

Using **jamovi** Stats. Open. Now. A Brief Introduction

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Outline

- 1. Getting Started in jamovi**
- 2. Defining Variables in jamovi**
- 3. Exploring Data**
- 4. Hypothesis Testing**
- 5. Regression Models**
- 6. Programming with R in jamovi**
- 7. Other Modules that are Useful**

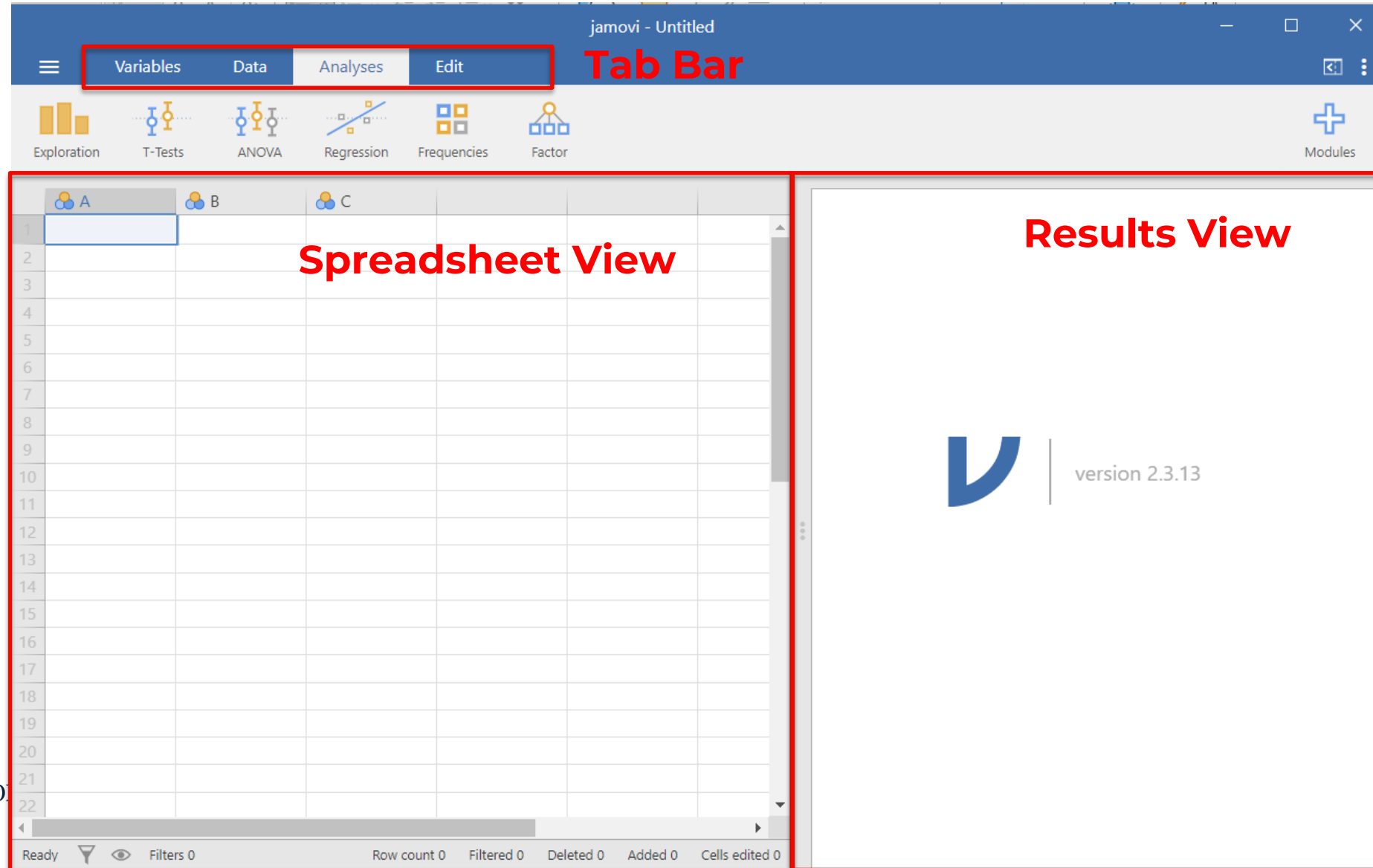


Getting Started in **jamovi** Stats. Open. Now.

1. **jamovi** is free, open-source, and available for a range of operating systems for download at <https://www.jamovi.org/download.html>.
2. Installation steps specific to your operating system can be found in the online user manual <https://www.jamovi.org/user-manual.html>.



When opening jamovi, the window should look like this.



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By clicking the **Variable** tab – you can open the variable view.
By clicking the **Edit** tab – you can edit the results view.

The screenshot displays the JAMOVI software interface. The top menu bar includes 'Variables', 'Data', 'Analyses', and 'Edit'. The 'Edit' tab is currently selected. Below the menu bar is a toolbar with various icons for editing, such as 'Paste', 'Clipboard', 'Edit', 'Font', 'Paragraph', 'Insert', 'Code-Block', 'Heading Styles', and 'Link'. The main workspace is divided into two panels. The left panel, titled 'Variable View', contains a table with columns 'Name' and 'Description'. It lists three variables: 'A' (selected with a blue checkmark), 'B', and 'C'. A red box highlights this panel, and the text 'Variable View' is written in red. The right panel, titled 'Results', shows a list of references. The text 'Editing the Results' is written in red above this panel. The bottom status bar indicates 'Selected 1' and 'Variables 3'.

Editing the Results

Variable View

Name	Description
<input checked="" type="checkbox"/> A	Enter description
<input type="checkbox"/> B	
<input type="checkbox"/> C	

Results

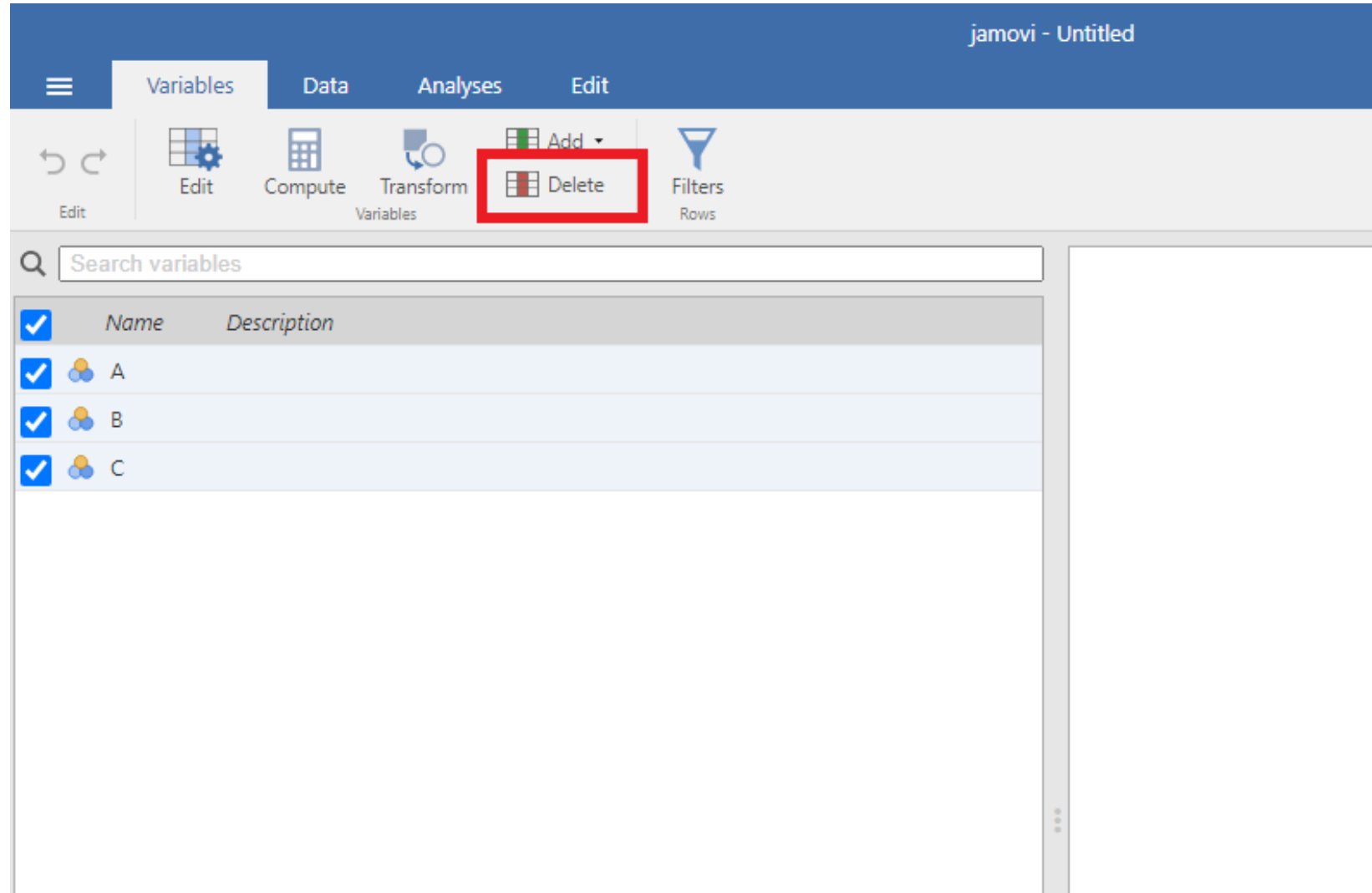
References

- [1] The jamovi project (2022). *jamovi*. (Version 2.3) [Computer Software]. Retrieved from <https://www.jamovi.org>.
- [2] R Core Team (2021). *R: A Language and environment for statistical computing*. (Version 4.1) [Computer software]. Retrieved from <https://cran.r-project.org>. (R packages retrieved from MRAN snapshot 2022-01-01).

ready Filters 0 Selected 1 Variables 3

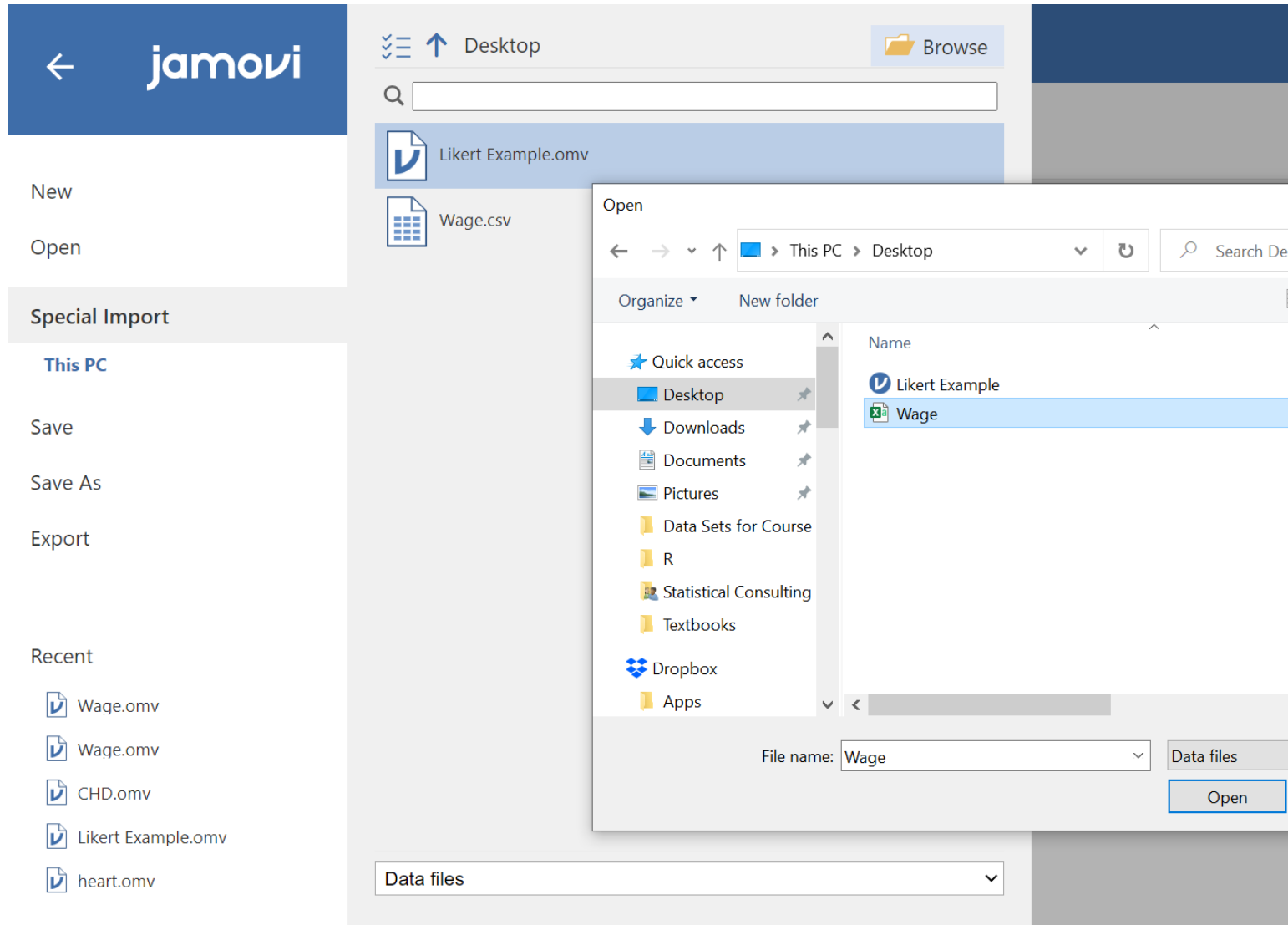


Before importing data, delete the three default variables.



To Import a data set

Go to **File (≡); Special Import; Browse** and then select your Data set.

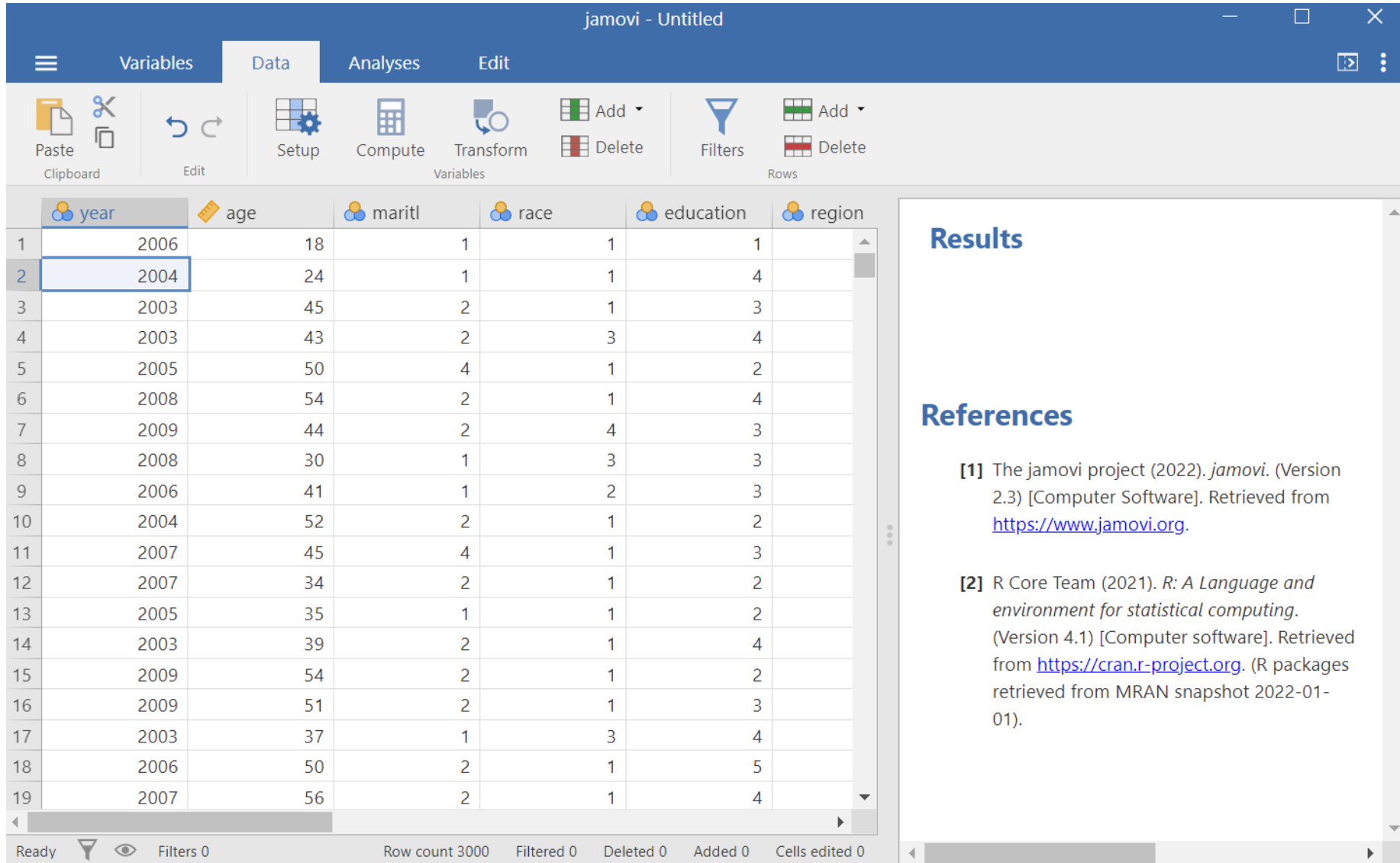


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By selecting the **Data** tab, you should see your Data.



The screenshot shows the Jamovi software interface with the 'Data' tab selected. The main window displays a dataset with the following columns: year, age, maritl, race, education, and region. The 'Data' tab is active, and the 'Results' and 'References' panels are visible on the right.

	year	age	maritl	race	education	region
1	2006	18	1	1	1	
2	2004	24	1	1	4	
3	2003	45	2	1	3	
4	2003	43	2	3	4	
5	2005	50	4	1	2	
6	2008	54	2	1	4	
7	2009	44	2	4	3	
8	2008	30	1	3	3	
9	2006	41	1	2	3	
10	2004	52	2	1	2	
11	2007	45	4	1	3	
12	2007	34	2	1	2	
13	2005	35	1	1	2	
14	2003	39	2	1	4	
15	2009	54	2	1	2	
16	2009	51	2	1	3	
17	2003	37	1	3	4	
18	2006	50	2	1	5	
19	2007	56	2	1	4	

Results

References

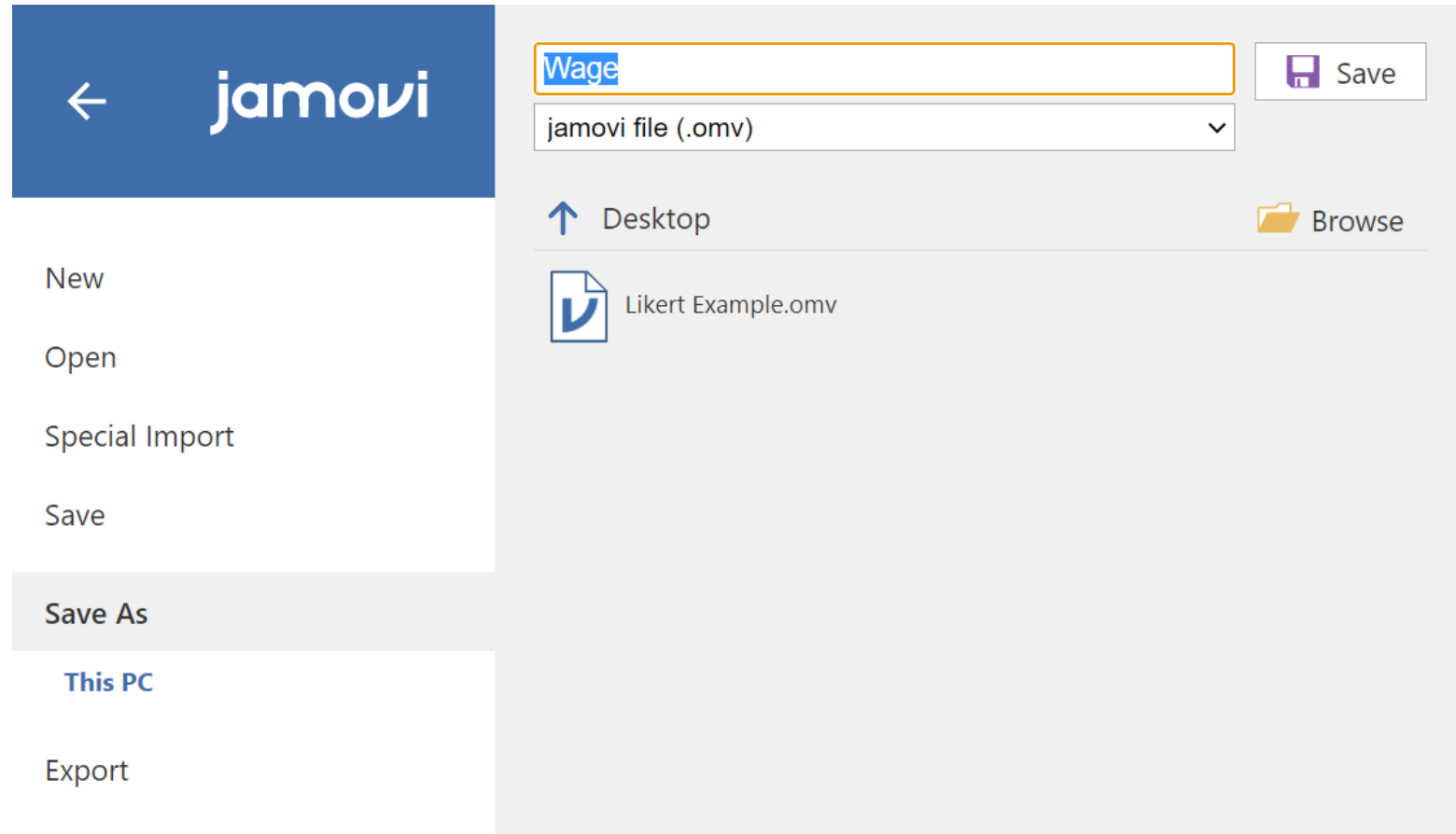
- [1] The jamovi project (2022). *jamovi*. (Version 2.3) [Computer Software]. Retrieved from <https://www.jamovi.org>.
- [2] R Core Team (2021). *R: A Language and environment for statistical computing*. (Version 4.1) [Computer software]. Retrieved from <https://cran.r-project.org>. (R packages retrieved from MRAN snapshot 2022-01-01).



To save your data

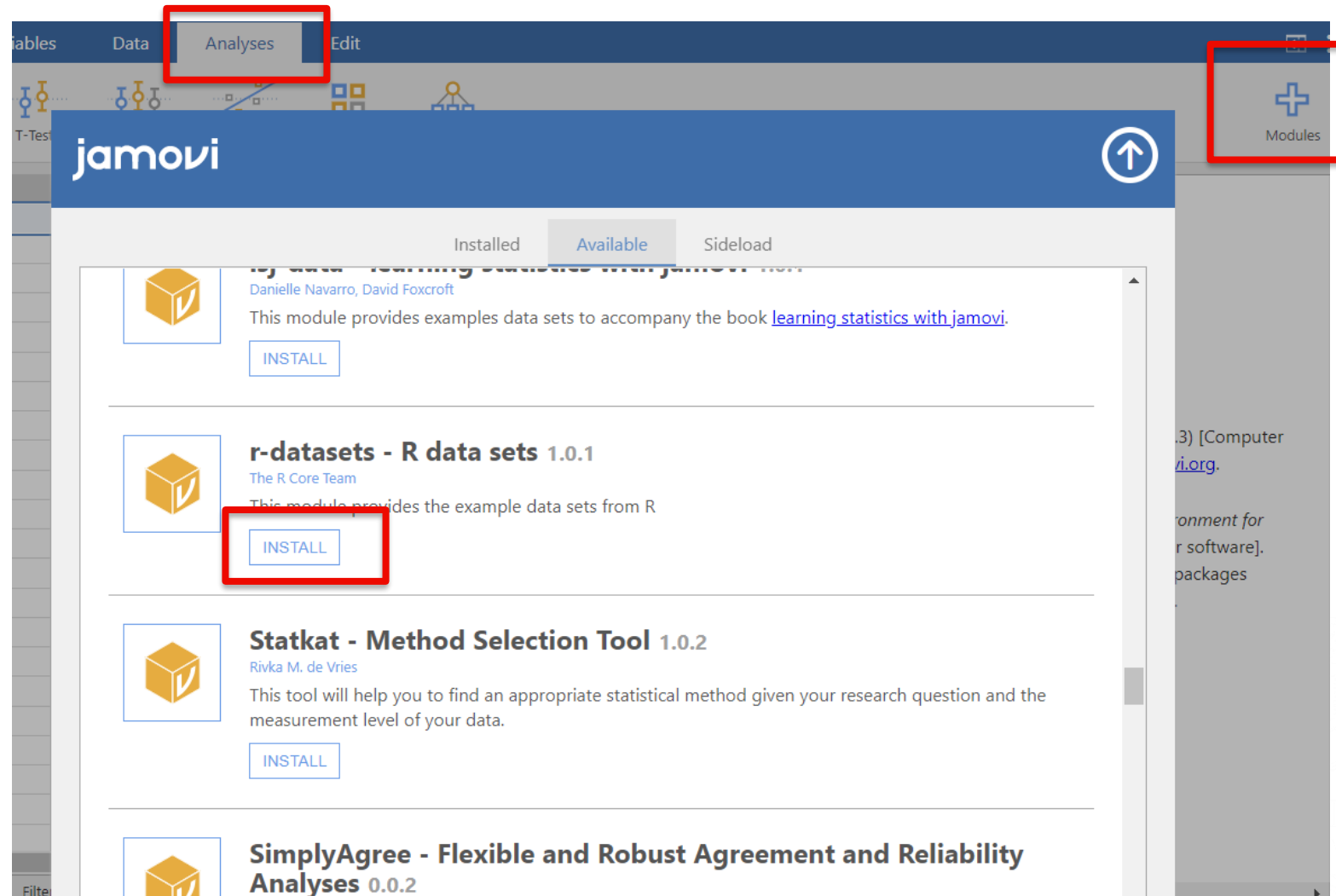
Go to **File (≡); Save As; Browse** and then save your Data onto your hard drive.

➤ jamovi saves the file as a **.omv** file.



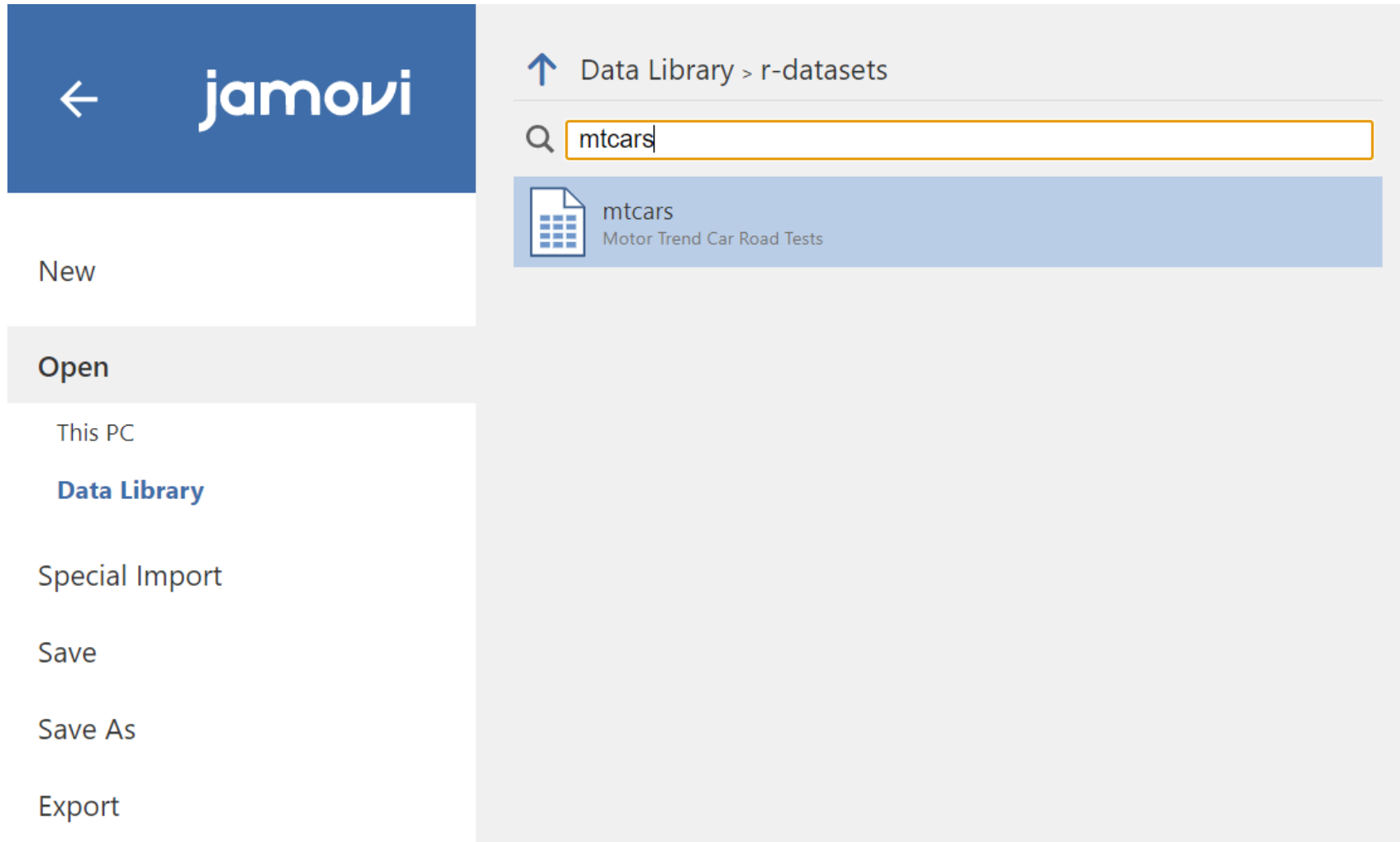
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We can also install additional Modules.
Click **Analyses; Module; jamovi library;** and then find the Module you would like to install and press **INSTALL**



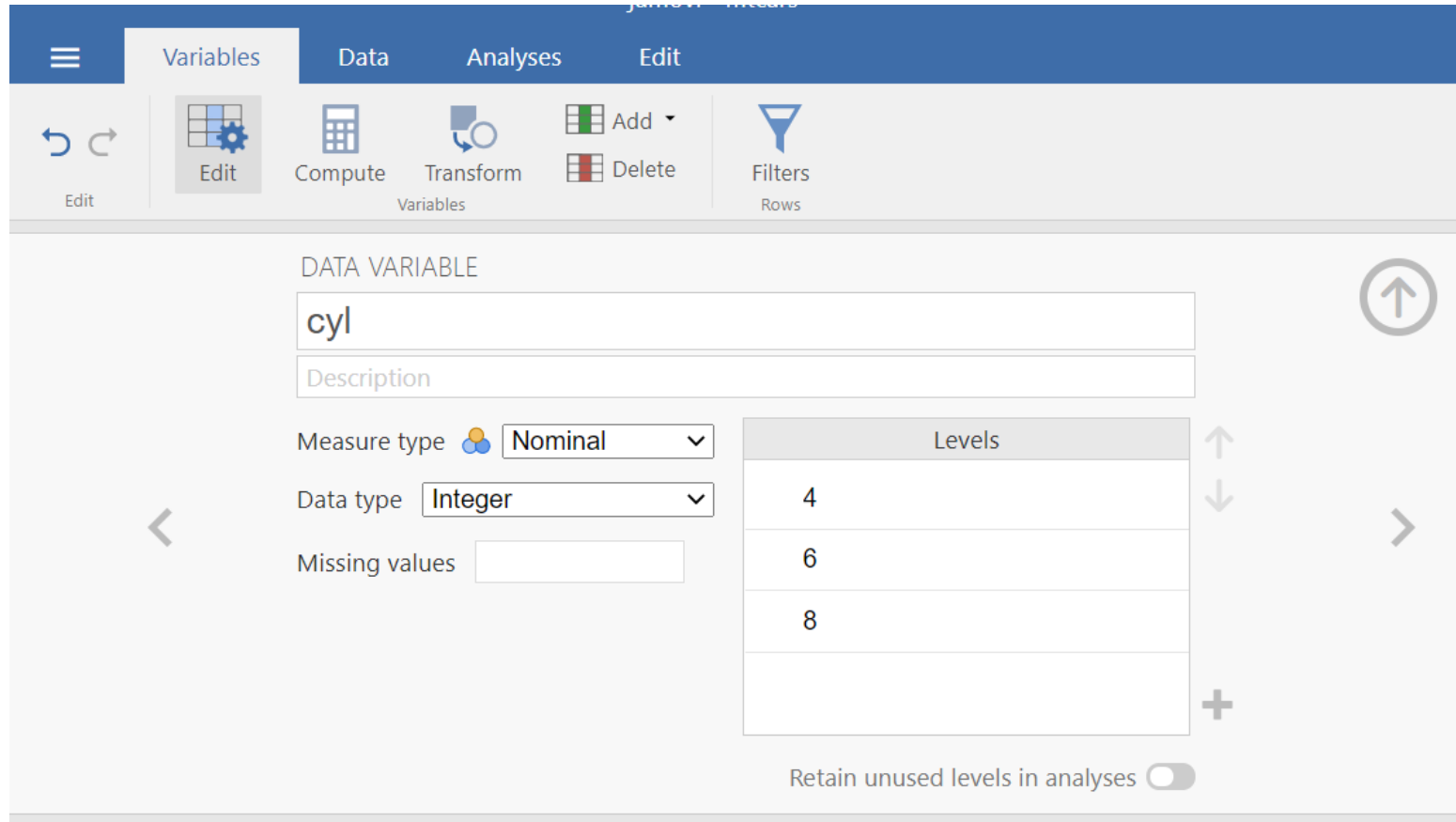
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The r-datasets module contains a range of sample data sets. Click **File (≡); Open; Data Library;** to see these data sets. The following examples will use the **mtcars** data set.



Defining Variables in jamovi

To setup variables click the **Variables** tab, select the variable you want to change and click **Edit**.




The screenshot shows the jamovi interface with the 'Variables' tab selected. The 'Edit' button is highlighted in the top toolbar. The main panel displays the configuration for the variable 'cyl'.

DATA VARIABLE

cyl

Description

Measure type  Nominal

Data type Integer

Missing values

Levels
4
6
8

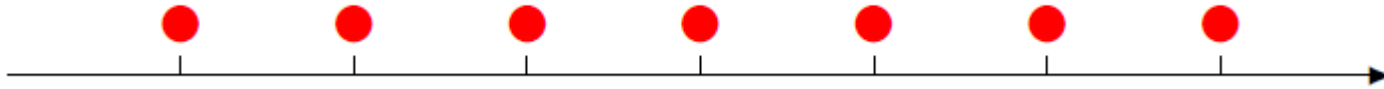
Retain unused levels in analyses ☐



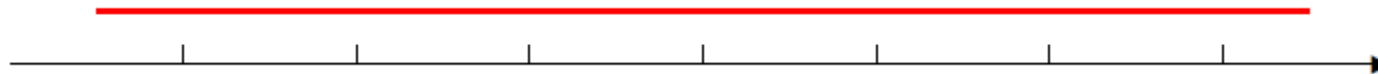
QUANTITATIVE VARIABLES IN JAMOVI

A variable that can be measured numerically is called a quantitative variable.

In jamovi, all quantitative variables are labeled as **Continuous**.



For discrete quantitative variables select a **Continuous** Measure Type with an **Integer** Data Type



For continuous quantitative variables select a **Continuous** Measure Type with a **Decimal** Data Type



QUALITATIVE MEASURE TYPES IN JAMOV

Nominal variables are qualitative variables that can be classified into two or more categories which have no order.

e.g. Male, Female,
e.g. Brand of Car,
e.g. Nationality

Ordinal variables are qualitative variables that can be classified into two or more categories which have order.

e.g. Age group,
e.g. Size of shirt



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For numerically coded qualitative variables select an **Integer** Data Type. For text coded variables, select a **Text** Data Type.

QUALITATIVE VARIABLES IN JAMOVI

Categories of qualitative variables are referred to as **Levels** in jamovi.

The screenshot shows the Jamovi software interface with the 'Variables' tab selected. The variable being edited is named 'am' and is described as 'Automatic or Manual Transmission'. The 'Measure type' is set to 'Nominal' and the 'Data type' is set to 'Integer'. A 'Levels' dialog box is open, displaying a list of levels: 'Automatic' (0) and 'Manual' (1). The 'Manual' level is currently selected. At the bottom of the dialog, there is a toggle for 'Retain unused levels in analyses' which is currently turned off. A search bar at the bottom of the main window contains the text 'Search variables'.

Levels can be given text labels in the Levels list.



MISSING DATA IN JAMOVI

Missing Data is often recorded as a specific value.
Common examples include NA, NULL, 999.

DATA VARIABLE

am

Automatic or Manual Transmission

Measure type Nominal

Data type Integer

Missing values

MISSING VALUES

when \$source == "NULL"

+ Add Missing Value

Automatic

Manual













These values can be coded in jamovi in the Missing values list.

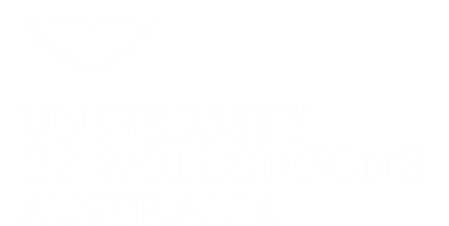
DEFINING VARIABLES

Here is an example of how the motor trend cars data set may look once you go through and define and label all your variables..



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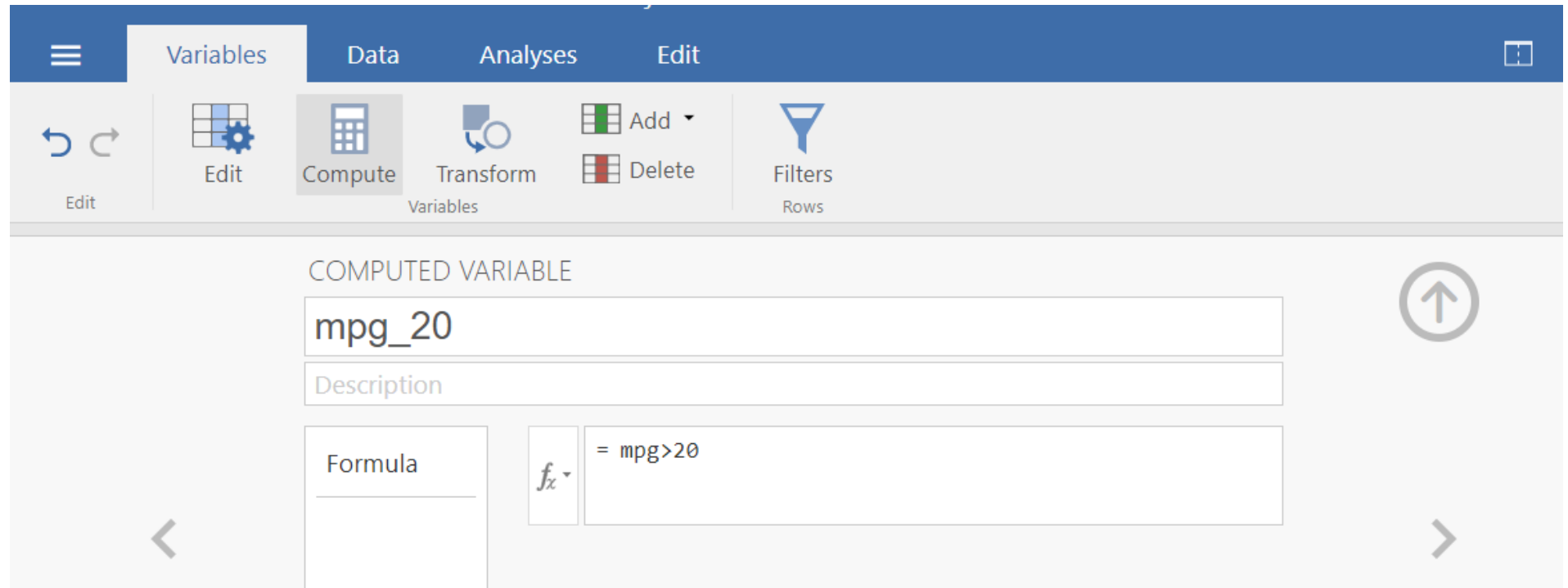
<input type="checkbox"/>	Name	Description
<input type="checkbox"/>	 A	
<input type="checkbox"/>	 mpg	Fuel Efficiency (miles per gallon)
<input type="checkbox"/>	 cyl	Number of cylinders
<input checked="" type="checkbox"/>	 disp	Displacement (cubic inches)
<input type="checkbox"/>	 hp	Gross horsepower
<input type="checkbox"/>	 drat	Rear axle ratio
<input type="checkbox"/>	 wt	Weight (1000 lbs)
<input type="checkbox"/>	 qsec	1/4 mile time
<input type="checkbox"/>	 vs	Engine Shape
<input type="checkbox"/>	 am	Transmission Type
<input type="checkbox"/>	 gear	Number of forward gears
<input type="checkbox"/>	 carb	Number of carburetors



COMPUTING VARIABLES

New variables can be computed by selecting Variables; Compute

To compute a new variable that tells us which car goes more than 20 miles per gallon, use the formula $\text{mpg} > 20$



The screenshot shows the Jamovi software interface. The top menu bar includes 'Variables', 'Data', 'Analyses', and 'Edit'. The 'Variables' menu is open, displaying options: 'Edit', 'Compute', 'Transform', 'Add', and 'Delete'. The 'Compute' option is highlighted. Below the menu, the 'COMPUTED VARIABLE' section is visible. It contains a text box with 'mpg_20', a 'Description' field, and a 'Formula' field. The formula field contains the expression $\text{mpg} > 20$. A small icon of a function symbol f_x is next to the formula field. Navigation arrows are visible at the bottom of the interface.

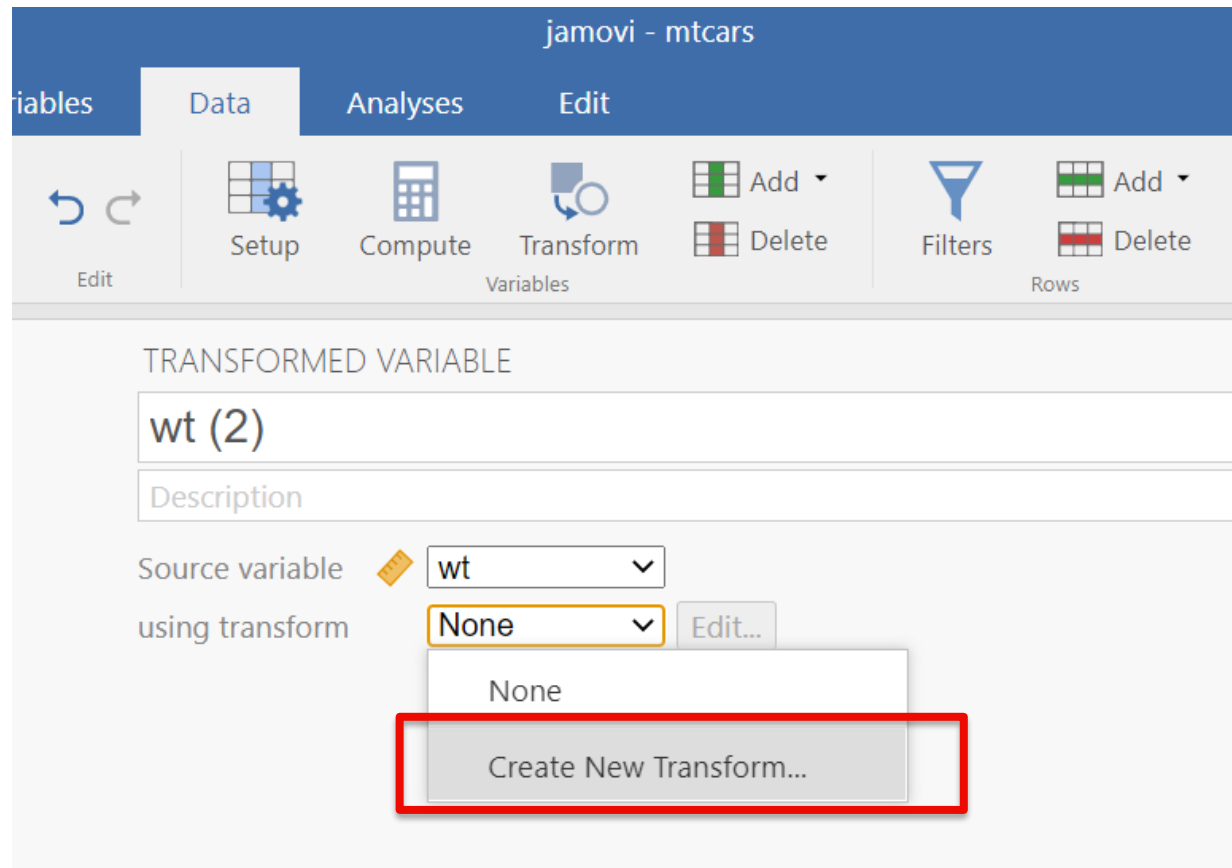


Note: Computation in jamovi is dynamic.

TRANSFORMING VARIABLES

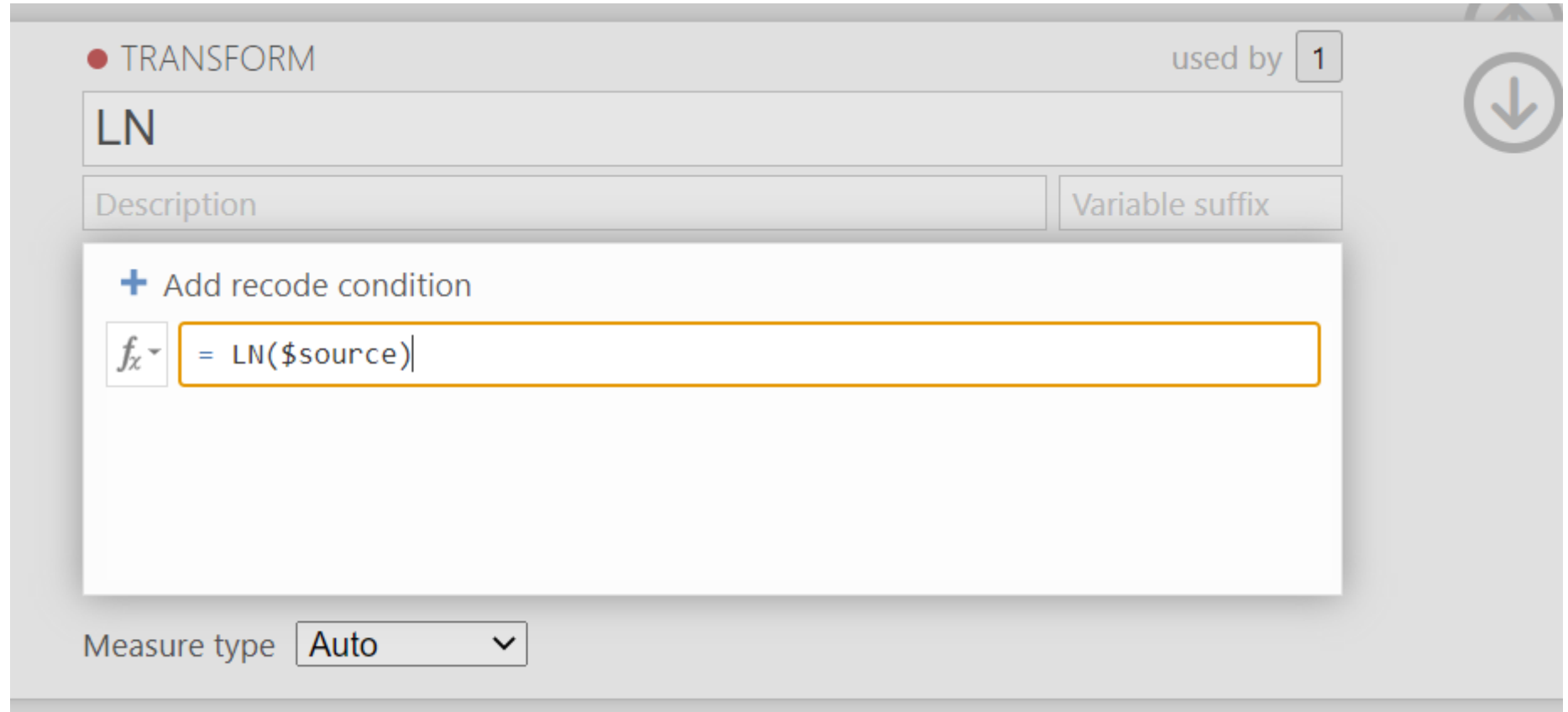
Existing variables can be transformed by selecting them and then selecting **Variables; Transform**

To log transform the **wt** (weight) variable in the mtcars data, select the **wt** column, **Variables; Transform**, and then select **Create New Transform** under using transform.



TRANSFORMING VARIABLES

Name the transformation and write the transformation code.
For the natural log transform, type `LN($source)`.



The screenshot shows the 'TRANSFORM' dialog box in Jamovi. At the top, it says 'used by 1'. Below this, there is a text field containing 'LN'. Underneath, there are two empty fields labeled 'Description' and 'Variable suffix'. A section titled '+ Add recode condition' contains a dropdown menu with 'f_x' selected and a text field containing '= LN(\$source)'. At the bottom, there is a 'Measure type' dropdown menu set to 'Auto'.



Note: Transformation in jamovi is dynamic.

Exploring Data

To perform basic exploratory data analysis, select
Analyses; Exploration; Descriptives

The screenshot shows the Jamovi software interface with the 'Analyses' menu open. The 'Exploration' sub-menu is selected, and the 'Descriptives' option is highlighted with a red box. The background shows a dataset with columns 'mpg', 'mpg_20', 'cyl', and 'c'. The 'Results' and 'References' panels are visible on the right.

	mpg	mpg_20	cyl	c
	21.0	true		6
	21.0	true		6
	22.8	true		4
	21.4	true		6
	18.7	false		8
6	18.1	false		6
7	14.3	false		8
8	24.4	true		4



EXPLORATORY DATA ANALYSIS

Add the variable(s) of interest to the **Variables list.**

To calculate descriptive statistics and plots for the mpg variable arrow the **mpg** variable across.

Descriptives

A

mpg_20

cyl

disp

hp

drat

wt

wt - LN

asec

→

Variables

mpg

→

Split by

☐ Frequency tables

Descriptives

Variables across columns

> | Statistics

> | Plots

Results

Descriptives

Descriptives	
	mpg
N	32
Missing	0
Mean	20.1
Median	19.2
Standard deviation	6.03
Minimum	10.4
Maximum	33.9



EXPLORATORY DATA ANALYSIS

To alter which statistics are computed select the **Statistics** drop-down menu.

▼ | Statistics

Sample Size

☒ N ☒ Missing

Percentile Values

☐ Cut points for equal groups

☐ Percentiles

Dispersion

☒ Std. deviation ☒ Minimum

☐ Variance ☒ Maximum

☐ Range ☐ IQR

Mean Dispersion

☐ Std. error of Mean

☐ Confidence interval for Mean %

Central Tendency

☒ Mean

☒ Median

☐ Mode

☐ Sum

Distribution

☐ Skewness

☐ Kurtosis

Normality

☐ Shapiro-Wilk

Descriptives

Descriptives

	mpg
N	32
Missing	0
Mean	20.1
Median	19.2
Standard deviation	6.03
Minimum	10.4
Maximum	33.9



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EXPLORATORY DATA ANALYSIS

To alter which plots are produced select the **Plots** drop-down menu.

Plots

Histograms

☒ Histogram

☒ Density

Q-Q Plots

☐ Q-Q

Box Plots

☒ Box plot

☒ Label outliers

☒ Violin

☒ Data

Jittered

▼

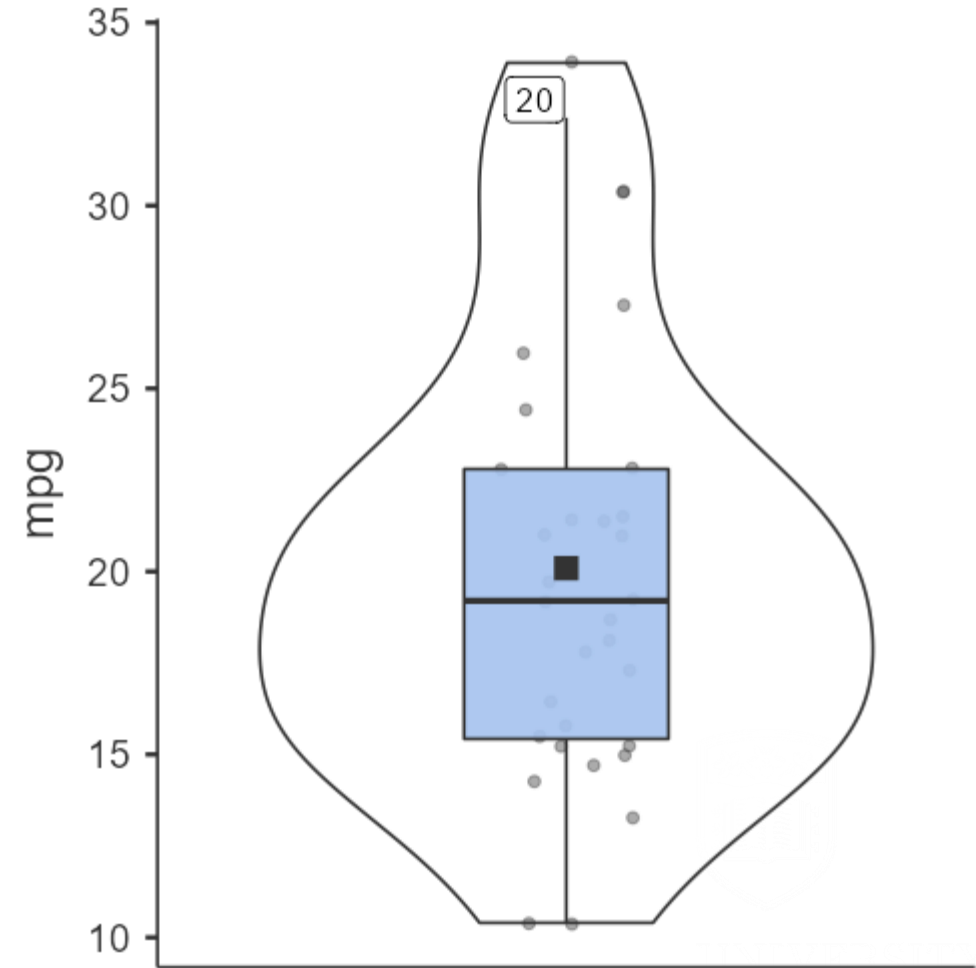
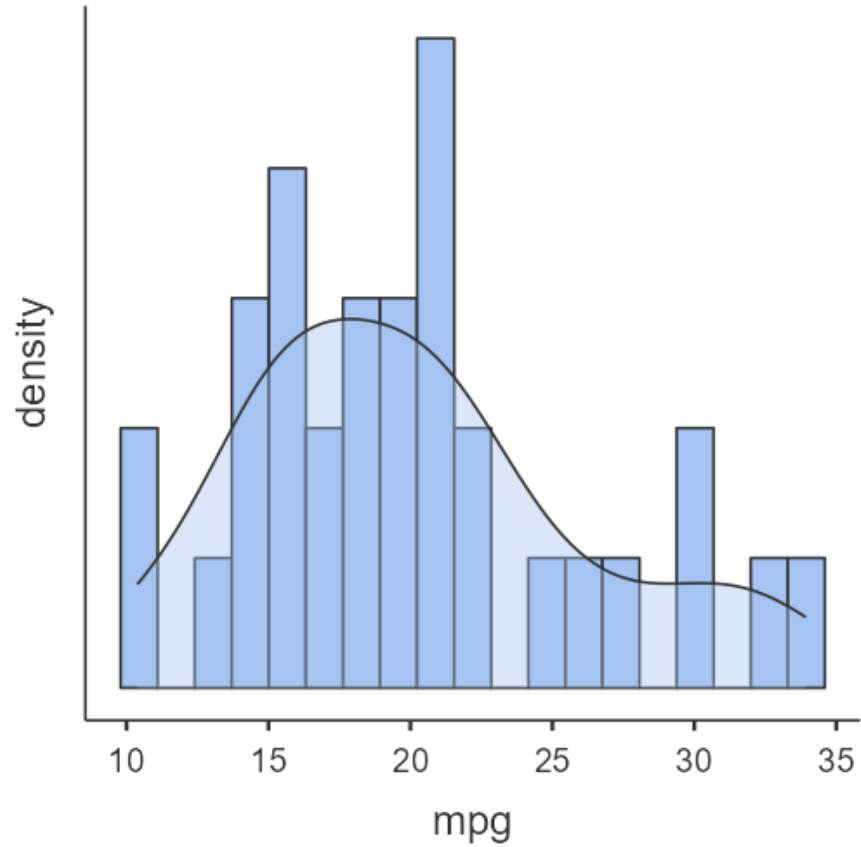
☒ Mean

Bar Plots

☐ Bar plot



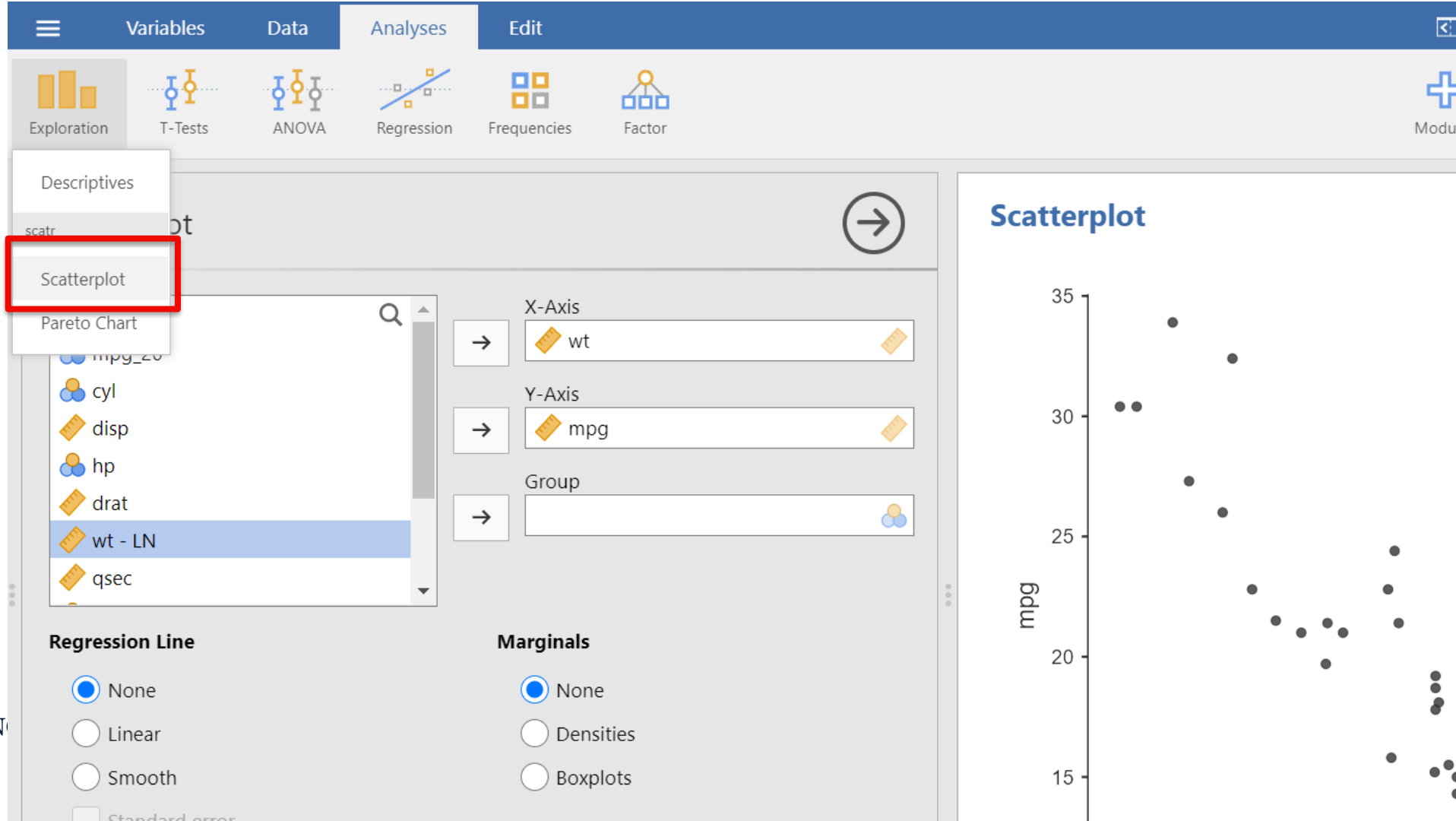
EXPLORATORY DATA ANALYSIS



EXPLORATORY DATA ANALYSIS

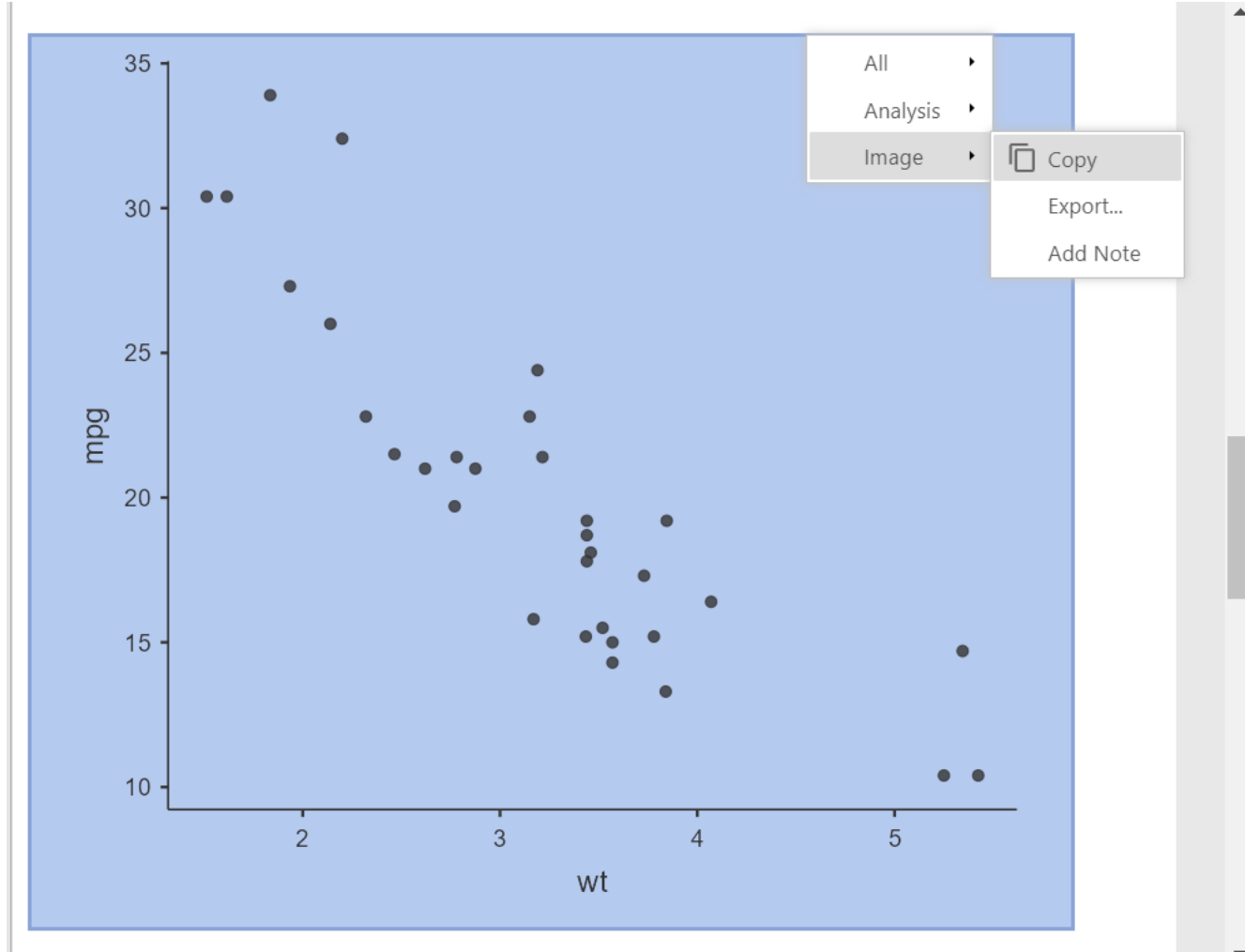
To produce a scatterplot select **Analyses; Exploration; Scatterplot**

Here we compare **wt** and **mpg**



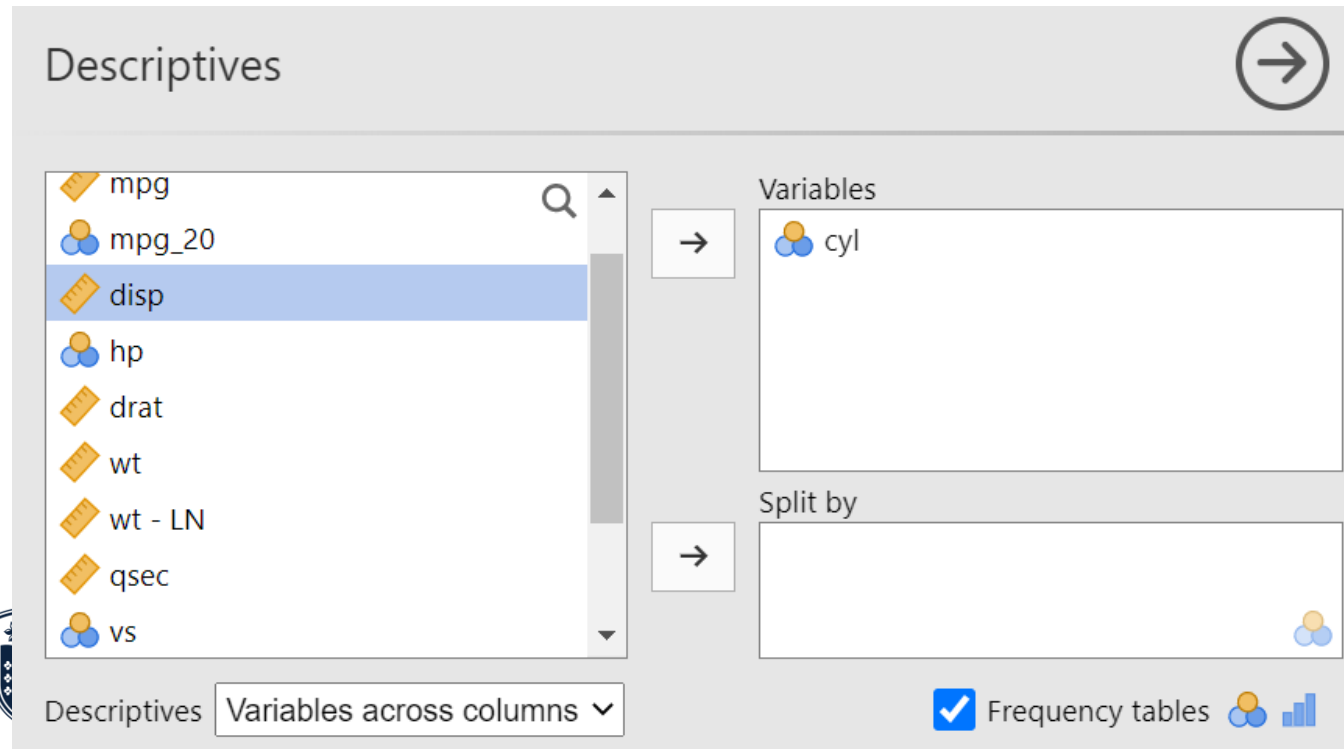
EXPLORATORY DATA ANALYSIS

By right-clicking on the output and selecting **Copy** or **Export**, output can be copied and pasted into word documents or exported as an image.



EXPLORATORY DATA ANALYSIS

When the variable(s) of interest in the **Variables** list are categorical, **Frequency tables** can also be produced.



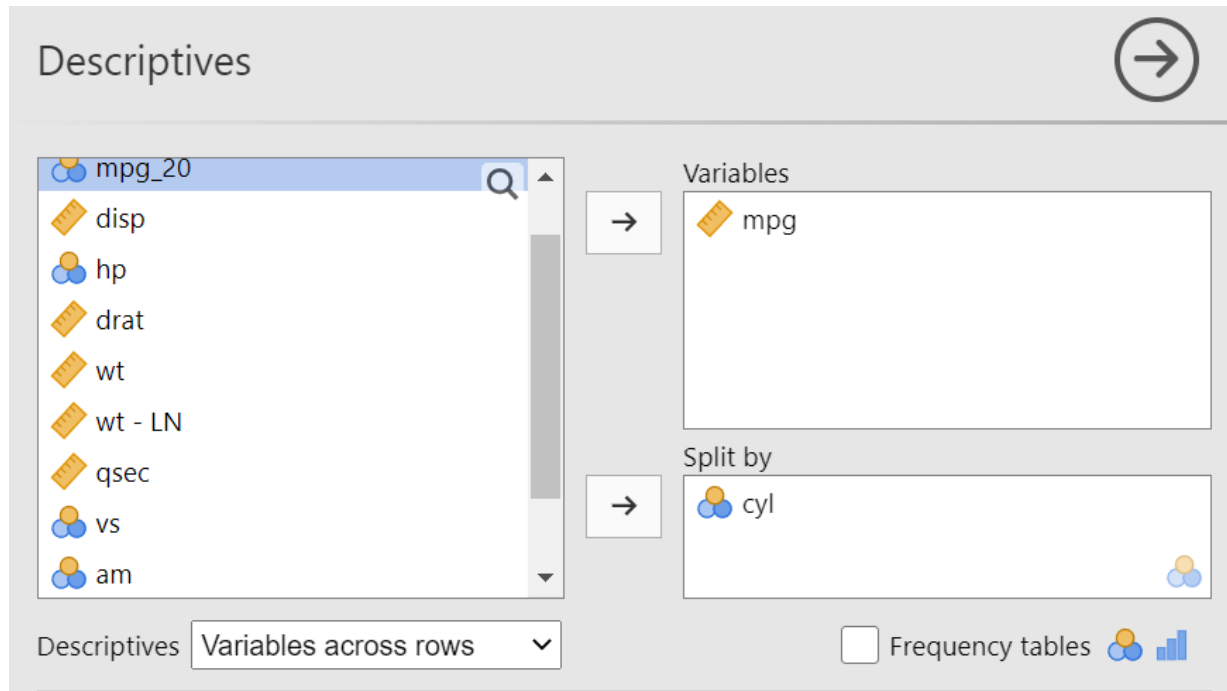
Frequencies

Frequencies of cyl

cyl	Counts	% of Total	Cumulative %
4	11	34.4 %	34.4 %
6	7	21.9 %	56.3 %
8	14	43.8 %	100.0 %

EXPLORATORY DATA ANALYSIS

And Continuous variable(s) of interest in the **Variables** list can be **Split by** (given for different levels of) categorical variables.



Descriptives

Descriptives

	cyl	N	Missing	Mean	Median	SD	Minimum
mpg	4	11	0	26.7	26.0	4.51	21.4
	6	7	0	19.7	19.7	1.45	12.7
	8	14	0	15.1	15.2	2.56	9.8



Hypothesis Testing

We will now look at performing some common hypothesis testing methods:

- 1. A one-sample T-test**
- 2. An independent samples T-test**
- 3. An ANOVA**
- 4. Chi-square test**

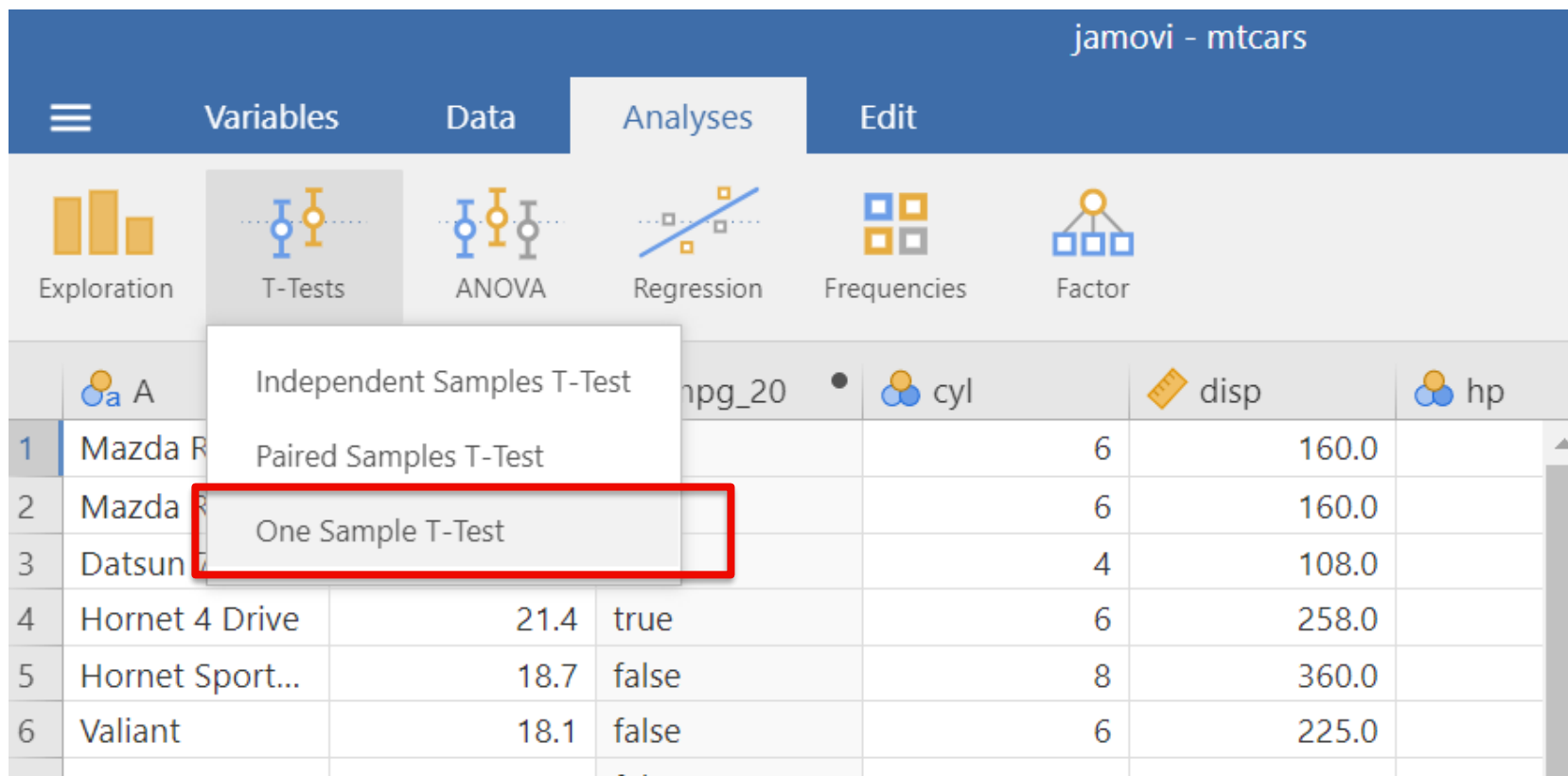


TESTING A SINGLE MEAN

Suppose we wanted to test whether the average fuel efficiency of the cars tested exceeds 15 miles per gallon.

We can use a one sample t-test to test this hypothesis.

To perform a one sample t-test select
Analyses; T-Tests; One Sample T-Test



The screenshot shows the Jamovi software interface with the 'Analyses' menu open. The 'One Sample T-Test' option is highlighted with a red rectangle. The background shows a dataset with columns 'mpg_20', 'cyl', 'disp', and 'hp'.

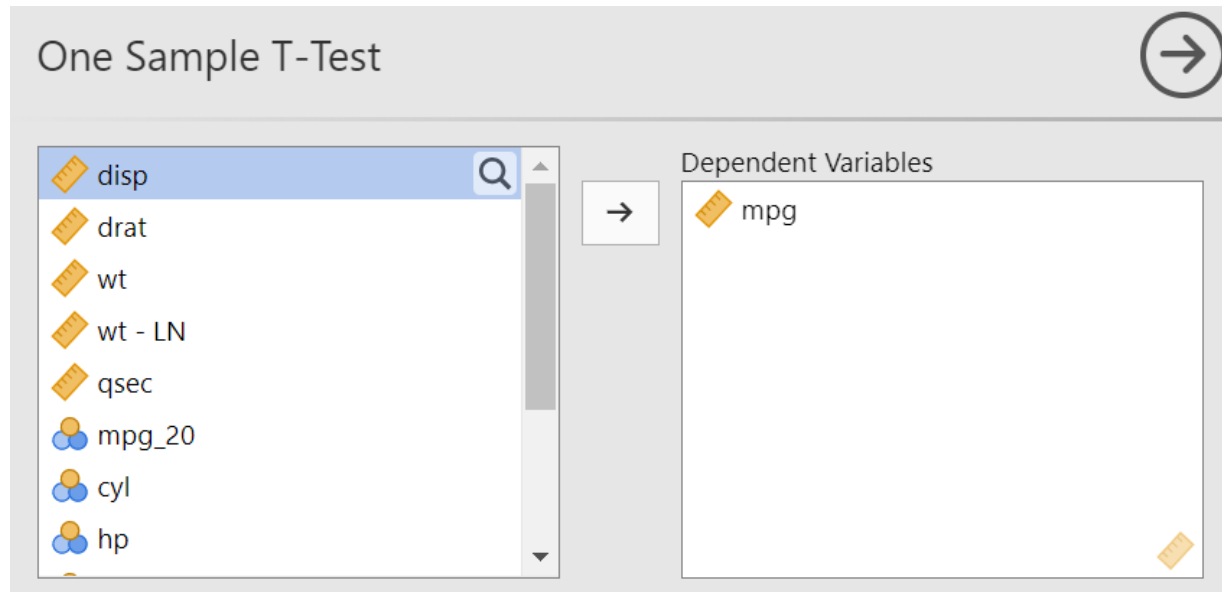
	A	mpg_20	cyl	disp	hp
1	Mazda R		6	160.0	
2	Mazda R		6	160.0	
3	Datsun		4	108.0	
4	Hornet 4 Drive	21.4	true	6	258.0
5	Hornet Sport...	18.7	false	8	360.0
6	Valiant	18.1	false	6	225.0



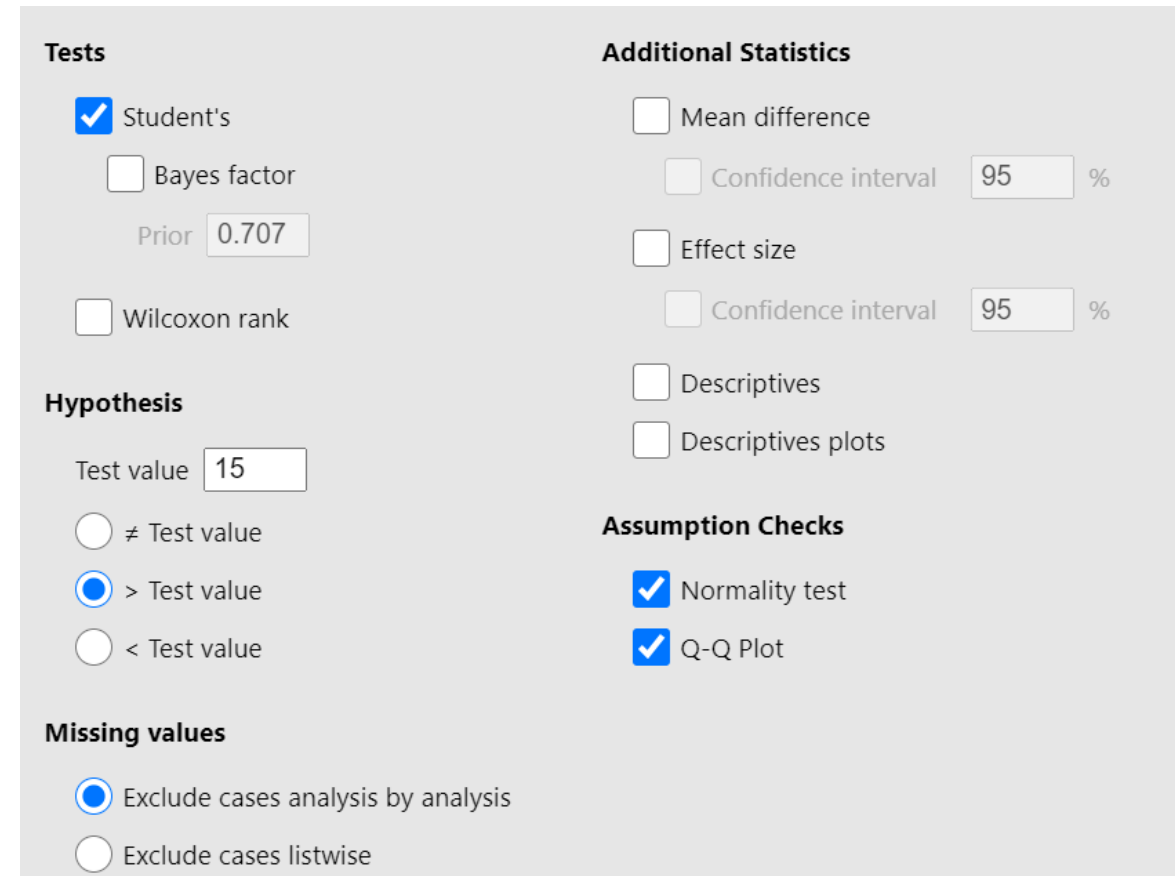
TESTING A SINGLE MEAN

To perform the hypothesis test, ensure **mpg** is placed in the **Dependent Variables** list, **Student's** is selected, the **Test value** is **15**, and the **> Test value** is selected.

To test the normality assumption, select **Normality test** and **Q-Q Plot**



The screenshot shows the 'One Sample T-Test' dialog box in SPSS. On the left, a list of variables includes 'disp', 'drat', 'wt', 'wt - LN', 'qsec', 'mpg_20', 'cyl', and 'hp'. The variable 'mpg' has been moved to the 'Dependent Variables' box on the right. A right-pointing arrow button is located between the two boxes.



This block contains two sub-dialogs from the SPSS interface. The 'Tests' sub-dialog on the left has 'Student's' selected with a checked checkbox, a 'Bayes factor' checkbox, a 'Prior' value of 0.707, and a 'Wilcoxon rank' checkbox. The 'Hypothesis' section shows 'Test value' set to 15, with radio buttons for ' \neq Test value', '> Test value' (which is selected), and '< Test value'. The 'Missing values' section has radio buttons for 'Exclude cases analysis by analysis' (selected) and 'Exclude cases listwise'. The 'Additional Statistics' sub-dialog on the right has checkboxes for 'Mean difference', 'Confidence interval' (set to 95%), 'Effect size', and 'Confidence interval' (set to 95%). It also has checkboxes for 'Descriptives' and 'Descriptives plots'. The 'Assumption Checks' section has checked checkboxes for 'Normality test' and 'Q-Q Plot'.



TESTING A SINGLE MEAN

The following output gets produced.

We conclude that the average fuel efficiency of the cars is significantly greater than 15mpg.

One Sample T-Test

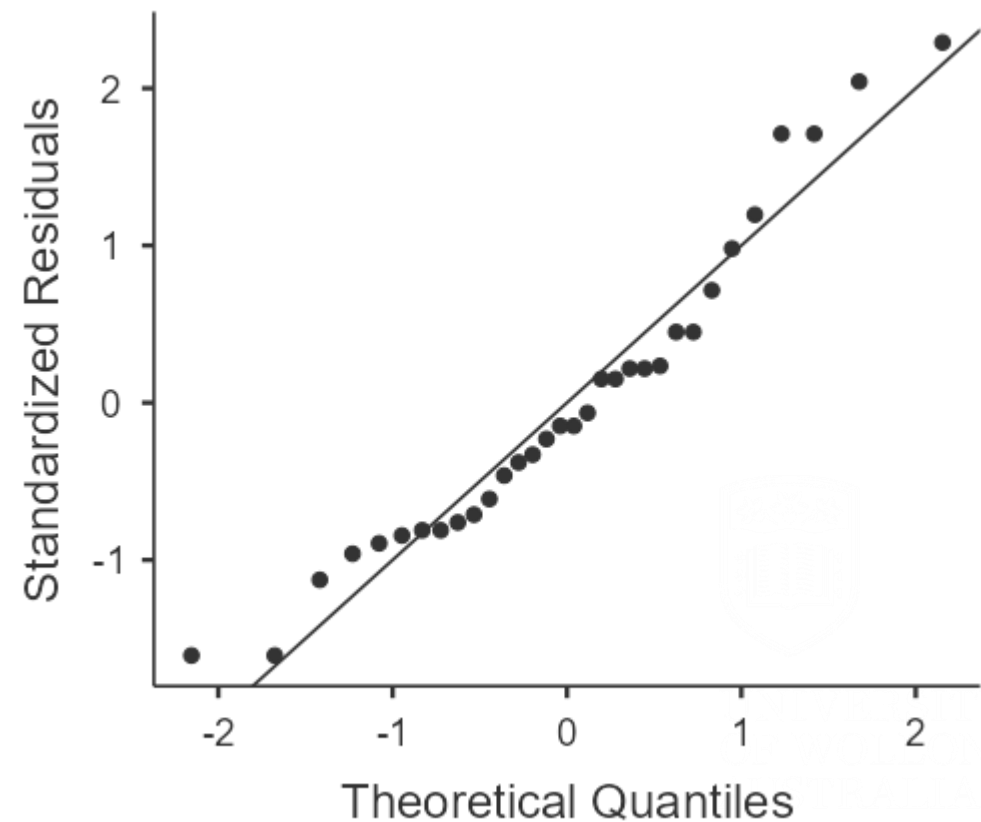
One Sample T-Test				
		Statistic	df	p
mpg	Student's t	4.78	31.0	< .001

Note. $H_a \mu > 15$

Normality Test (Shapiro-Wilk)		
	W	p
mpg	0.948	0.123

Note. A low p-value suggests a violation of the assumption of normality.

Results
Q-Q plots



TESTING A SINGLE MEAN

The non-parametric Wilcoxon rank test can also be performed.

Tests

☒ Student's

☐ Bayes factor

Prior

☒ Wilcoxon rank

One Sample T-Test

One Sample T-Test

		Statistic	df	p
mpg	Student's t	4.78	31.0	< .001
	Wilcoxon W	449		< .001

Note. $H_a: \mu > 15$



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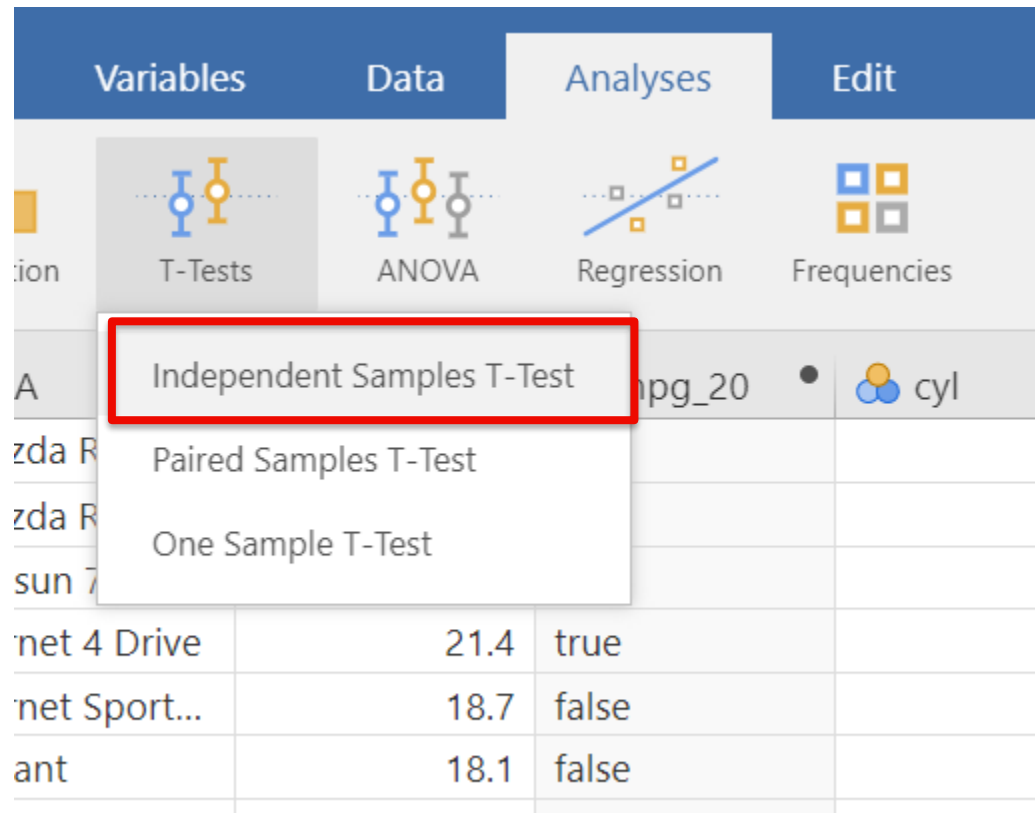
TESTING THE DIFFERENCE IN MEANS

Suppose we wanted to test whether the average fuel efficiency of the cars is significantly different between automatic and manual cars.

We can use an independent samples t-test to test this hypothesis.

To perform an independent samples t-test select

Analyses; T-Tests; Independent Samples T-Test



TESTING THE DIFFERENCE IN MEANS

To perform the hypothesis test, ensure **mpg** is placed in the **Dependent Variables** list and select **am** as the **Grouping Variable**.

Independent Samples T-Test

Dependent Variables

Grouping Variable

am

mpg

mpg_20

cyl

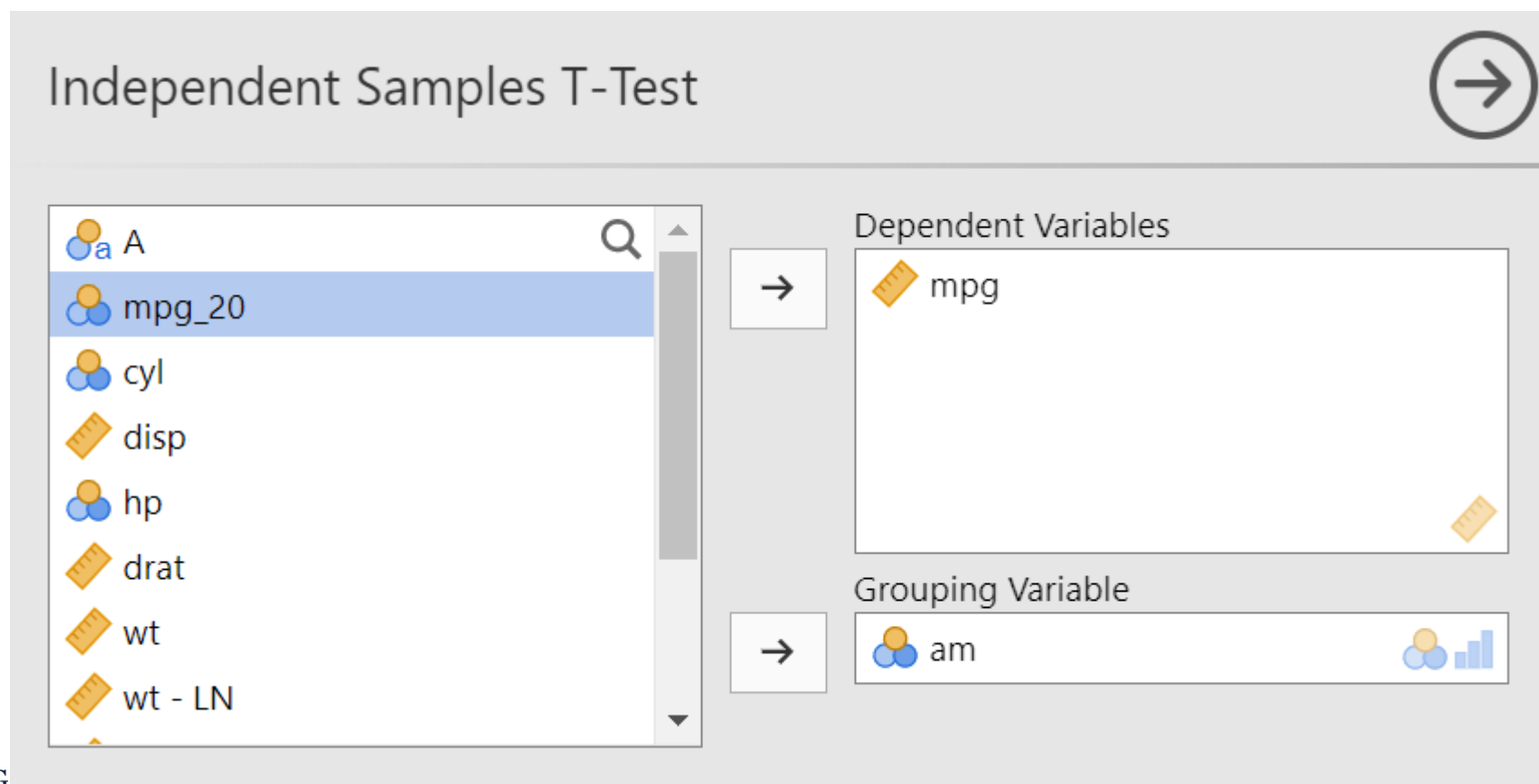
disp

hp

drat

wt

wt - LN



TESTING THE DIFFERENCE IN MEANS

Within the same menu we can determine the pooled, unpooled, and non-parametric statistic value and perform the Assumption Checks

Tests

☒ Student's **Pooled**

☐ Bayes factor

Prior

☒ Welch's **Unpooled**

☒ Mann-Whitney U **Non-parametric**

Additional Statistics

☐ Mean difference

☐ Confidence interval %

☐ Effect size

☐ Confidence interval %

☐ Descriptives

☒ Descriptives plots

Hypothesis

☒ Group 1 ≠ Group 2

☐ Group 1 > Group 2

☐ Group 1 < Group 2

Missing values

☒ Exclude cases analysis by analysis

☐ Exclude cases listwise

Assumption Checks

☒ Homogeneity test

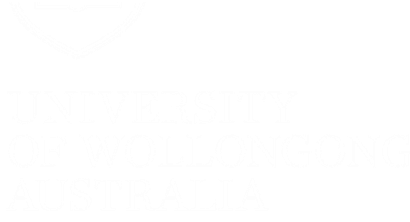
☒ Normality test

☒ Q-Q plot

Independent Samples T-Test

Independent Samples T-Test				
		Statistic	df	p
mpg	Student's t	-4.11 ^a	30.0	< .001
	Welch's t	-3.77	18.3	0.001
	Mann-Whitney U	42.0		0.002

^a Levene's test is significant (p < .05), suggesting a violation of the assumption of equal variances



TESTING THE DIFFERENCE IN MEANS

Diagnostics are also outputted.

Assumptions

Normality Test (Shapiro-Wilk)

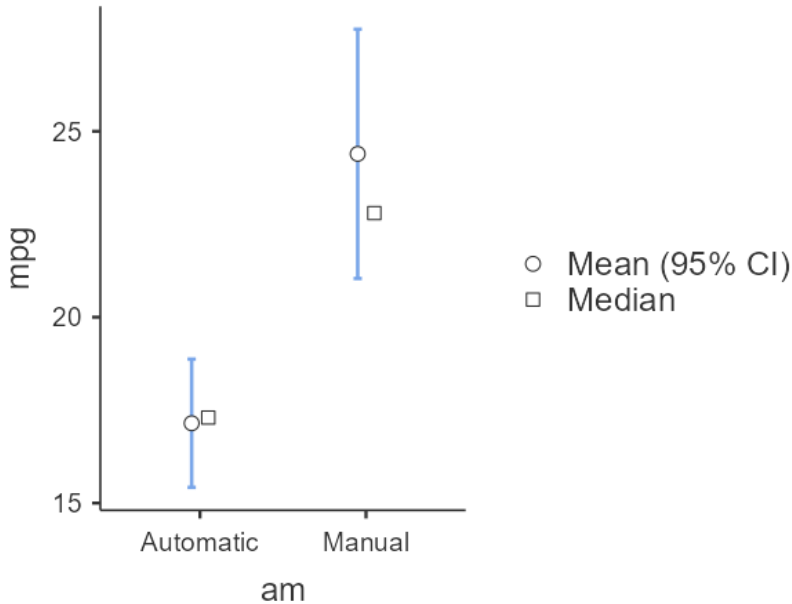
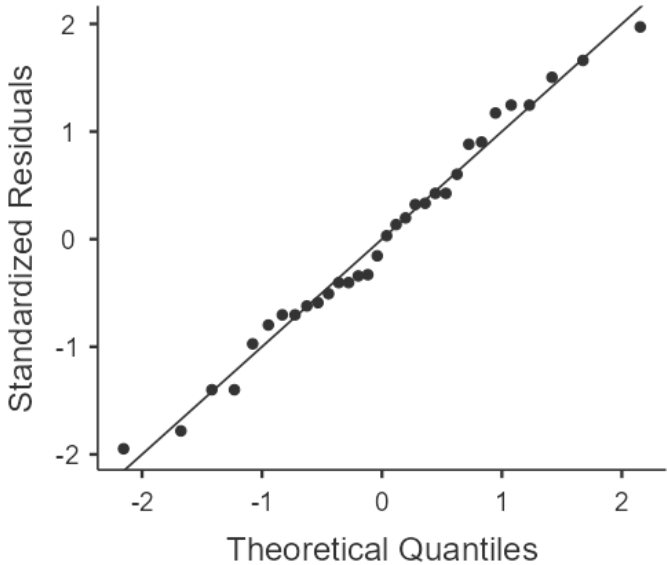
	W	p
mpg	0.982	0.857

Note. A low p-value suggests a violation of the assumption of normality

Homogeneity of Variances Test (Levene's)

	F	df	df2	p
mpg	5.92	1	30	0.021

Note. A low p-value suggests a violation of the assumption of equal variances



Based on the diagnostics we conclude that the Welch's (Unpooled) T-test is the most appropriate statistic to consider and conclude there is a significant difference in fuel efficiency between automatic and manual cars tested.

PERFORMING AN ANOVA

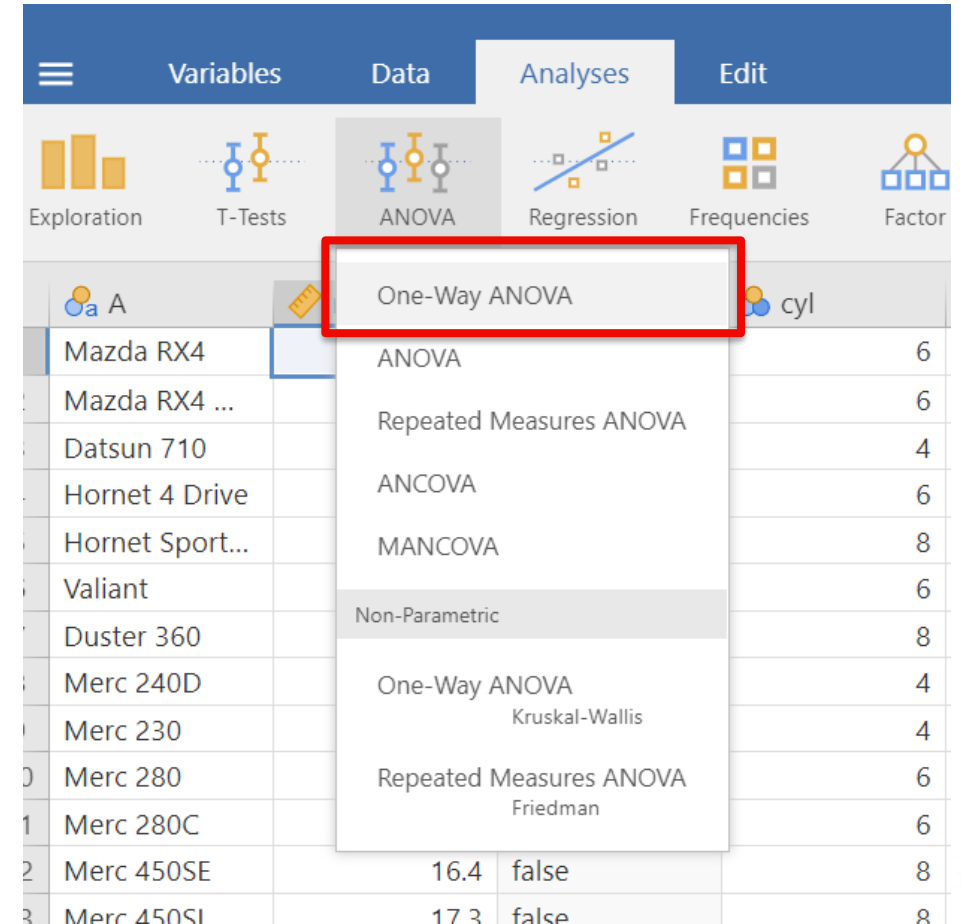
Suppose we wanted to test whether the fuel efficiency of the cars tested differed significantly between groups of cars with 4, 6, and 8 cylinders. We can use a one-way ANOVA to test this hypothesis.

**To perform a one-way ANOVA select
Analyses; ANOVA; One-Way ANOVA**

Note that options for other types of ANOVA including the non-parametric ANOVA are also available in jamovi.



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PERFORMING AN ANOVA

To calculate the ANOVA table, select **mpg** in the **Dependent Variables** list and **cyl** as the **Grouping Variable**.

One-Way ANOVA

Dependent Variables: mpg

Grouping Variable: cyl

Variances

- ☒ Don't assume equal (Welch's)
- ☒ Assume equal (Fisher's)

Missing Values

- ☒ Exclude cases analysis by analysis
- ☐ Exclude cases listwise

Additional Statistics

- ☐ Descriptives table
- ☒ Descriptives plots

Assumption Checks

- ☒ Homogeneity test
- ☒ Normality test
- ☒ Q-Q Plot

One-Way ANOVA

One-Way ANOVA

		F	df1	df2	p
mpg	Welch's	31.6	2	18.0	< .001
	Fisher's	39.7	2	29	< .001



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PERFORMING AN ANOVA

Assumption Check diagnostics are also outputted.

Assumption Checks

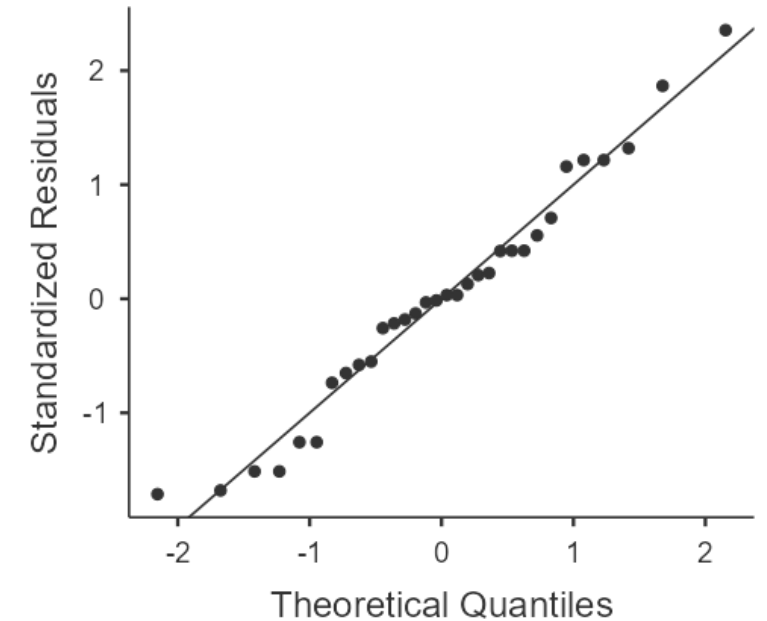
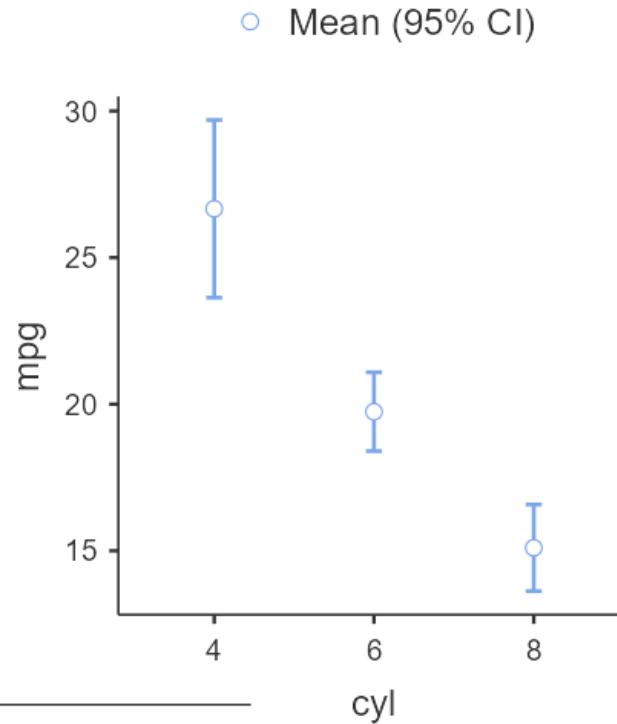
Normality Test (Shapiro-Wilk)

	W	p
mpg	0.971	0.538

Note. A low p-value suggests a violation of the assumption of normality

Homogeneity of Variances Test (Levene's)

	F	df1	df2	p
mpg	6.48	2	29	0.005



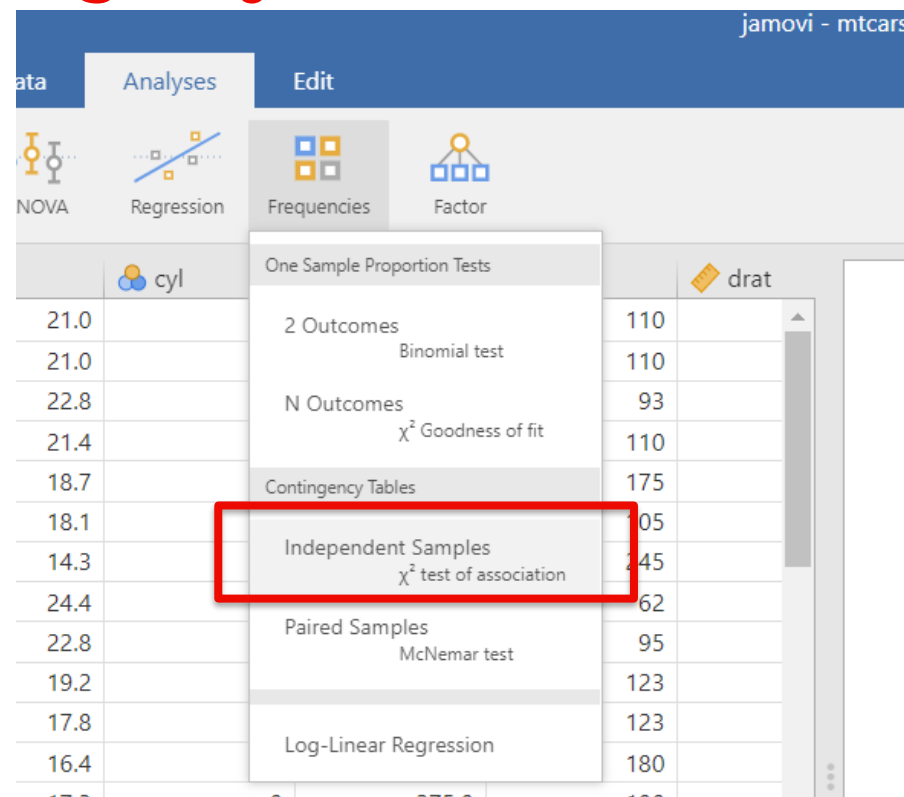
Based on the output we conclude that the Welch's test is the most appropriate statistic to consider and conclude there is a significant difference in fuel efficiency between cars with different numbers of cylinders.

[3]

TESTING ASSOCIATIONS WITH CHI-SQUARE

Suppose we wanted to test the association between number of gears (**gears**) and transmission type (**am**). Both variables are categorical, so we can use a **Chi-square test of independence** to test for an association.

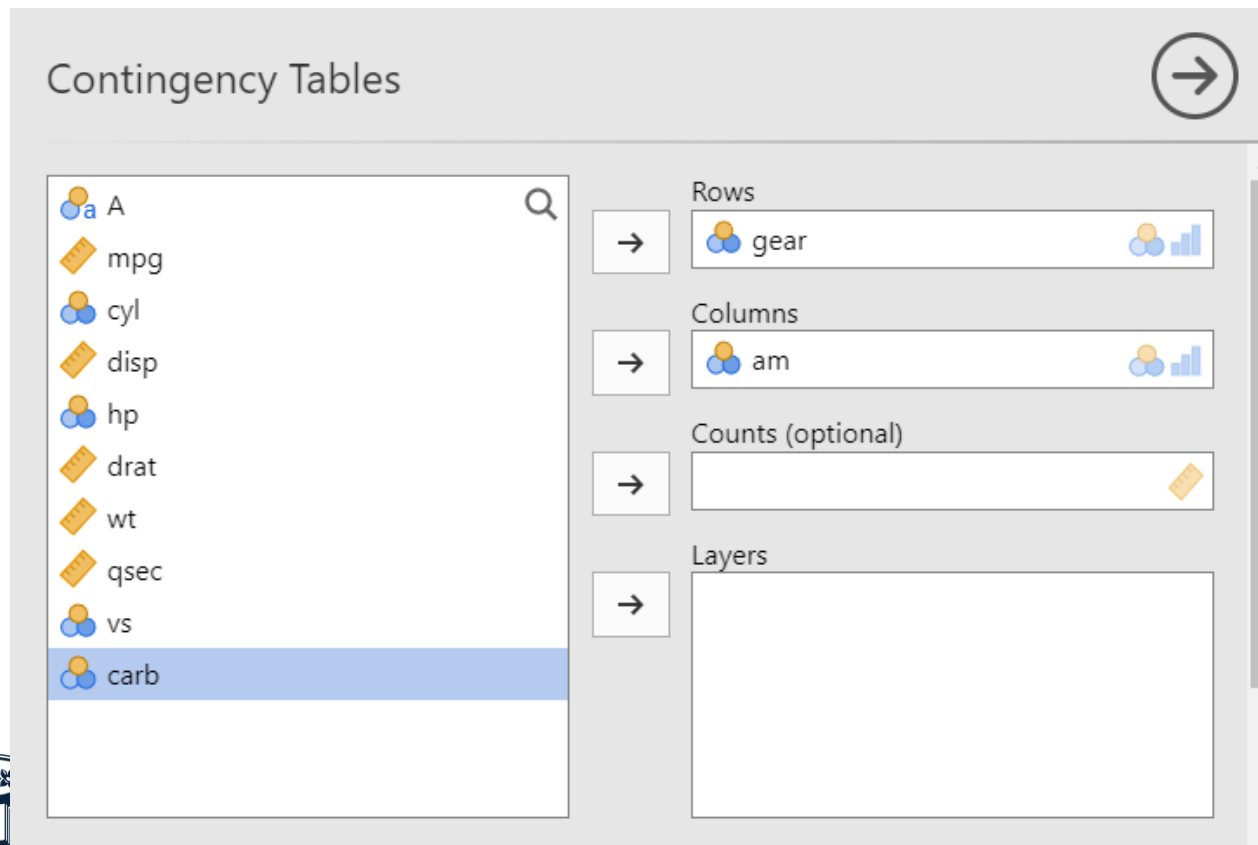
To perform a Chi-square test of independence select **Analyses; Frequencies;** and under **Contingency Tables** select **Independent Samples**



TESTING ASSOCIATIONS WITH CHI-SQUARE

Place **gear** under **Rows** and **am** under **Columns**

Contingency Tables



Rows: gear

Columns: am

Counts (optional):

Layers:

Contingency Tables

Contingency Tables

gear	am		Total
	Automatic	Manual	
3	15	0	15
4	4	8	12
5	0	5	5
Total	19	13	32

χ^2 Tests

	Value	df	p
χ^2	20.9	2	< .001
N	32		



TESTING ASSOCIATIONS WITH CHI-SQUARE

To view expected counts and total percentages select the following under the **Cells** tab.

▼ | Cells

Counts
☒ Observed counts
☒ Expected counts

Percentages
☐ Row
☐ Column
☒ Total

Contingency Tables

Contingency Tables

gear		am		Total
		Automatic	Manual	
3	Observed	15	0	15
	Expected	8.91	6.09	15.00
	% of total	46.9 %	0.0 %	46.9 %
4	Observed	4	8	12
	Expected	7.13	4.88	12.00
	% of total	12.5 %	25.0 %	37.5 %
5	Observed	0	5	5
	Expected	2.97	2.03	5.00
	% of total	0.0 %	15.6 %	15.6 %
Total	Observed	19	13	32
	Expected	19.00	13.00	32.00
	% of total	59.4 %	40.6 %	100.0 %



TESTING ASSOCIATIONS WITH CHI-SQUARE

To also calculate the Fishers exact statistic, select the option under the **Statistics** tab.

Statistics

Tests

- ☒ χ^2
- ☐ χ^2 continuity correction
- ☐ Likelihood ratio
- ☒ Fisher's exact test
- ☐ z test for difference in 2 proportions

Comparative Measures (2x2 only)

- ☐ Odds ratio
- ☐ Log odds ratio
- ☐ Relative risk
- ☐ Difference in proportions
- ☒ Confidence intervals

Interval %

Compare

Hypothesis

- ☒ Group 1 \neq Group 2
- ☐ Group 1 > Group 2
- ☐ Group 1 < Group 2

Nominal

- ☐ Contingency coefficient
- ☐ Phi and Cramer's V

Ordinal

- ☐ Gamma
- ☐ Kendall's tau-b
- ☐ Mantel-Haenszel

χ^2 Tests

	Value	df	p
χ^2	20.9	2	< .001
Fisher's exact test			< .001
N	32		

TESTING ASSOCIATIONS WITH CHI-SQUARE

Bar plots can also be generated under the **Plots** tab.

Plots

☒ Bar Plot

Bar Type

☒ Side by side

☐ Stacked

Y-Axis

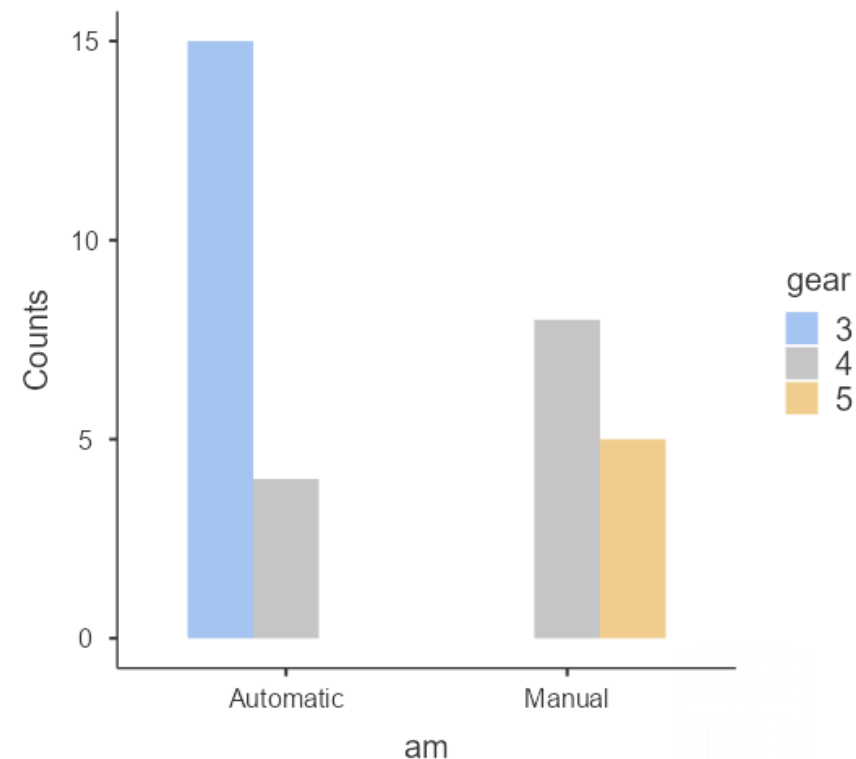
☒ Counts

☐ Percentages of total

X-Axis

☐ Rows

☒ Columns



Regression Models

Various regression and correlation options are available in the **Regression module.**

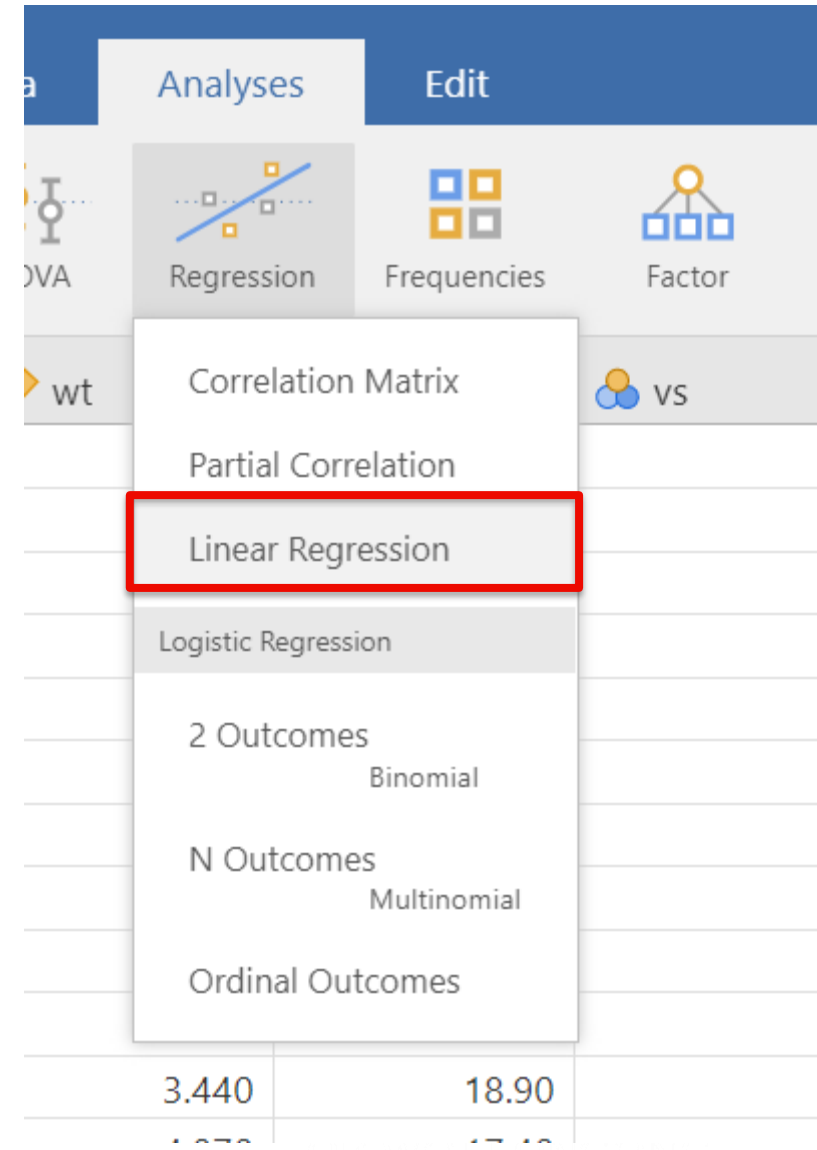
Suppose we wanted to model fuel efficiency (**mpg**) with respect to horsepower (**hp**), weight (**wt**), and transmission type (**am**).

We can fit a linear regression model by selecting:

Analyses; Regression; Linear Regression.



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FITTING A LINEAR REGRESSION MODEL

Suppose we wanted to model fuel efficiency (mpg) with respect to horsepower (hp), weight (wt), and transmission type (am).

Place **mpg** as the **Dependent Variable**, **hp** and **wt** under **Covariates** and **am** under **Factors**

Linear Regression

Dependent Variable: mpg

Covariates: hp, wt

Factors: am

Weights (optional):

Linear Regression

Model Fit Measures

Model	R	R ²
1	0.916	0.840

Model Coefficients - mpg

Predictor	Estimate	SE	t	p
Intercept ^a	34.0029	2.64266	12.87	< .001
hp	-0.0375	0.00961	-3.90	< .001
wt	-2.8786	0.90497	-3.18	0.004
am:				
Manual – Automatic	2.0837	1.37642	1.51	0.141

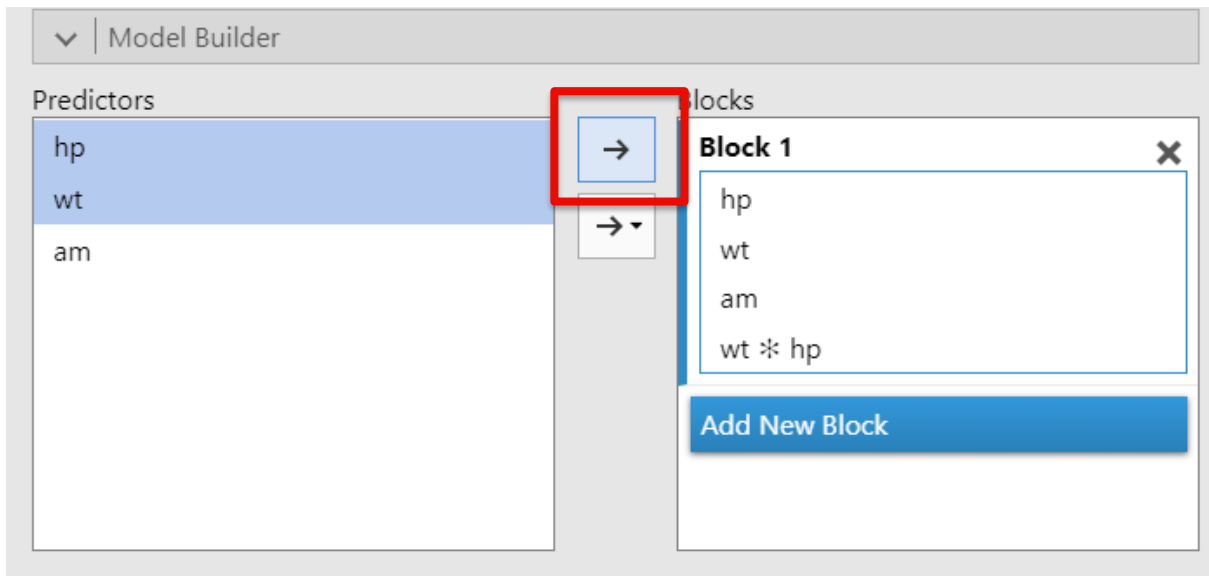
^a Represents reference level



FITTING A LINEAR REGRESSION MODEL

We can add interaction terms by selecting multiple variables under the **Model Builder** tab and arrowing them across.

Suppose we wanted to include a $hp*wt$ interaction term.



Model Coefficients - mpg

Predictor	Estimate	SE	t	p
Intercept ^a	49.4522	5.28073	9.3647	< .001
hp	-0.1193	0.02655	-4.4935	< .001
wt	-8.1006	1.78933	-4.5272	< .001
am:				
Manual – Automatic	0.1251	1.33343	0.0938	0.926
wt * hp	0.0275	0.00847	3.2444	0.003

^a Represents reference level



FITTING A LINEAR REGRESSION MODEL

Assumptions can also be checked with options under the **Assumption Checks** tab.

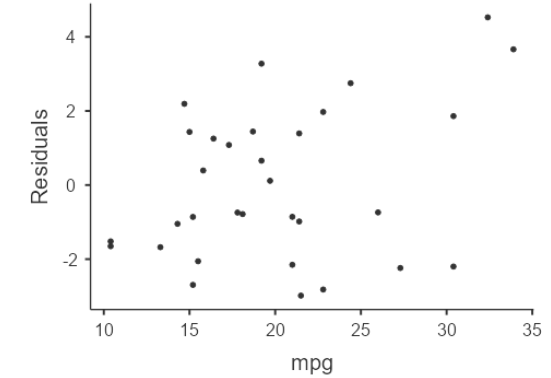
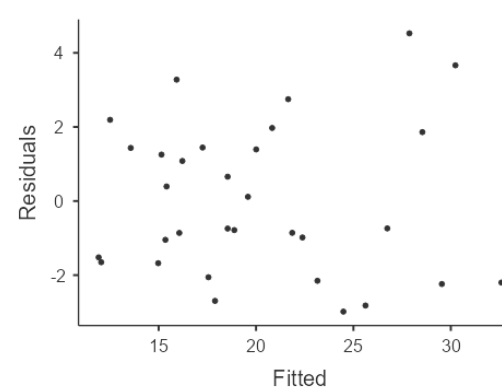
▼ | Assumption Checks

Assumption Checks

- ☐ Autocorrelation test
- ☐ Collinearity statistics
- ☒ Normality test
- ☒ Q-Q plot of residuals
- ☒ Residual plots

Data Summary

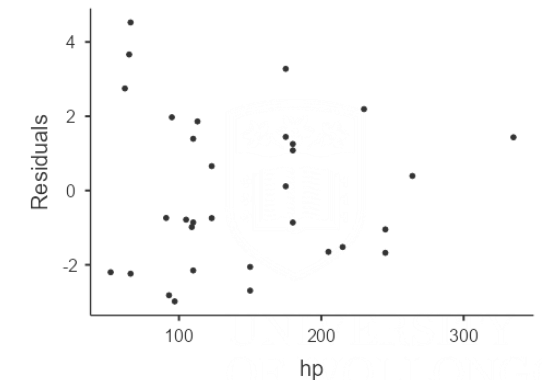
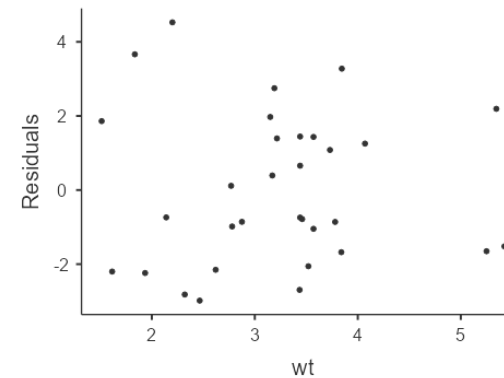
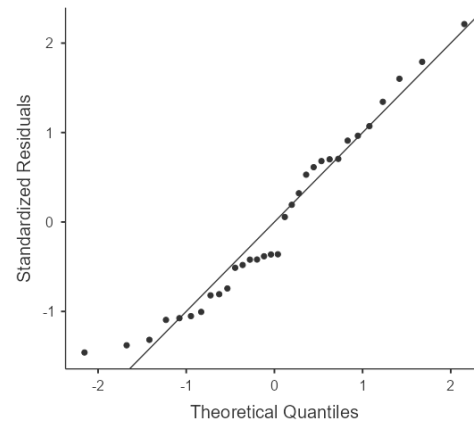
- ☐ Cook's distance



Assumption Checks

Normality Test (Shapiro-Wilk)

Statistic	p
0.951	0.157



FITTING A LINEAR REGRESSION MODEL

Model fit measures and more detail for the model coefficients can be obtained under the **Model Fit** and **Model Coefficients** tabs respectively

Model Fit

Fit Measures

☒ R

☒ R²

☐ Adjusted R²

☒ AIC

☐ BIC

☒ RMSE

Overall Model Test

☐ F test

Model Coefficients

Omnibus Test

☒ ANOVA test

Estimate

☒ Confidence interval

Standardized Estimate

☐ Standardized estimate

☐ Confidence interval

Interval %

Linear Regression

Model Fit Measures

Model	R	R ²	AIC	RMSE
1	0.941	0.885	148	2.01

Omnibus ANOVA Test

	Sum of Squares	df	Mean Square	F	p
hp	97.0098	1	97.0098	20.19181	< .001
wt	98.4672	1	98.4672	20.49516	< .001
am	0.0423	1	0.0423	0.00880	0.926
wt * hp	50.5719	1	50.5719	10.52612	0.003
Residuals	129.7192	27	4.8044		

Note. Type 3 sum of squares

FITTING A LINEAR REGRESSION MODEL




Predicted values, Residuals and Cooks Distances can all be outputted under the **Save** tab for further analysis.

▼ | Save

☒ Predicted values

☒ Residuals

☒ Cook's distance

 Predicted ...	 Residuals	 Cook's dis...
	-2.153	0.032
	-0.858	0.009
	-2.820	0.036
	1.393	0.008
	1.444	0.008
	-0.784	0.003
	-1.047	0.015
	2.749	0.060
	1.972	0.018
	0.657	0.002
	-0.743	0.002
	1.254	0.005
	1.082	0.003
	-0.861	0.002
	-1.651	0.050

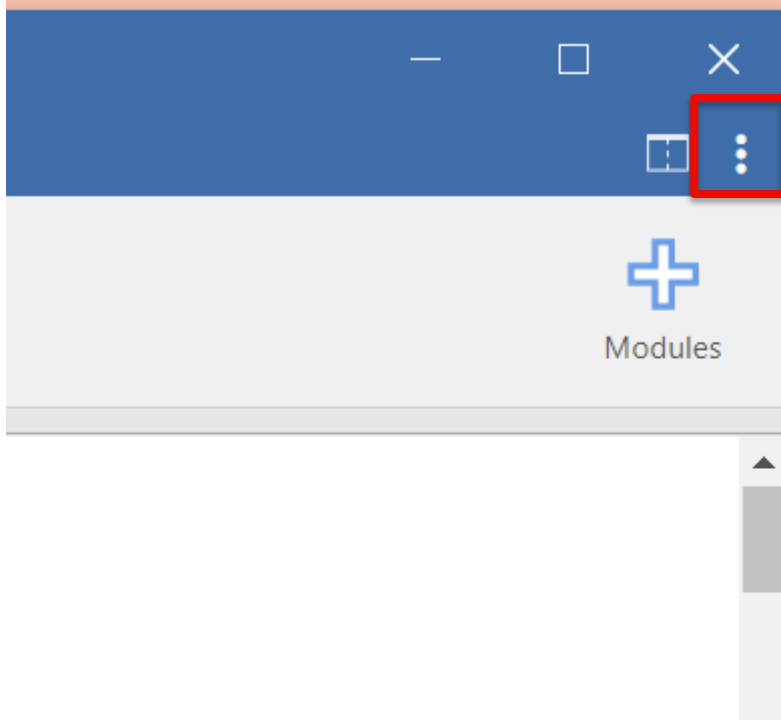


Programming with R in jamovi

- All calculations and outputs produced by jamovi are actually produced by R code.
- This mean ALL analysis in jamovi can be reproduced in R.
- R code can be called from within jamovi.
- You can load in data to R directly from jamovi using the **jmvconnect** package.



To see the R code used to produce the jamovi output select the three vertical dots in the top right corner of the window and select **Syntax mode**



Results

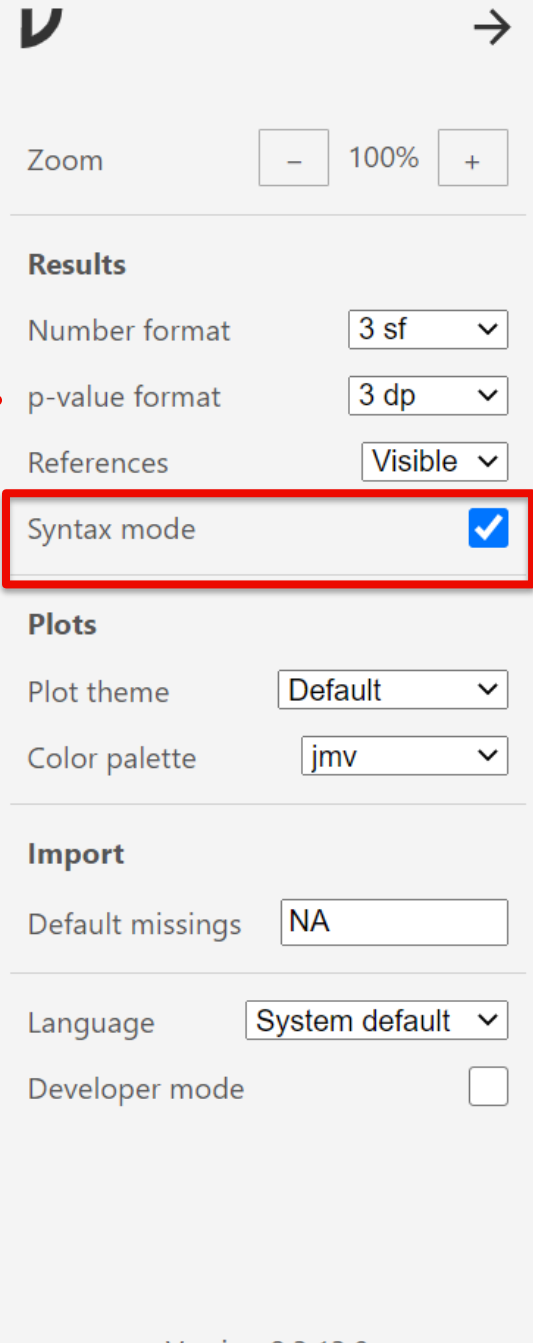
Descriptives

R code to produce the descriptives table.

```
jmv::descriptives(  
  data = data,  
  vars = mpg,  
  hist = TRUE,  
  dens = TRUE,  
  box = TRUE,  
  violin = TRUE,  
  dot = TRUE,  
  boxMean = TRUE)
```

Descriptives

	mpg
N	32
Missing	0
Mean	20.1
Median	19.2
Standard deviation	6.03
Minimum	10.4
Maximum	33.9



To load data directly into R from jamovi use the jmvconnect commands below.

```
> jmvconnect::what()
```

Available Data Sets

	Title	Rows	Cols
1	mtcars	32	12

```
> data <- jmvconnect::read(1)
```



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Then you can run code directly from the syntax.

```
> jmv::descriptives(  
+   data = data,  
+   vars = mpg,  
+   hist = TRUE,  
+   dens = TRUE,  
+   box = TRUE,  
+   violin = TRUE,  
+   dot = TRUE,  
+   boxMean = TRUE)
```

DESCRIPTIVES

Descriptives

mpg	
N	32
Missing	0
Mean	20.09062
Median	19.20000
Standard deviation	6.026948
Minimum	10.40000
Maximum	33.90000

To run R code in jamovi, you need to add the **Rj Editor** Module

Rj Editor

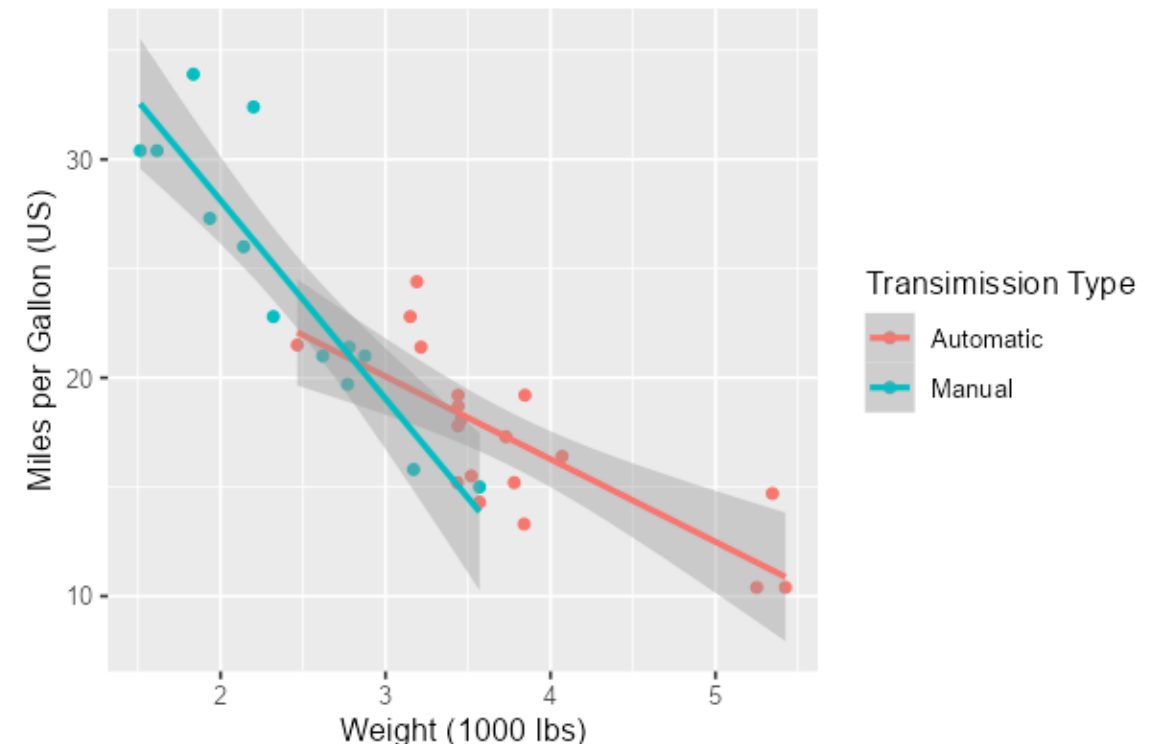


Here we have used R code to produce a better plot

```
1  
2 # summary(data[1:3])  
3 library(ggplot2)  
4 ggplot(data)+  
5   geom_point(aes(x=wt,y=mpg,col=am))+  
6   geom_smooth(aes(x=wt,y=mpg,group=am,col=am),  
7               formula = 'y~x',method="lm")+  
8   labs(title = "Fuel Efficiency (mpg) vs Weight (1000 lbs)  
9         by Transmission Type",  
10        x="Weight (1000 lbs)", y="Miles per Gallon (US)",  
11        col="Transmission Type")|
```



Fuel Efficiency (mpg) vs Weight (1000 lbs)
by Transmission Type



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Other Useful Modules

- **gamlj** – general analysis for linear models (includes mixed modeling and GAMs).
- **walrus** – robust statistical methods.
- **deathwatch** or **jsurvival** – survival analysis software.
- **jpowers** – power calculations.
- **semj** – **SEM** – structural equation modelling.
- **jsq** – Bayesian modelling
- **MAJOR** – meta-analysis software.
- **snowCluster** – clustering software.
- **MORE**



U

Where to from here...

O



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W

Where to from here: Short courses

- Introduction to R/Rstudio online:
- Introduction to JAMOVl:
- Advertised in Universe \$100 and on our website <https://www.uow.edu.au/niasra/>
- Introduction to Data Science and Machine Learning for Health and Social Sciences: 2 days \$220
- GRS Seminars
 1. Introduction to Methods – **Tuesday 30th August**
 2. Common Mistakes in Statistics – **Tuesday 20th September**
- Statistical Consulting Centre (individual advice on your needs)
- <https://www.uow.edu.au/niasra/>
- Introduction to Jamovi
 - <https://www.linkedin.com/learning/introduction-to-jamovi/introduction-to-jamovi>

A BIT ABOUT THE STATISTICAL CONSULTING CENTRE...

Prof. Marijka Batterham

• **Director**

Brad Wakefield

• **Consultant**

Aim

The service aims to improve the statistical content of research carried out by members of the University. Researchers from all disciplines may use the Centre. Priority is currently given to staff members and postgraduate students undertaking research for Doctor of Philosophy or Masters' degrees.

How we can help

Currently the Statistical Consulting Centre provides each researcher with a free initial consultation. Up to ten hours per calendar year of consulting time is provided without charge if research funding is not available. When researchers require more consulting time, or receive external funding, a service charge may be necessary.



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To learn more or book an appointment

<https://www.uow.edu.au/niasra/our-research/statistical-consulting-centre/>