on the **Change** button.

Next, click on the **Old and New Values** button and in the *Old Value box* select the first *Range* option and type the range **21** through **28.** In the *New Value* box type **1** followed by the **Add** button.

Next type the range **29** through **35** in the *Old Value box* and the number **2** in the *New Value box* once again followed by the **Add** button.

Finally, select the third *Range* option and enter **36** in the *Old Value box* and the number **3** in the *New Value box* once again followed by the **Add** button (this will recode ages 36 through to the highest score in our data set). Follow this with clicking the **Continue** button and then **OK**.



A new column for 'agegrp' has been added at the end of your spreadsheet.

Sorting Cases

The sort cases function allows you to organise your data in your data editor by particular groups of cases. For example, you may have already noted that our present file is actually sorted in order of ethnicity. Let's resort this data by gender. To do so, from the menu bar choose: Data→Sort Cases

In the dialog box that appears, select the **'Gender'** variable and add it across into the list by clicking on the right-pointing arrow. Click on **OK.** Our data set is now ordered according to our subject's gender.

It is possible to sort by more than one variable. Simply add the variables you wish to sort by into the 'Sort by' list and SPSS will sort them according to the order in which they are entered.

Transposing Cases and Variables

There may be occasions where you wish to transpose your cases (rows) into variables (columns) and vice-versa. This most commonly occurs when you obtain your data from a source which does not have the data entered in SPSS format. To transpose your data, from the menu bar choose: Data→Transpose
Choose the variable(s) you wish to transpose and add them into the list for 'Variable(s)' then click **OK**.

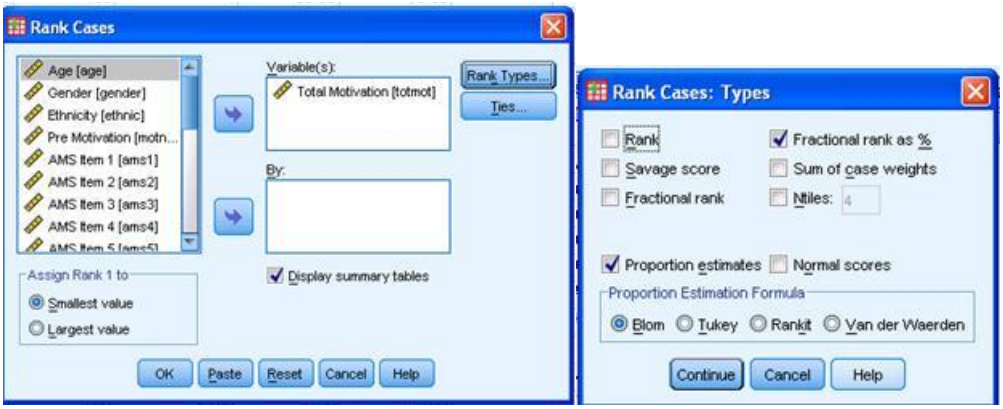
Note that any variables you do not choose to transpose will be lost (SPSS will provide you with a warning about this).

Ranking Data

The Rank Cases dialog box allows you to create new variables containing ranks, normal and Savage scores, and percentile values for numeric variables. You can rank only numeric variables. Optionally, you can rank cases in ascending or descending order and organize ranks into subgroups.
For example, we would like to know the Ntiles of each of our subjects on the 'Total Motivation' score we computed earlier. To do this, from the menu bar, choose:

Transform→Rank Cases

Add the variable **'Total Motivation'** into the Variable(s) list, click on **Rank Type** and Click on **Fractional rank as %** and tick **Proportion estimates** and/or **Normal Scores**

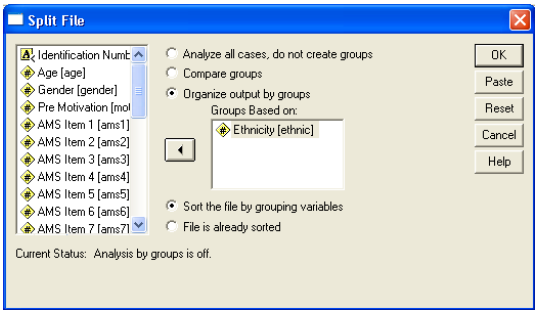


SPSS will now calculate a new variable called **PER001** (Fractional Rank Percent of **totmot**) which ranks each subject by percentiles by their total motivation variable.

Splitting Files

Splitting files is a useful way for organising your data so that your output is arranged by two or more groups, based on one of your variables. For example, we may want to conduct statistical analyses separately for each ethnicity group in our data set. To split our file, from the menu bar choose: **Data→Split File**

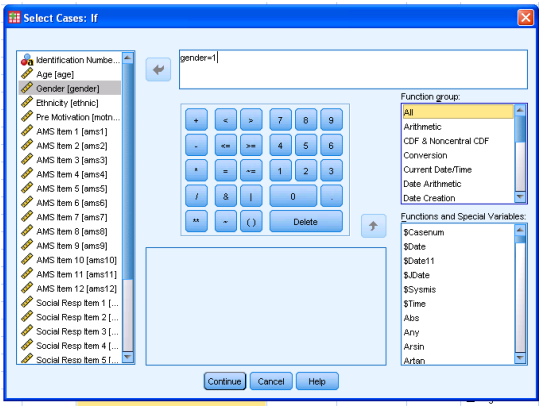
Choose the option 'Organise output by groups' and add the **'Ethnicity'** variable into the 'Groups based on' list. Click on **OK**.
Now, all analyses performed from this point onwards will have their output organised by our ethnic groups. To turn your spilt file procedure off, repeat the above steps but choose 'Analyse all cases, do not create groups'.



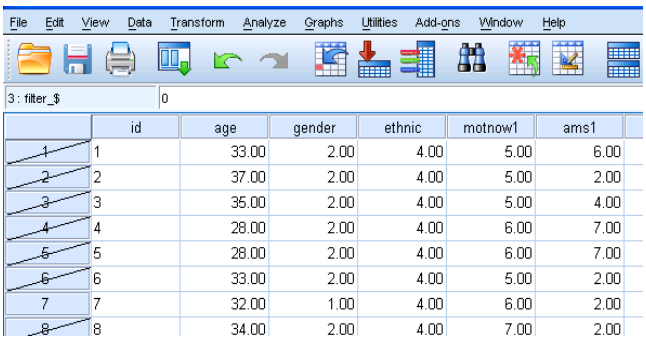
Selecting Cases

A similar procedure to splitting your file is that of selecting cases. It is possible to ask SPSS to only perform analyses on a certain subset of your data, for example, only the males or only students who scored above a certain point on your questionnaire.
To select a subset of cases, from the menu bar choose: **Data→Select Cases**

In the dialog box that appears, select *If condition is satisfied* and click on the *If* button that appears underneath. Add the **'Gender'** variable across using the right-pointing arrow. Press the '=' button on the calculator pad and then type the number **1**. Only male subjects in our sample are now selected.



Select Continue followed by **OK**. In the Data Editor your data will now show 'slashed lines' through any subject that was not male. Any output that is created will be based only on those selected subjects (in this case, males). To select all your cases once again, repeat the above steps, this time choosing the 'All Cases' option.



	id	age	gender	ethnic	motnow1	ams1
1	1	33.00	2.00	4.00	5.00	6.00
2	2	37.00	2.00	4.00	5.00	2.00
3	3	35.00	2.00	4.00	5.00	4.00
4	4	28.00	2.00	4.00	6.00	7.00
5	5	28.00	2.00	4.00	6.00	7.00
6	6	33.00	2.00	4.00	5.00	2.00
7	7	32.00	1.00	4.00	6.00	2.00
8	8	34.00	2.00	4.00	7.00	2.00

Merging Files

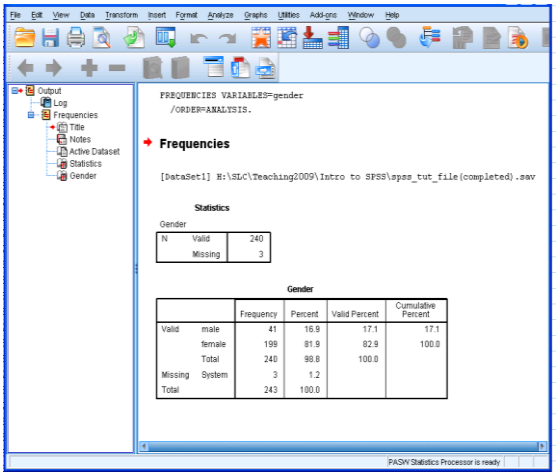
There are two instances where you may wish to merge files. Firstly, you may have two different sets of data which have the same variables but different cases – for instance, two researchers may have collected the same set of data for two different populations and then wish to combine them. Secondly, you may have collected data from the same set of subjects (cases) but have two different sets of variables for these.
To merge files, ensure that your files are saved in SPSS format and that they are sorted in order by the key field (eg. ID number). Open up your base file, select: **Data→Merge Files**

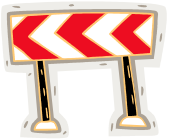
Followed by the type of merge you require. Select the file you wish to be merged and then follow the on screen instructions.

Calculating Simple Statistics

Frequencies

Say we wanted to know how many students in our sample were of each gender. To calculate this we use the *Frequency* procedure. From the menu, choose:
Analyze→Descriptive Statistics→Frequencies
This will open the *Frequencies* box. Select **'Gender'** as a variable and click on the small arrow to the right of the variable list. The variable **'Gender'** should now have moved into the box headed *Variable(s)*. Click on **OK**.
The SPSS output viewer will appear displaying all the data from your stats procedures.





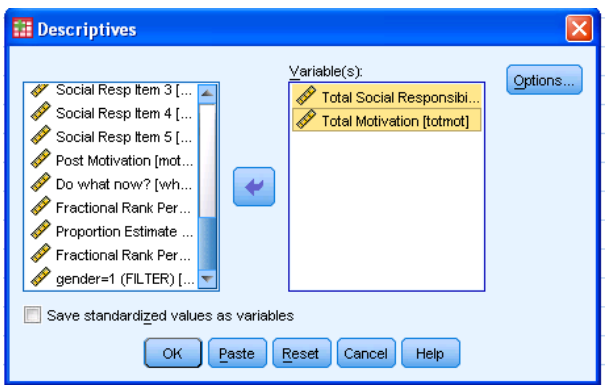
Information contained in your Output Viewer needs to be SAVED SEPARATELY from your data files. These files are of a different type and are given the file extension '.spv' as opposed to the '*.sav' extension of data files. Make sure that you save all output you create (that you'll need later), giving each file a sensible name so that you know what is contained in it.*

Descriptives

The *Descriptive Statistics* menu enables us to display for example the mean scores for **Total Motivation** and **Total Social Responsibility** (including standard deviations) without having to perform any statistical test.

From the menu bar, select: **Analyze→Descriptive Statistics→Descriptives**

From the dialog box that appears select the variables **'Total Motivation'** and **'Total Social Responsibility'** and add them to the Variable(s) box on the right.

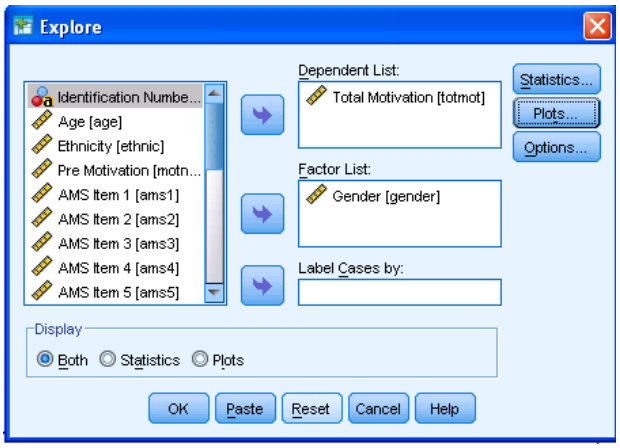


Under **Options**, have a look at a variety of descriptive statistics (e.g. mean, median, SD) options to choose from. Select whichever statistics you require and then click **Continue** followed by **OK**. The Viewer will now display the appropriate output for this function.

Explore your data

The Explore procedure produces summary statistics and graphical displays, either for all of your cases or separately for groups of cases. This procedure is used for data screening, outlier identification, description, assumption checking, and characterizing differences among subpopulations (groups of cases). Data screening may show that you have unusual values, extreme values, gaps in the data, or other peculiarities. Exploring the data can help to determine whether the statistical techniques that you are considering for data analysis are appropriate. The exploration may indicate that you need to transform the data if the technique requires a normal distribution. Or you may decide that you need nonparametric tests.

We use the *Explore* procedure to look at the distribution of for example Total Motivation scores **(totmot)** between males and females. From the menu bar choose:
Analyze→Descriptive Statistics→Explore
This will open the *Explore* box. Select the variable **'totmot'**, and enter it into the *Dependent List* box by clicking on the arrow to the left of the *Dependent List* box.
Select the variable **'Gender'** and enter it into the *Factor List* box by clicking on the arrow to the left of the *Factor List* box. For **Display** tick 'both'



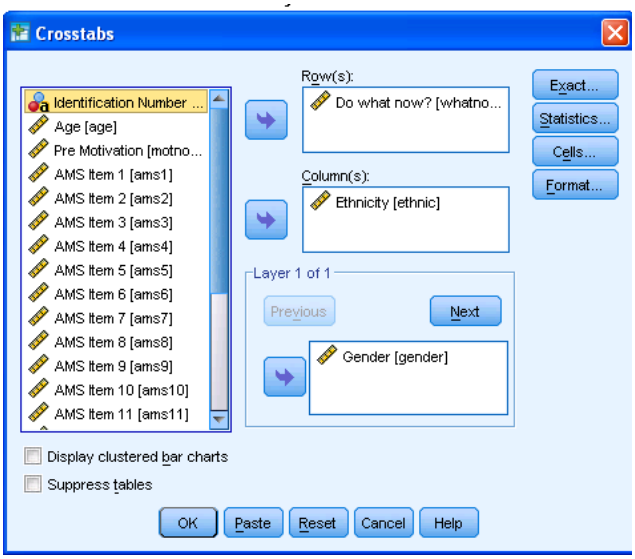
Click on **Statistics** and tick 'Descriptives' (95% confidence interval), **continue**. Click on **Plots** and choose 'Box Plots' (Factor levels together), 'Descriptive' (stem and leaf plots; histogram), tick 'Normality plots with tests (none)', then click on **continue** then **OK** to run the Explore procedure. The SPSS Viewer will display the appropriate output on

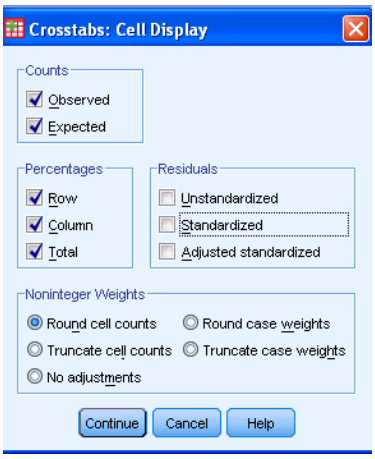
- Descriptive statistics (take note of skewness and kurtosis to assess a possible deviation from normal distribution)
- Tests of Normality (Kolmorogov-Smirnov test)
- Test of homogeneity of variance (Levene's test)
- Plots for exploring the distribution of your data for any deviation from normality (histograms, box-and-whisker plots, Q-Q plots,

Crosstabulation

Crosstabs are commonly used to summarize categorical variables weighted on for example frequencies. For example, using the present data, we might want to summarize the number of cases for the activities in the variable **whatnow** by gender and ethnicity. To run this procedure, from the menu bar choose: **Analyze→Descriptives→Crosstabs**

Place the variable **Do what now?** into the *Row(s)* option and **'Ethnicity'** into the *Column(s)* option while **Gender** is entered as layer 1 of1 as shown below





Click on 'Cells' and tick the following options as shown to the right, then click on **OK.**

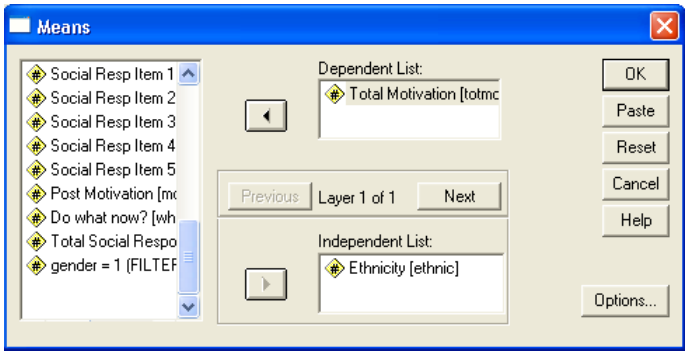
A Chi-square test can also be run as part of to the Crosstabs procedure in order to examine whether there are any significant relationships between categorical variables .However, the assumption of a chi-square which is that all expected frequencies should be greater than 5 in a 2x2 contingency table has to be met.

Comparing Means

To compare the means of different ethnic groups on the Total Motivation measure (without computing any statistical tests such as ANOVAs - we will be doing this later) we can use the *Compare Means* procedure. From the menu choose:

Analyze→Compare Means→Means

The *Means* box should now be open. Select the variable **'Total Motivation'** from the variable list and enter it into the *Dependent List* box by clicking on the arrow to the left of the *Dependent List* box. Select the variable **'Ethnicity'** from the variable list and enter it into the *Independent List* box by clicking on the arrow to the left.



Click on **OK** to run this procedure.

If you ever 'change your mind' about which variables you wish to analyse after adding them into the analysis list, click the 'Reset' option and all the lists will empty.

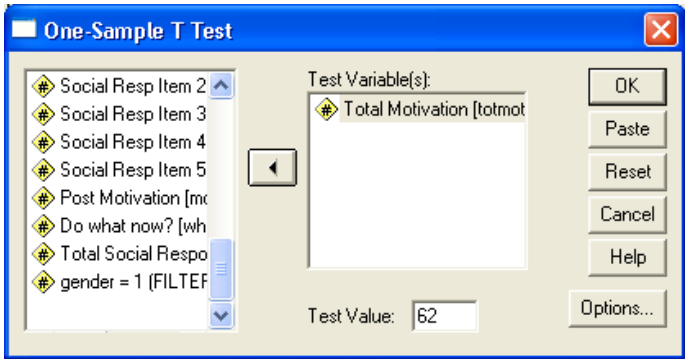
Statistical Procedures

The following section provides examples of how to test for differences in means using t-tests and one-way ANOVA. We will not be covering the theory of these tests in this workshop.

One Sample T-Test

We want to compare a **Total Motivation** score from a previous study (the average there was **62**) with the total motivation scores of the whole group that was questioned in our recent study. This can be done by using the one-sample t-test. Select:
Analyze→Compare Means→One Sample T-Test
From the dialogue box that appears, select **'Total Motivation'** and add it across into the *Test Variable(s)* box by clicking on the right-pointing arrow.

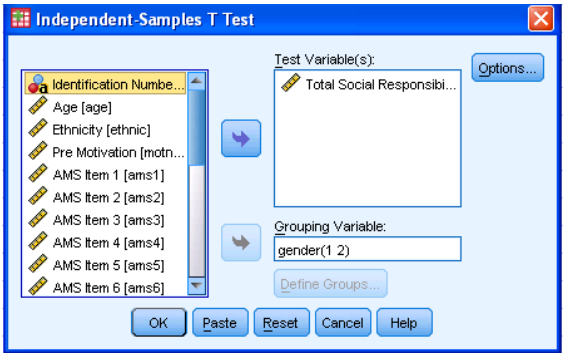
Enter **62** being the average score from a previous study into the box for *Test Value*.



Click on **OK** to run this procedure.

Independent Groups T-Test

We have a suspicion that the Total Motivation score **[totmot]** of the males in our sample are quite different from that of the females and decide to test for this. From the menu bar, select: **Analyze→Compare Means→Independent-Samples T-Test**
From the dialogue box that appears, select **totmot** and add it across into the *Test Variable(s)* box by clicking on the right-pointing arrow. Then select **'Gender'** and add it into the *Grouping Variable* box, once again by using the right-pointing arrow. The symbols (? ?) will now appear after the gender variable (see screen picture below) as it will be necessary to specify what values define your groups. To do this, click on the **Define Groups** button. As we defined our groups as 1=male and 2=female, we will enter the value *1* in the box for Group 1 and *2* in the box for Group 2. Follow this by clicking **Continue** and then **OK**.

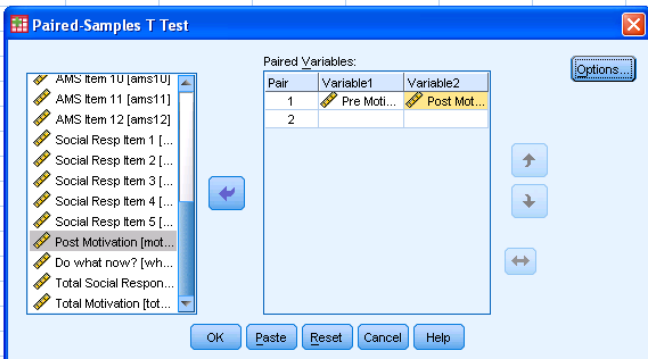


Paired Samples T-Test

Part of the questionnaire tested whether or not filling out a motivational survey affects motivation levels by asking about students' motivation both at the beginning and the end of the questionnaire. We want to determine if this was the case by performing a paired-samples t-test. From the menu bar, select:

Analyze→Compare Means→Paired-Samples T-Test

From the dialogue box that appears, select **'Pre Motivation'** and **'Post Motivation'** and add them both across into the *Paired Variables* box by clicking on the right-pointing arrow. Then select **OK**.



If you want to make more than one comparison just enter the other pairs to be analysed under Pair 2, 3, 4 etc

The t-test is an example of a parametric test: that is, it is assumed that your data are normally distributed populations with the same variance. The non-parametric equivalents do not make this assumption, for example the Wilcoxon test (paired samples) or Mann Whitney test (independent samples).

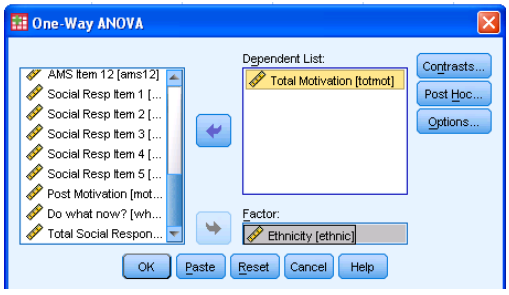
Analysis of Variance (one-way ANOVA)

The One-Way ANOVA procedure produces a one-way analysis of variance for a quantitative dependent variable (Dependent List) by a single independent variable (Factor). Analysis of variance is used to test the hypothesis that several means are equal. This technique is an extension of the two-sample t test.

In addition to determining that differences exist among the means, you may want to know which means differ. There are two types of tests for comparing means: a priori contrasts and post hoc tests. Contrasts are tests that are set up before running the experiment and post hoc tests are run after the experiment has been conducted. Here we will focus on post hoc tests.

We had four different ethnic groups in our sample and we wish to test whether or not there is a difference in **Total Motivation** levels between these four groups.

From the menu bar select: **Analyse→Compare Means→One-Way ANOVA**

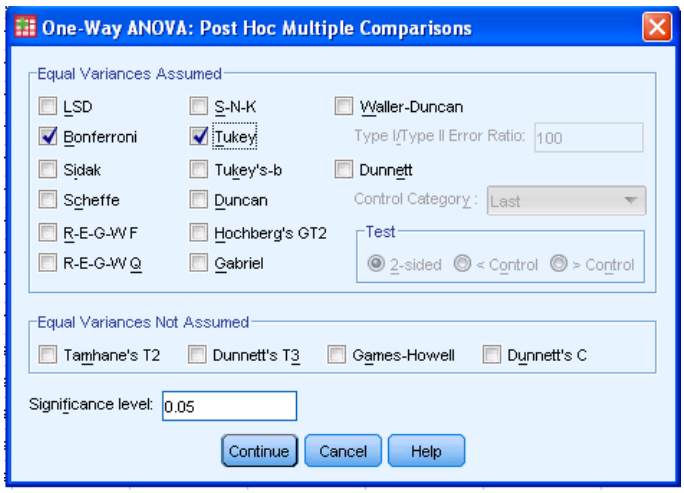


Select **'Ethnicity'** and add this into the *Factor* box, add the **'Total Motivation**' variable into the *Dependent List* box.

Click on the **OK** button.

Post Hoc Tests

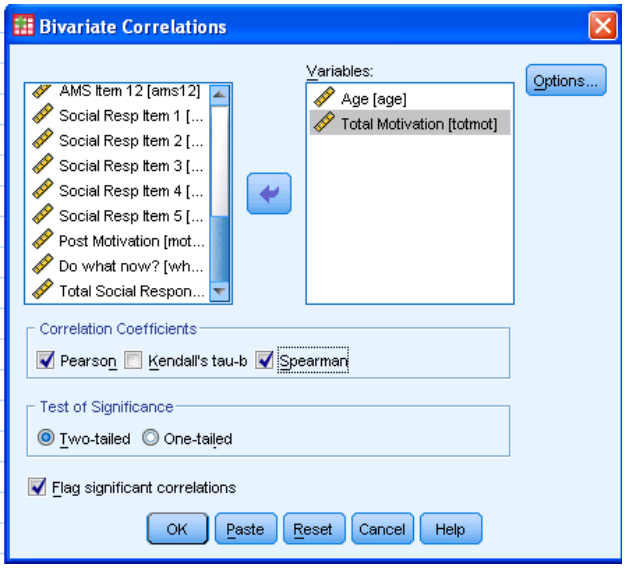
If the ANOVA is significant ($p<0.05$) we should find at least one significant difference within the multiple comparisons. We therefore have to apply a PostHoc test to find out where the difference lies. *Bonferroni* correction (conservative), *Tukey* tests for pairwise comparisons, or the *Dunnett* test for comparisons against a baseline control group (e.g. placebo group versus several drug treated groups) are commonly used.
To calculate post hoc test for our ANOVA, repeat the above procedure but click on the **Post Hoc** button. For the present tutorial, choose the *Bonferroni* and *Tukey* options.



Click on **Continue**, then on **OK**.

Correlations

Correlations are used to test whether there is a relationship between one variable and another. Beware, correlations cannot explain causality! From our survey data we may wish to check how well **age** correlates with **total motivation**. In order to do this, from the menu bar, select: **Analyze→Correlate→Bivariate**



Next, select the variables of **'Age'** and **'Total Motivation'** and add these into the *Variable(s)* box as shown below:

Click on **OK**.

SPSS will produce a table of correlations for you in the Output Viewer:

Correlations

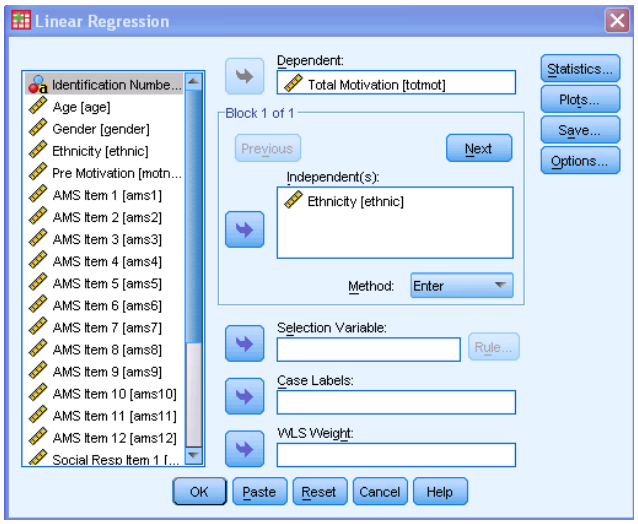
		Age	Total Motivation
Age	Pearson Correlation	1	-.038
	Sig. (2-tailed)		.552
	N	243	243
Total Motivation	Pearson Correlation	-.038	1
	Sig. (2-tailed)	.552	
	N	243	243

From the **Pearson Correlation** we can see that motivation does not correlate with age (not significant at 0.552 small coefficient at -0.038).
The **Spearman Rank Correlation** is used for not normally distributed data and nominal or ordinal data sets.

Linear Regression

We will use *Linear Regression* to see if we can use a person's **ethnicity** to predict how motivated they are. From the menu bar select: **Analyze→Regression→Linear**

The *Linear Regression* dialogue box will appear.
Move **'Total Motivation'** into the *Dependent* box and **'Ethnicity'** into the *Independent(s)* box (see below):



Click on **OK**. The result is in the output viewer as shown below:

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.212[a]	.045	.041	10.38117

a. Predictors: (Constant), Ethnicity

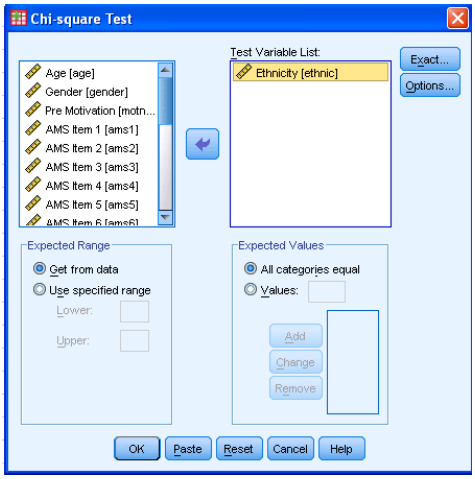
Only 4.5 % of the motivation can be predicted by ethnicity alone (R square of 0.045) which means other factors play a much bigger role than ethnicity. Try the same regression analysis with **age** as a predictor leaving Total Motivation **[totmot]** as a dependent variable.

Chi-Square Test for Goodness of Fit

This test designed for for nominal data can be used to test the null hypothesis that our sample population represents all ethnic groups at equal numbers. In other words, we want to find out if some ethnic groups have significantly more representatives in our sample than others. From the menu bar, select:

Analyze→Nonparametric Tests→Legacy Dialogues→Chi-Square...

From the dialogue box that appears, select **'Ethnicity'** and add it across to the *Test Variable List* box by clicking on the right-pointing arrow. We are presuming that in our study all categories (ie ethnic groups) should be equal in numbers.



Click on **OK**.

The output tell us that the Chi-square test is significant ($p<0.05$) which means that our observed frequencies deviate from the expected numbers as can be seen in the table below.

Ethnicity

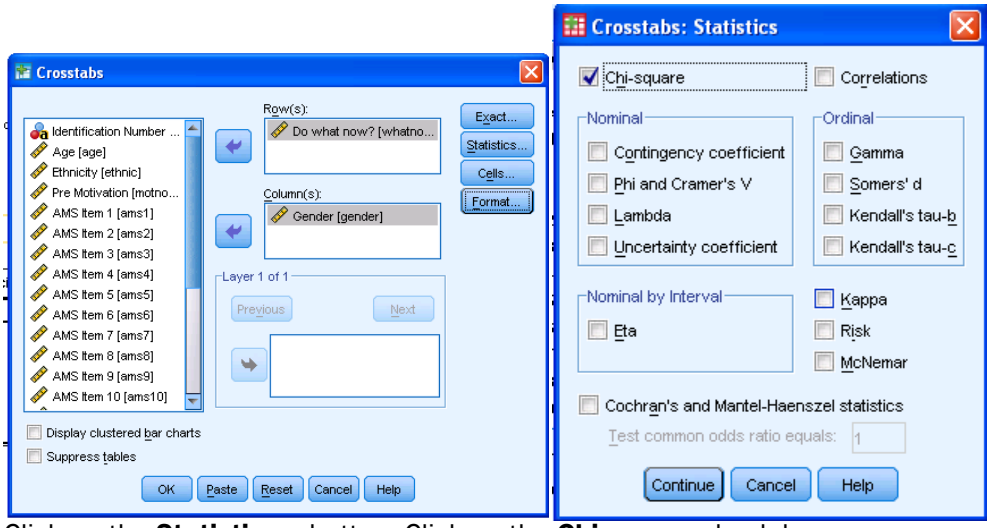
	Observed N	Expected N	Residual
Pakeha	150	60.8	89.3
NZ Maori	28	60.8	-32.8
Pacific Islands	32	60.8	-28.8
Asian	33	60.8	-27.8
Total	243		

Chi-square Test for Relatedness or Independence

We wish to determine if what respondents most felt like doing immediately after completing the questionnaire is related to their gender.From the menu bar, select:

Analyze→Descriptive Statistics→Crosstabs...

From the dialogue box that appears, select **'Do What Now?'** and add it across to the *Row(s)* box by clicking on the right-pointing arrow. Select **'Gender'** and add it across to the *Column(s)* box.

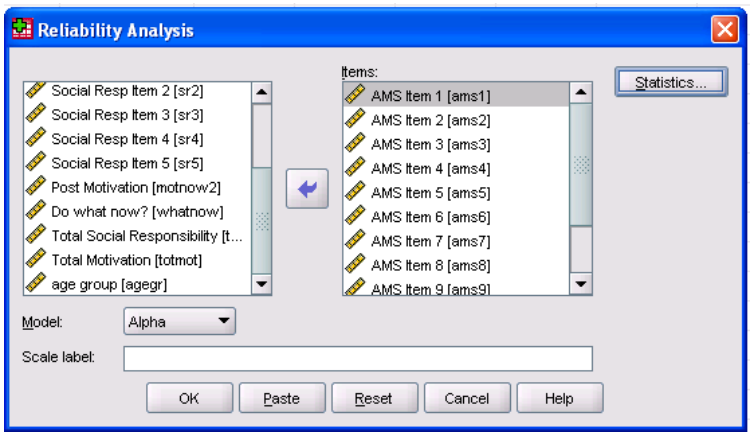


Click on the **Statistics...** button. Click on the **Chi-square** check box.
Click on **Continue**.
Click on the **Cells...** button. In the *Counts* box, click on the *Observed* and *Expected* check boxes. In the *Percentages* box, click on the *Row*, *Column* and *Total* check boxes.
Click on **Continue** and then on **OK**.

All expected frequencies in a contingency table should be greater than 5 in order to meet the assumptions of a Chi-square test otherwise the Chi-square statistics is not valid. If you found an expected count lower than 5 than it is wise to collect more data to try and boost the proportion of cases falling into each category.

Reliability Analysis

In order to test whether questions that were asked in for example a survey are reliable i.e. give consistent results if tested on different occasions by different testers or, as in our case when attempting to generate a scale score by adding together the scores of a number of variables, it is important to ensure that the questions are all measuring the same thing. In the case of our example, the scale score is *motivation*. If some of the questions are measuring something other than motivation, it does not make sense to include them in this scale score. From the menu bar, select
Analyze→Scale→Reliability Analysis
The *Reliability Analysis* dialogue box will appear.Select all the **AMS items (1-12)** in the box on the left and move them across to the *Items* box on the right.



Click on the *Statistics* button
Ensure that *Item*, *Scale*, and *Scale if item deleted* are ticked.
Click **Continue**.
Click **OK**.
The following window will appear in the output_SPSS Viewer:

Reliability Statistics

Cronbach's Alpha	N of Items
.763	12

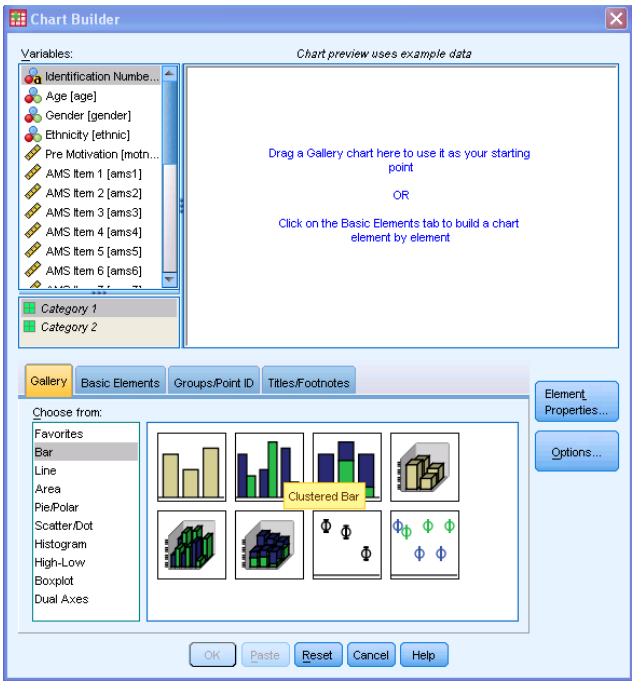
Cronbach's alpha is a model of internal consistency, based on the average inter-item correlation. An acceptable value should be close to 0.8 (or above).

Creating Graphs

There are different ways of creating graphs in SPSS. There is a selection of different graphs under the 'Graphs'menu but graphs are options in analytical procedures as well for example there is a **Charts** option in the **Frequencies** procedure and a **Profile Plot** option in the ANOVA procedure. This tutorial focuses on producing graphs using **Chart Builder** or **Legacy Dialogs,** which can be found on the SPSS menu bar under **Graphs.**

Creating a Bar Chart Summarizing Groups of Cases

From the menu choose : **Graphs→Chart Builder (or Legacy Dialogs)**
The *Chart Builder* box should now be open. It is important to set the measurement level (nominal, ordinal, scalar) properly for each variable in 'Variable View'. In addition assign value labels if your variable has more than one category as for example in **gender** and **ethnicity**.



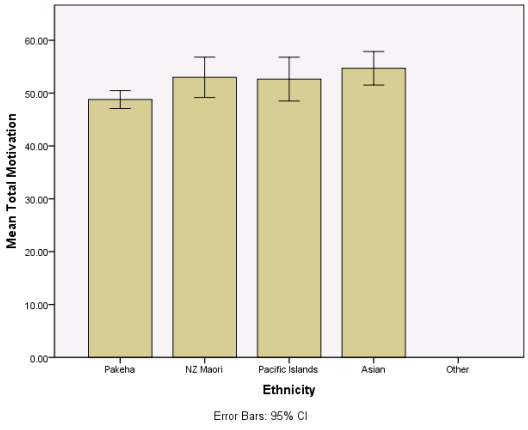
From the gallery (tab) selection drag the bar chart into the chart preview window.

In the *Element properties* Box to the left of the chart builder window, click on *Statistics* and select *Mean* and select 'Display Error Bars'.

Into the *X-Axis* box underneath the graph drag **'Ethnicity'** from the variable's list

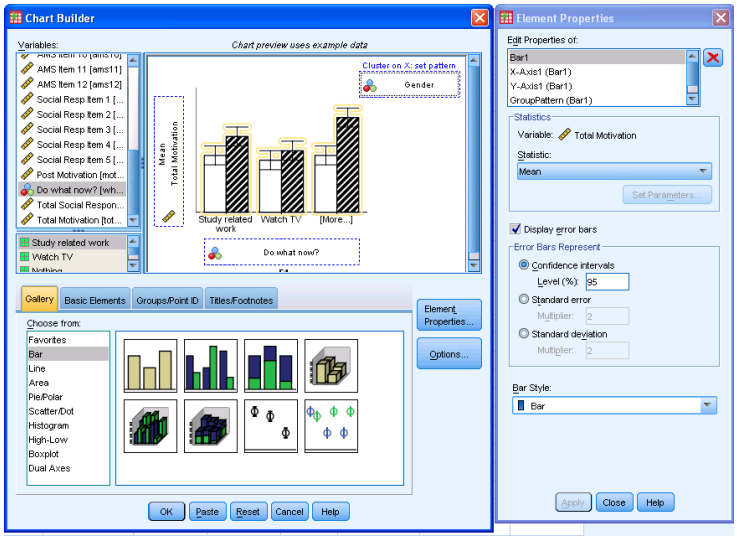
Into the *Y-Axis* box to the left of the graph drag **'Total Motivation'** from the variable's list.

Click on **OK**. The chart can now be seen in the SPSS Viewer. To copy the bar chart into a new document (word file) for example your thesis or report, simply select the graph in '*output viewer'* and use the copy and paste function from the *'edit'* menu.

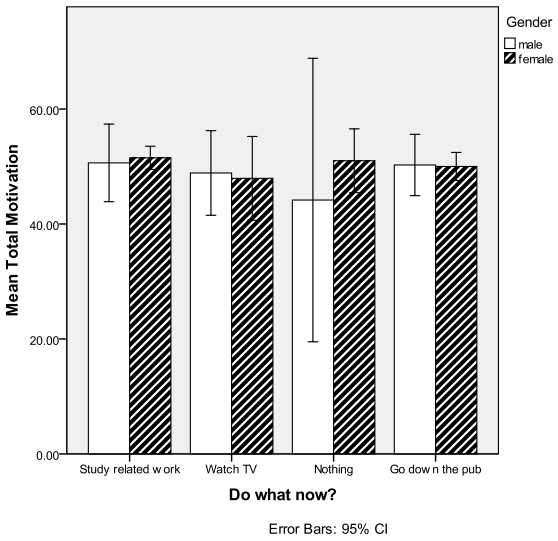


Creating a Clustered Bar Chart

From the menu choose: **Graphs→Chart Builder** (select the second bar chart picture and drag into the chart preview window)
Drag the variable **Do what now?** into the X-box, and **Total Motivation** into the Y-box of the graph. Drag **Gender** into the *'Cluster on X'* box (here you can select a colour or a pattern for your bars; I have selected 'pattern').
In the *'Element Properties'* box under *'Statistics'* select *Mean* and tick the 'Display Error bars' box, then 'click on 'Apply'



Click on **OK**. The chart can now be seen in the SPSS Statistics Viewer. Use 'copy and paste' function to transfer the graph into a new document.



Editing Charts

To make changes to a chart, double click on the chart while being in the output viewer. This will open the **Chart Editor**. The menu bar of this window gives a variety of options of features you may wish to alter. For example, we may wish to add a more descriptive title to our graph. From the Chart Editor menu bar, select: Options→Title

You can now type in a more appropriate title for the graph. An alternative to the menu bar is to double click on the feature that you wish to change e.g. the axes – try this now and see what happens.
To make further changes to the graph, try using the buttons available on the Chart Editor toolbar.

To change something in the Chart Editor it must be selected first. For example, to change the colour on the bars of a bar graph, you must first select the bars by clicking on them once and then choosing to change the colour.

Chart Templates

Once we have a chart looking just as we want it, we do not want to have to change every chart we create into that format. For example, if we are writing a manuscript for publishing in a journal that needs to be in APA format it may take a lot of time to transfer all our charts into this form.
Once you complete a chart that completes your format, from the menu bar in the Chart Editor, choose: File→Save Chart Template.....
Enter a name for your template, choose a location ie desktop or 'my documents' and click **Save** (your template will be given an *.sgt extension).
When you need to create another graph using this style, produce the graph first then in chart editor click on: File→ Apply Chart Template and locate your previously saved template, then click on **OK**.

Running Procedures and Getting Help

You are now at a point where you could probably run any analysis you wanted in SPSS, as all the procedures work the same way as those described above. The two most frequently asked questions, however, regarding how to run procedures are discussed below:

Firstly, how do I decide which procedure to actually run ? This will require some basic statistical knowledge. If you are unsure which test to use, you might like to have a play with the Statistics Coach, which can be accessed from the Help menu in SPSS. This 'Coach' will guide you through a series of questions regarding your data and the questions you want answered from your data, and then suggest a possible statistical technique for this.

Secondly, how do I define my variables to add across into the analyses boxes? Knowing your independent variables from your dependent variables will be a big help here. Note that in some dialog boxes SPSS refers to the independent variable as a *'factor', 'covariate',* or *'grouping variable'* and the dependent variable as a *'test variable. If* you've made a mistake you can re-run the procedure by re-calling your most recently used analysis by clicking on the 'Dialog Recall' button located on the toolbar:

Users are often unsure as to what the various terms and options mean in the dialog boxes. In nearly all of the dialog boxes in SPSS, right clicking over a term (i.e. clicking the right mouse button instead of the left) will bring up a definition for you – very handy!!

Further reading

1. Andy Field (2009) Discovering statistics using SPSS. London: SAGE

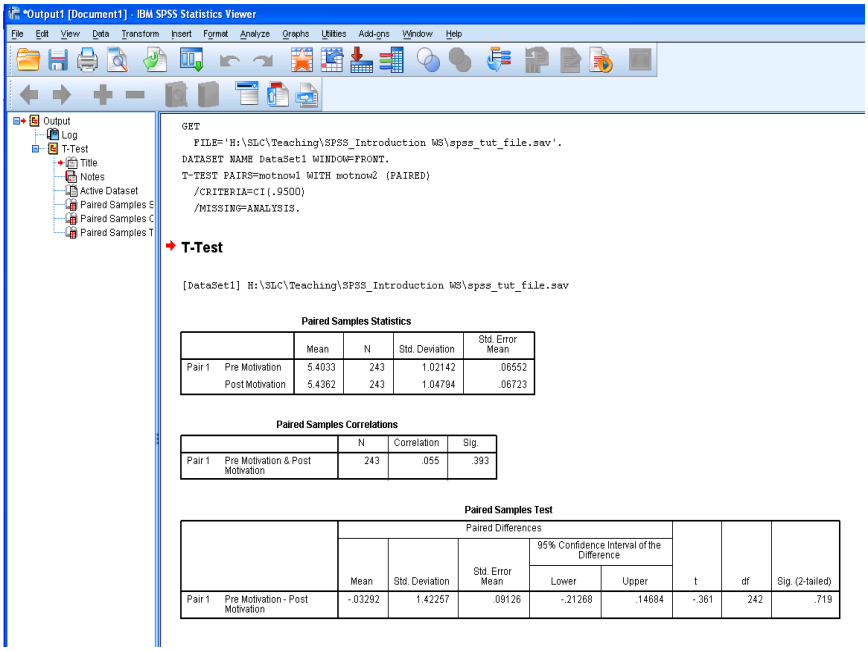
2. Paul R Kinnear & Colin D Gray (2009) SPSS 16 made simple. Hove, East Sussex: Psychology Press

3. Julie Pallant (2011) SPSS Survival Guide, 4th edition. Crows Nest, NSW, Australia: Allen&Unwin.

Working With Output

By this point of our tutorial we have created a lot of output in our Output Viewer. You may have noticed that down the left hand side of your Output Viewer there is a list of all the output you have created. You can use this outline to navigate through your output and control the output display. You need to save your output file separately from any changes made to your data set!

You can collapse or expand items by clicking on the "-" or "+" sign next to the item as appropriate. You can also delete items of output by selecting them on the left-hand side and pressing the delete key.

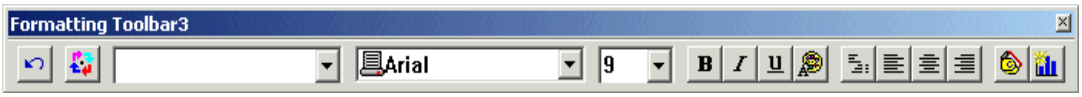


Moving Output from SPSS

In order to transfer your SPSS tables or charts into your word-processing document select object of your choice and then click your right mouse button. A pop-up menu will appear – choose the **Copy** option. Return to your word-document and use the **Paste Special** procedure on the **Edit** menu to paste your chart or table. If you are pasting a table, using Paste Special will give you three options: Unformatted Text, Formatted Text (RTF), or Picture. Choose the picture option if you wish your table to appear exactly as it did in SPSS. The other two options will paste in MS Word format (the RTF option pastes as a MS Word table). If you are pasting a chart, once choosing Paste Special it is best to choose the 'Picture' option.

Changing the Appearance of Tables

There are several ways to do this. Firstly, you can alter various parts of a table by double-clicking on the table itself. This will open up a formatting toolbar for pivot tables that will allow you control over various aspects of your table.



It is also possible to change the overall look of the table. Once you have double-clicked on a table there will be an option for **Format** on the menu bar. Choose **Tablelooks** from this menu and pick one of the many options available in the dialog box that appears (a preview sample will appear on the right-hand side once you have selected an option). Select **OK** and see the change that has occurred in your table!

*To change the look of all your tables from this point onwards, choose **Options** from the **Edit** menu and click on the 'Pivot Tables' tab. This will allow you to choose a table look for all tables (click on **OK** when you have made your decision).*

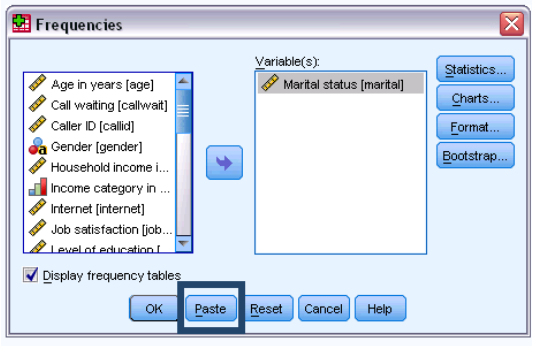
Working with SPSS Statistics Syntax

In early versions of SPSS, it was necessary to write syntax in order to analyse your data. SPSS Syntax is a control language, and is similar in concept to the programming code written in SAS. While we no longer need syntax to operate SPSS, it has remained a feature of the software and can be very useful, for example:

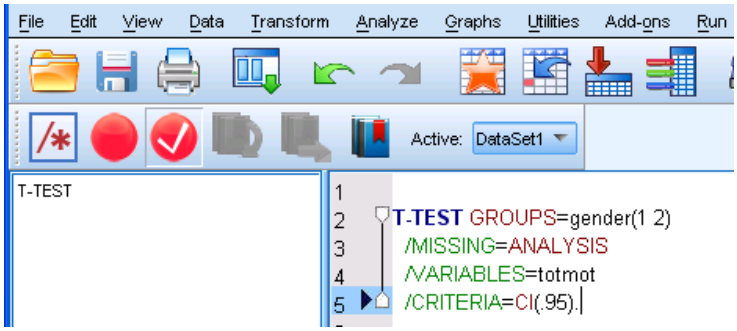
- To run a common set of commands without choosing all the options over and over again from the dialog boxes.
- To re-run a complicated (or lengthy) set of procedures with just a minor change from your earlier analysis – if you have saved your syntax, the procedure can be re-run with your minor changes simply by one click of a button.
- To provide a 'record' of your analysis in terms of either accountability or for documentation purposes about the procedures used.
- Finally, some SPSS functions are actually not available from the menu options and can only be accessed via syntax, for example if you need to break down the interactions of independent variables after doing a factorial ANOVA (**simple effects analysis**).

The commands are written in a special window known as the SPSS syntax editor:

Click on **File→New→Syntax**



If an analysis has been set up previously from dialog boxes, pressing **Paste** (instead of **OK**) will paste the hidden syntax into the syntax editor as shown to the left. Each command begins with the name of the procedure you wish to run, followed by the 'details' of the procedure. At the end of the command is a full stop, called the 'command terminator' (see picture below).



Motivation Survey

Please complete the following:

ID#

Age _____ Gender _____ Ethnicity _____

For the remaining questions, please circle the response that best fits you:

MOTNOW1How motivated do you feel towards your University studies *right now*?

not very motivated very motivated

1 2 3 4 5 6 7

Using the scale below, indicate to what extent each of the following items presently corresponds to one of the reasons why you go to University.

Does not correspond at all — Corresponds moderately — Corresponds exactly

1 2 3 4 5 6 7

Motivation Items AMS 1 - 12

1. Because with only a high-school qualification I would not find a high-paying job later on.	1	2	3	4	5	6	7
2. Because I experience pleasure and satisfaction while learning new things.	1	2	3	4	5	6	7
3. For the intense feelings I experience when I am communicating my own ideas to others.	1	2	3	4	5	6	7
4. In order to obtain a more prestigious job later on.	1	2	3	4	5	6	7
5. I once had good reasons for going to University; however, now I wonder whether I should continue.	1	2	3	4	5	6	7
6. For the pleasure that I experience while I am surpassing myself in one of my personal accomplishments.	1	2	3	4	5	6	7

7. Because I want to have 'the good life' later on.	1	2	3	4	5	6	7
8. For the pleasure that I experience when I feel completely absorbed by what certain authors have written.	1	2	3	4	5	6	7
9. For the satisfaction I feel when I am in the process of accomplishing difficult activities.	1	2	3	4	5	6	7
10. Because my studies allow me to continue to learn about many things that interest me.	1	2	3	4	5	6	7
11. For the "high" feeling that I experience while reading about various interesting subjects.	1	2	3	4	5	6	7
12. Because University allows me to experience a personal satisfaction in my quest for excellence in my studies.	1	2	3	4	5	6	7

Please indicate to what extent each of the following statements are true of you,
1 = not at all true of me, and 5 = very true of me.

Social Responsibility Items SR1 - 5

1. I try to think how my behaviour will affect other students completing the same course as me.	1	2	3	4	5
2. I like to keep promises that I have made to other people in my course.	1	2	3	4	5
3. I try to do what my lecturer/supervisor asks me.	1	2	3	4	5
4. I try to share what I have learnt with other people in the same course as me.	1	2	3	4	5
5. I like to keep quiet when other people are trying to study.	1	2	3	4	5

MOTNOW2 Having completed this questionnaire, how motivated do you feel towards your University studies *now*?

not very motivated					very motivated	
1	2	3	4	5	6	7

WHATNOW Having completed this questionnaire, what do you most feel like doing?

1 = Study-related work 2 = Watching TV
3 = Doing nothing 4 = Going down to the pub