

7.1. z test with unmatched data

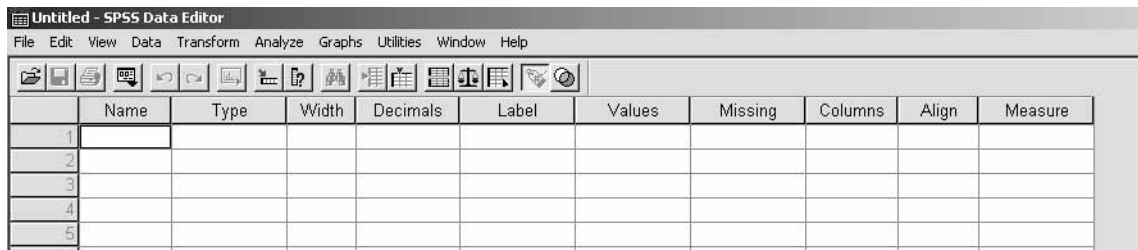
EXAMPLE 7.1. The evolution of *Littorina littoralis* at Aberystwyth, 2002

BOX 7.1. How to carry out an F test to check for homogeneous variances before carrying out a z test for unmatched data

SPSS doesn't actually implement a simple F test: it will instead do a Levene test for homogenous variance, which does not depend on the assumption of a normal distribution.

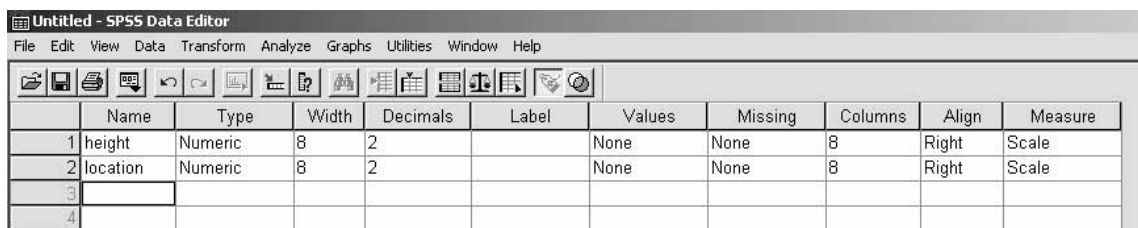
Step 1. Set up the variables.

When SPSS starts up, select 'Variable View' using the tabs at the bottom left. You should get something like this:



	Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align	Measure
1										
2										
3										
4										
5										
6										

For the first variable name, type in 'height', and for the second 'location'. Default properties will be set for each variable.



	Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align	Measure
1	height	Numeric	8	2		None	None	8	Right	Scale
2	location	Numeric	8	2		None	None	8	Right	Scale
3										
4										

'Height' is measured to only one decimal place of mm, so we need to change the 'Decimals' property. Click in the 'Decimals' cell of row 1, and use the 'up and down' arrows that appear at the right-hand side of the cell to change the 'Decimals' to 1.

The screenshot shows the SPSS Data Editor window titled 'Untitled - SPSS Data Editor'. The menu bar includes File, Edit, View, Data, Transform, Analyze, Graphs, Utilities, and Window. Below the menu is a toolbar with various icons. The main area is a table with the following columns: Name, Type, Width, and Decimals.

	Name	Type	Width	Decimals
1	height	Numeric	8	1
2	location	Numeric	8	2
3				

'location' is a categoric variable, and SPSS doesn't like this, so we have to use value labels. Click in the 'values' cell in row 2, and click on the grey area that appears at the right-hand side of the cell. The 'Value Labels' dialogue box will appear. In the 'Value' window, type '1', and in the 'Value Label' window, type 'lower'. Click on 'Add' to enter this pair into the system.

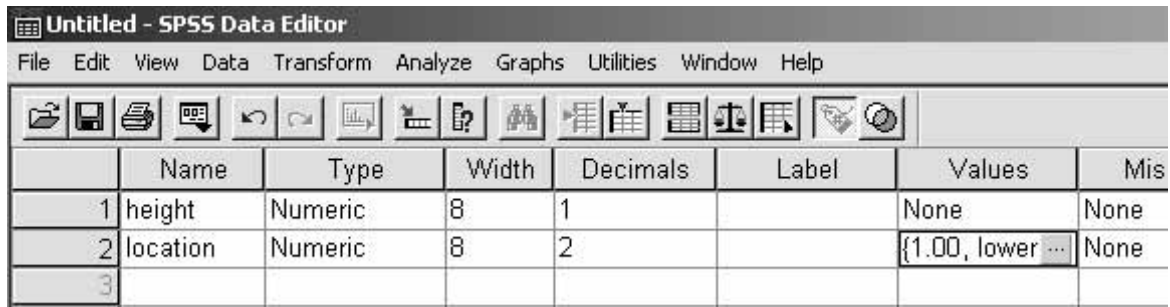
The screenshot shows the SPSS Data Editor window with the 'Value Labels' dialog box open for the 'location' variable. The dialog box has a title bar 'Value Labels' and a close button. It contains the following fields and buttons:

- Value Labels:** A list box containing one entry: 1.00 = "lower".
- Value:** A text input field.
- Value Label:** A text input field.
- Buttons:** Add, Change, Remove, OK, Cancel, and Help.

The background table in the Data Editor shows the 'location' variable selected in the 'Decimals' column.

	Name	Type	Width	Decimals	Label
1	height	Numeric	8	1	
2	location	Numeric	8	2	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

Repeat for '2' and 'mid', then click on 'OK'.



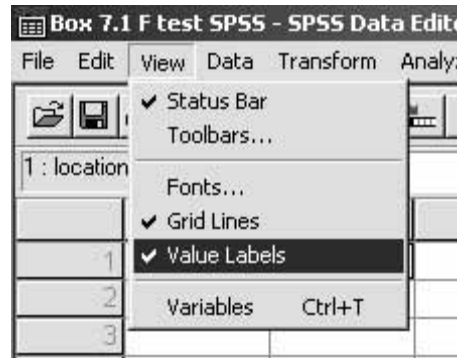
The screenshot shows the 'Untitled - SPSS Data Editor' window with a menu bar (File, Edit, View, Data, Transform, Analyze, Graphs, Utilities, Window, Help) and a toolbar. Below the toolbar is a table with the following columns: Name, Type, Width, Decimals, Label, Values, and Mis. The table contains three rows:

	Name	Type	Width	Decimals	Label	Values	Mis
1	height	Numeric	8	1		None	None
2	location	Numeric	8	2		{1.00, lower ...	None
3							

We could do with changing the decimals property for location to zero, since our values are integers: do this in the same way that you changed the decimals property of 'height'. Transfer to data view using the tabs at the bottom left.

Step 2. Enter the data.

Check that value labels are enabled by going to 'View' and (if necessary) clicking on 'Value Labels'.



We can't enter the value labels until we have the numeric data for height. Enter the numeric data for height into column 1. (If you have it in a 'Word' table or an 'Excel' spreadsheet, you can copy and paste.)

We can now start to enter the value labels for 'location'. Click in the first cell of column 2, and a drop-down menu should appear. Select the appropriate entry ('lower' or 'mid', depending on which order you entered the numbers in column 1).

Box 7.1 F test SPSS - SPSS Data Editor

File Edit View Data Transform Analyze

1 : location

	height	location	var
1	5.3	.	
2	8.7	lower	
3	5.3	mid	
4	5.3		

Repeat for all the other cells in column 2. (Some more copying and pasting might be appropriate here.)

Step 3. Perform the test.

Go to 'Analyze', 'Compare Means', 'One-Way ANOVA'.

Box 7.1 F test SPSS - SPSS Data Editor

File Edit View Data Transform Analyze Graphs Utilities Window Help

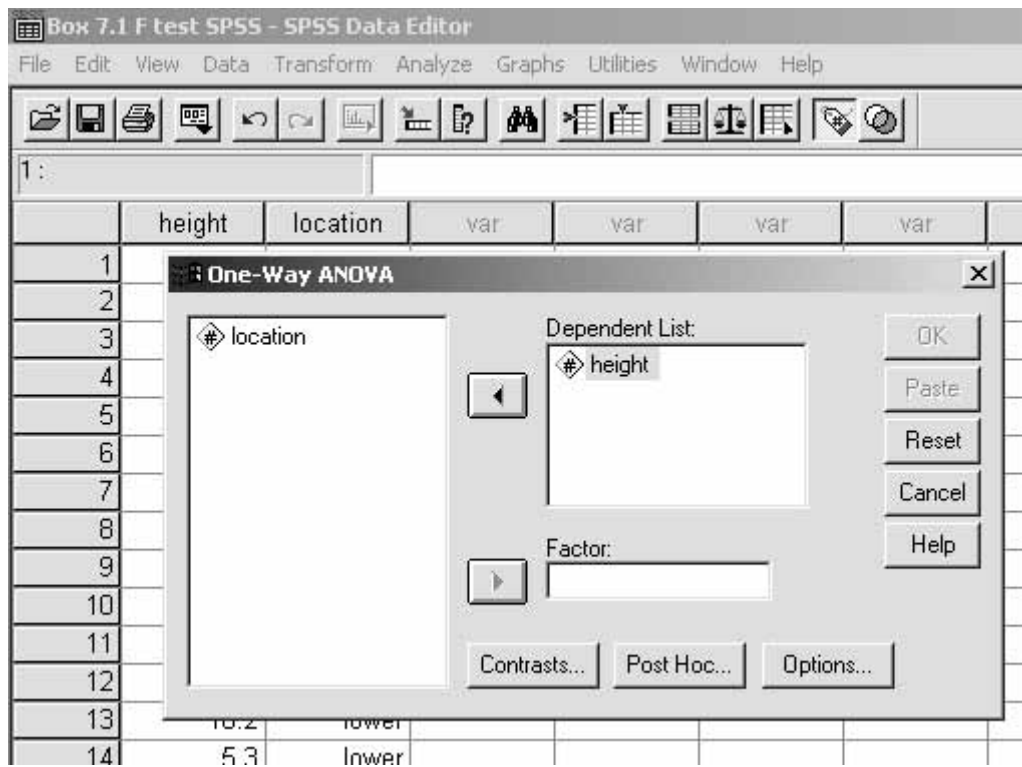
1 :

	height	location	var
1	5.3	low	
2	8.7	low	
3	5.3	low	
4	5.3	low	
5	5.9	low	
6	2.8	low	
7	8.7	low	
8	2.0	low	
9	5.3	low	
10	6.5	low	

Analyze menu items:

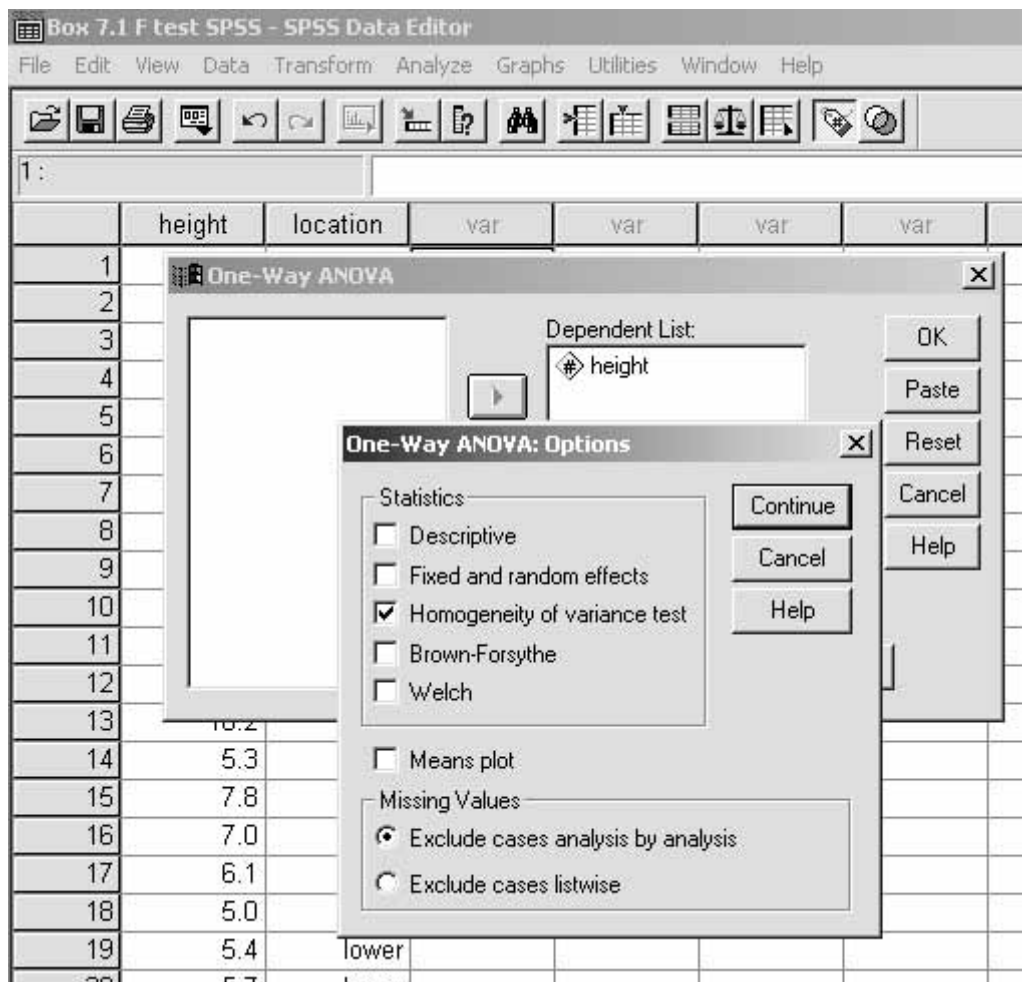
- Reports
- Descriptive Statistics
- Compare Means**
 - Means...
 - One-Sample T Test...
 - Independent-Samples T Test...
 - Paired-Samples T Test...
 - One-Way ANOVA...**
- General Linear Model
- Mixed Models
- Correlate
- Regression
- Loglinear
- Classify
- Data Reduction
- Scale
- Nonparametric Tests
- Survival
- Multiple Response

Click on 'height' to highlight it, then click on the arrow to transfer it to the 'Dependent List' window.



In the same way, transfer 'location' to the 'Factor' window.

Click on 'Options' and select 'Homogeneity of Variance Test'.



Click on 'Continue'. Click on 'OK', and the results should appear in a separate window.

Oneway

Test of Homogeneity of Variances

HEIGHT

Levene Statistic	df1	df2	Sig.
.164	1	58	.687

ANOVA

HEIGHT

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	55.488	1	55.488	14.436	.000
Within Groups	222.938	58	3.844		
Total	278.426	59			

Step 4. Decide what the results mean.

The significance of the Levene statistic is 0.687, which is much greater than 0.05. We therefore conclude that there is no significant difference between the variances of the periwinkle shell heights from the lower shore and from the mid shore and so may proceed with the z test.