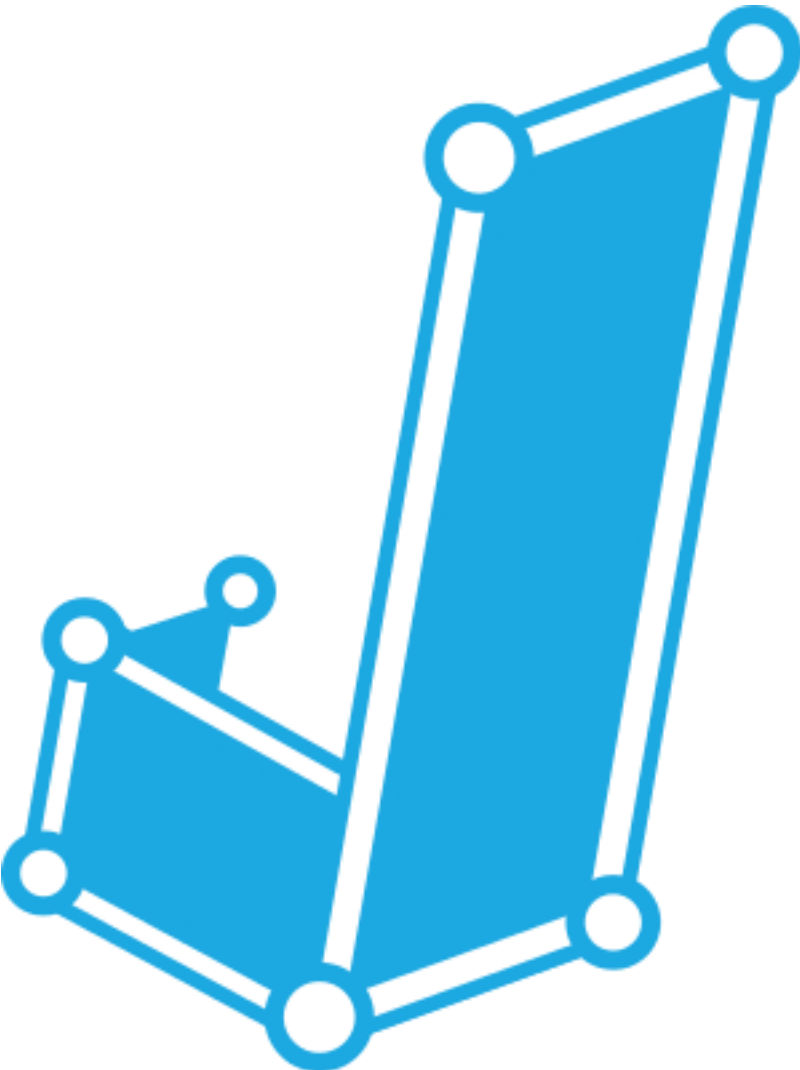


# JASP Manual



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Department of Psychology  
2018

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## Welcome to JASP!

The following manual is intended to guide you through running various statistical analyses. We have provided step-by-step instructions on how to run each test along with pictures for you to reference.

## What is JASP?

JASP stands for Jeffreys' Amazing Statistical Program, after the Bayesian pioneer Sir Harold Jeffreys. It is a new, intuitive substitute for statistical programs, like SPSS. Unlike other programs commonly used in research labs, colleges, and universities, JASP is completely free. It is an open-source program supported by the University of Amsterdam, developed with the user in mind. Gone are the days of entering in code to run a program. JASP utilizes a point-and-click user interface to make analysis fun and easy.

## What functions can JASP perform?

JASP offers both classical and Bayesian analysis procedures. A complete list of the functionality is included below:

Analysis	Classical	Bayesian
ANOVA	✓	✓
ANCOVA	✓	✓
Binomial Test	✓	✓
Multinomial Test	✓	
Contingency Tables (Chi-squared included)	✓	✓
Correlation: Pearson, Spearman, Kendall	✓	✓
Exploratory Factor Analysis (EFA)	✓	
Linear Regression	✓	✓
Log-Linear Regression	✓	✓
Logistic Regression	✓	
Principal Component Analysis (PCA)	✓	
Repeated Measures ANOVA	✓	✓
Reliability Analyses: $\alpha$ , $\gamma\delta$ , and $\omega$	✓	
Structural Equation Modeling (SEM)	✓	
Summary Statistics		✓
T-Tests: Independent, Paired, One-Sample	✓	✓

It's important to remember that as an open-source program, JASP is constantly evolving based on the needs of its users. If you see an analysis is missing, their website offers a link to submit a feature request: <https://jasp-stats.org/feature-requests-bug-reports/>.

Another important feature to point out is all of the output tables are in APA format. This makes it easy to copy and paste tables directly from your JASP output.

### **What are some of the limitations?**

As a result of the program constantly increasing its repertoire of analyses, it's important to check the JASP website for updated software. Also remember to consider the version your class or instructor is using when you download the software. **IMPORTANT: JASP does not offer automatic system updates.**

You cannot directly import data from excel. In order to import your data, you must save your file as a .csv file, then open the file in JASP. Step-by-step directions are provided for you reference.

## Frequently Asked Questions (FAQ):

*How do I cite JASP?*

JASP Team (2018). JASP (Version 0.9)[Computer software].

And the BibTeX entry :

```
@MISC{JASP2017,  
AUTHOR = {{JASP Team}},  
TITLE = {{JASP (Version 0.8.4)[Computer software]}},  
YEAR = {2017},  
URL = {https://jasp-stats.org/}
```

*What programming language is JASP written in?*

JASP is written in C++, R, and javascript.

*What do the symbols in the corner of variable boxes represent?*

These symbols tell you what type of variable (scale, ordinal, or categorical) can go in the particular category.




*Is there anything JASP cannot do at this point?*

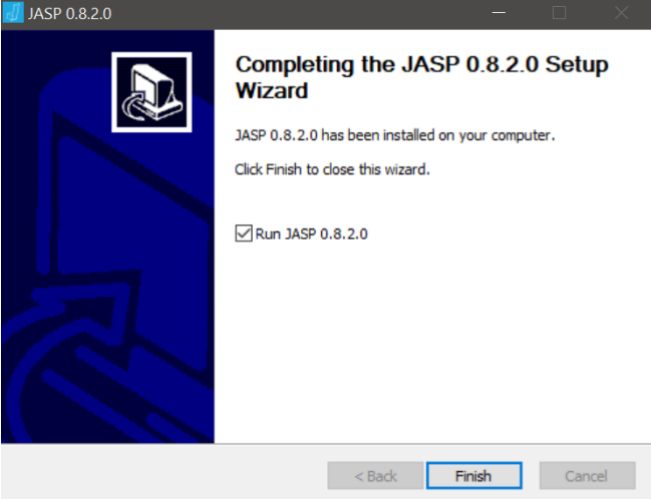
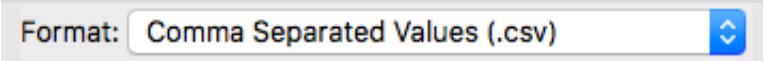









At present, JASP does not have a sufficient system for producing histograms. It is better to utilize excel for this feature. JASP also does not run a MANOVA or MANCOVA.

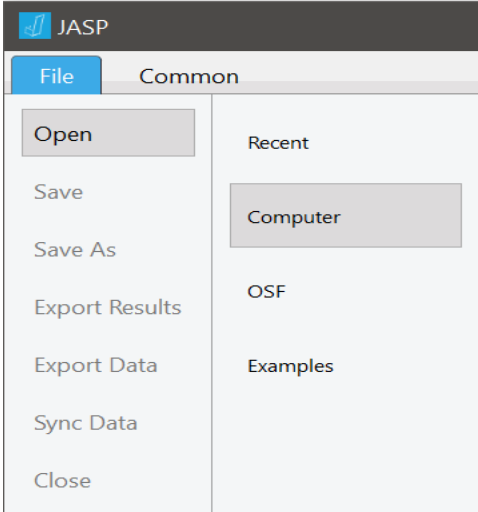
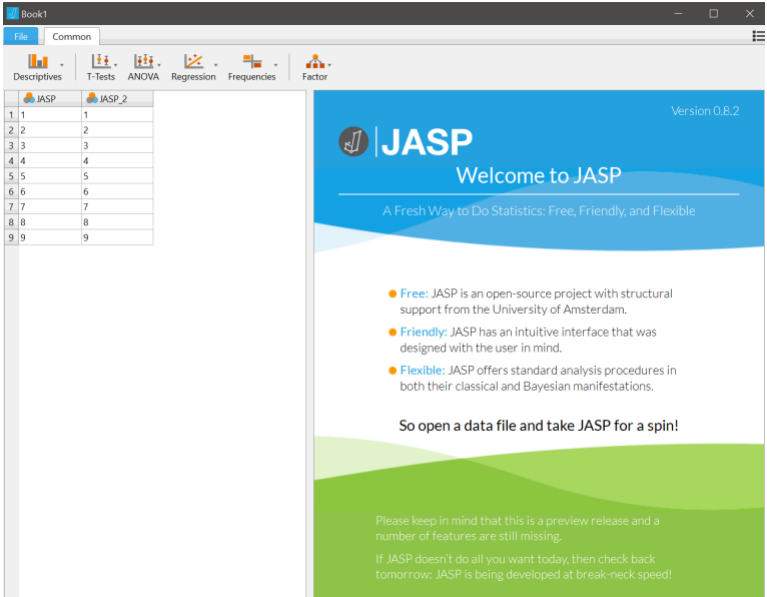
*How do I save my output?*

There are a few different options. (1) You can save your output in JASP. Simply, select File > Save and select a destination. (2) You can export your data. At the moment, JASP only allows you to export the output as an HTML file, meaning you can only open it in a web browser. However, you are still able to print this page normally. (3) You can copy and paste your output from JASP into word. Simply, click the downward arrow next to the analysis test name and select copy, then paste your output into Word or PowerPoint.

# Introduction to JASP

Step	Action	Result
<b>Downloading JASP</b>		
<p>1.</p>	<p>Open web browser (recommended: Google Chrome) and type in <a href="https://jasp-stats.org/download/">https://jasp-stats.org/download/</a></p>	 <p>The screenshot shows the JASP website homepage. The navigation bar includes links for GETTING STARTED, ADVISORY BOARD, SPONSORS, ABOUT, FAQ, NEWSLETTER, CONTACT, and DONATE. The main content area features the JASP logo and navigation links for HOME, DOWNLOAD, WORKSHOPS, VIDEOS, TEACHING, and BLOG. Below this, it states 'JASP is available for:' followed by icons for Microsoft Windows, Mac OS X, and Linux. The version 'JASP 0.8.2' is prominently displayed, along with the release date 'RELEASED August 21th, 2017.' and a brief description of new features.</p>
<p>2.</p>	<p>Select your OS (whether Windows or MAC) and click “Download.” If you have a Linux processor, continue to the download instructions listed on the webpage.</p>	 <p>This screenshot shows the download section of the JASP website. It lists 'JASP 0.8.2' and 'RELEASED August 21th, 2017.' Below this, there are two main download options: 'Microsoft Windows' with a download button and 'Mac OS X' with a download button. There are also links for 'Advanced downloads', 'Previous versions', and 'Release notes'. An 'Installation Notes' section is visible, providing instructions for Mac OS X users to have XQuartz installed.</p>
<p>3.</p>	<p>As the file downloads, open file, and select “YES” to run the installation, and then click “Next” and “I Agree.”</p>	 <p>The screenshot shows the 'Welcome to the JASP 0.8.2.0 Setup Wizard' window. The window title is 'JASP 0.8.2.0'. The main text reads: 'This wizard will guide you through the installation of JASP 0.8.2.0. It is recommended that you close all other applications before starting Setup. This will make it possible to update relevant system files without having to reboot your computer. Click Next to continue.' At the bottom, there are 'Next &gt;' and 'Cancel' buttons.</p>

Step	Action	Result																																
4.	Select "Finish"																																	
<b>Importing Data Into JASP</b>																																		
1.	<p>In order to analyze data in JASP, the file must be in CSV format.</p> <p>To convert an Excel, or spreadsheet File into a CSV extension file, click "File," "Save As" and "CSV" and save the file somewhere on your computer.</p>																																	
2.	The top row in your excel file will become your variable names once the file is opened in JASP.	<table border="1" data-bbox="771 1203 1284 1360"> <thead> <tr> <th></th> <th>Diet</th> <th>Crackers</th> <th>Calories</th> </tr> </thead> <tbody> <tr> <td></td> <td>1</td> <td>1</td> <td>850</td> </tr> <tr> <td></td> <td>1</td> <td>1</td> <td>875</td> </tr> <tr> <td></td> <td>1</td> <td>1</td> <td>825</td> </tr> </tbody> </table> <table border="1" data-bbox="771 1377 1531 1635"> <thead> <tr> <th></th> <th> Diet</th> <th> Crackers</th> <th> Calories</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1</td> <td>1</td> <td>850</td> </tr> <tr> <td>2</td> <td>1</td> <td>1</td> <td>875</td> </tr> <tr> <td>3</td> <td>1</td> <td>1</td> <td>825</td> </tr> </tbody> </table>		Diet	Crackers	Calories		1	1	850		1	1	875		1	1	825		 Diet	 Crackers	 Calories	1	1	1	850	2	1	1	875	3	1	1	825
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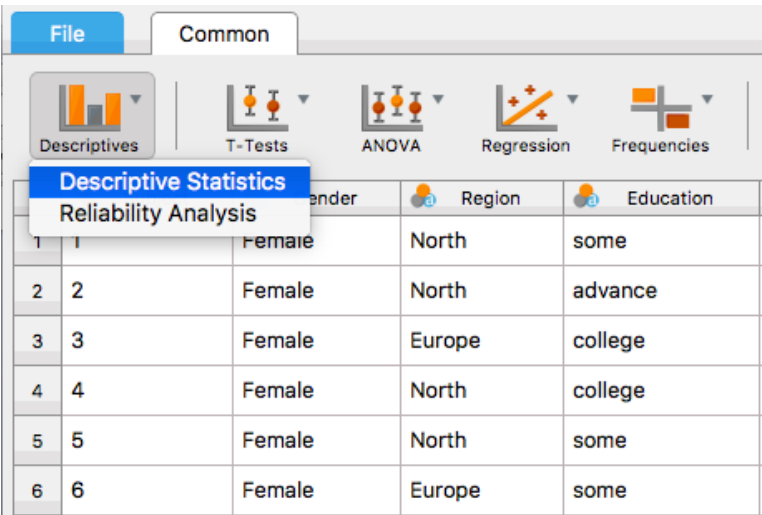
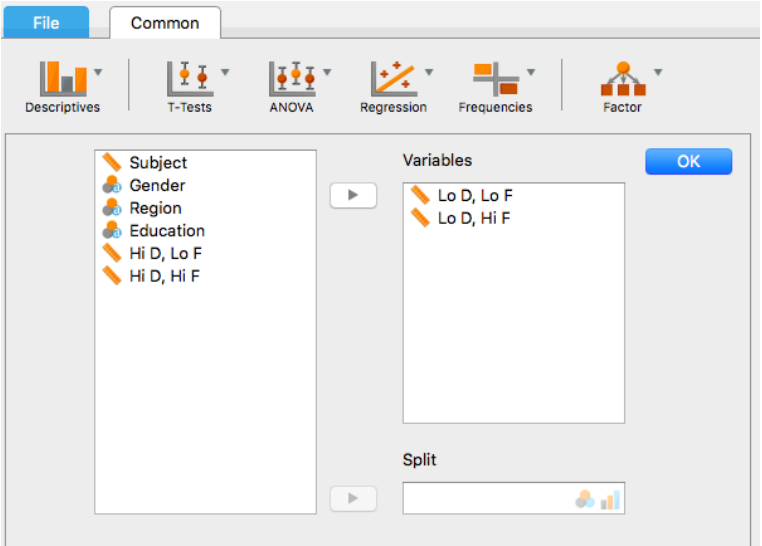
Step	Action	Result																											
3.	<p>To import into JASP, open JASP select “File,” “Open,” and “Computer” and select the saved CSV File.</p> <p>For this manual, will we be using the Examples that JASP includes. To follow along, this is where we would click “Examples” and select the appropriate file for the test we are conducting.</p>	 <p>The screenshot shows the JASP application window with the 'File' menu open. The 'Common' tab is selected. The 'Open' option is highlighted, and the 'Computer' option is selected in the submenu. Other options visible in the submenu include 'Recent', 'OSF', and 'Examples'.</p>																											
4.	<p>Once the file is open, the data should appear in the “Common” tab.</p>	 <p>The screenshot shows the JASP main interface. On the left, a data table is displayed with the following content:</p> <table border="1" data-bbox="769 905 919 1058"> <tr><td>1</td><td>1</td><td>1</td></tr> <tr><td>2</td><td>2</td><td>2</td></tr> <tr><td>3</td><td>3</td><td>3</td></tr> <tr><td>4</td><td>4</td><td>4</td></tr> <tr><td>5</td><td>5</td><td>5</td></tr> <tr><td>6</td><td>6</td><td>6</td></tr> <tr><td>7</td><td>7</td><td>7</td></tr> <tr><td>8</td><td>8</td><td>8</td></tr> <tr><td>9</td><td>9</td><td>9</td></tr> </table> <p>On the right, a 'Welcome to JASP' message is displayed. The message includes the following text:</p> <p><b>Free:</b> JASP is an open-source project with structural support from the University of Amsterdam.</p> <p><b>Friendly:</b> JASP has an intuitive interface that was designed with the user in mind.</p> <p><b>Flexible:</b> JASP offers standard analysis procedures in both their classical and Bayesian manifestations.</p> <p><b>So open a data file and take JASP for a spin!</b></p> <p>Please keep in mind that this is a preview release and a number of features are still missing.</p> <p>If JASP doesn't do all you want today, then check back tomorrow: JASP is being developed at break-neck speed!</p>	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5	6	6	6	7	7	7	8	8	8	9	9	9
1	1	1																											
2	2	2																											
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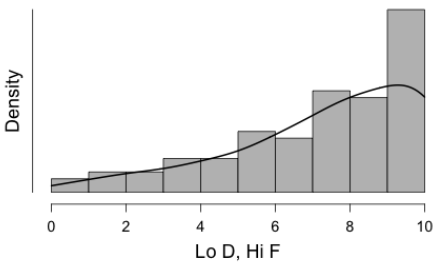
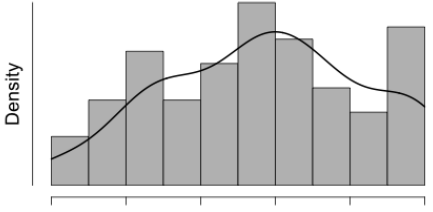
*End of procedure*



# Descriptive Statistics

Descriptive statistics and reliability tell us basic features about our data. Descriptive statistics can give us things such as measures of central tendency and measures of dispersion to describe the data. Reliability refers to a scale's ability to consistently measure a variable.

Step	Action	Result																												
Descriptive Statistics																														
<p>We will use Descriptive Statistics to discover basic information about our data. This can be used to simply get an idea about the data or to compare groups as follow-up information to an omnibus test.</p> <p>We will be using the example data set "<b>Bugs.</b>"</p>																														
1.	Click "Descriptives" at the top left-hand corner and "Descriptive Statistics" from the drop-down menu.	 <table border="1" data-bbox="771 884 1528 1220"> <thead> <tr> <th>Subject</th> <th>Gender</th> <th>Region</th> <th>Education</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Female</td> <td>North</td> <td>some</td> </tr> <tr> <td>2</td> <td>Female</td> <td>North</td> <td>advance</td> </tr> <tr> <td>3</td> <td>Female</td> <td>Europe</td> <td>college</td> </tr> <tr> <td>4</td> <td>Female</td> <td>North</td> <td>college</td> </tr> <tr> <td>5</td> <td>Female</td> <td>North</td> <td>some</td> </tr> <tr> <td>6</td> <td>Female</td> <td>Europe</td> <td>some</td> </tr> </tbody> </table>	Subject	Gender	Region	Education	1	Female	North	some	2	Female	North	advance	3	Female	Europe	college	4	Female	North	college	5	Female	North	some	6	Female	Europe	some
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3	Female	Europe	college																											
4	Female	North	college																											
5	Female	North	some																											
6	Female	Europe	some																											
2.	<p>Add the variables you are interested in to Variables. We can add a single variable or as many as we wish. When comparing two variables, JASP will provide us with common descriptive information for the variables.</p> <p>Explore other options given in the menu space to include any other descriptive information you would like. For the sake of information purposes, all possible characteristics are included in the example.</p> <p>When you have made your selections, click "OK."</p>																													

Step	Action	Result																																																																					
3.	<p>Your results will be displayed in the right-hand space.</p> <p>Among other things, this provides information about measures of central tendency, measures of dispersion, and the normal curve.</p>	<p><b>Descriptives</b></p> <p>Descriptive Statistics</p> <table border="1"> <thead> <tr> <th></th> <th>Lo D, Lo F</th> <th>Lo D, Hi F</th> </tr> </thead> <tbody> <tr><td>Valid</td><td>93</td><td>91</td></tr> <tr><td>Missing</td><td>0</td><td>2</td></tr> <tr><td>Mean</td><td>5.715</td><td>7.379</td></tr> <tr><td>Std. Error of Mean</td><td>0.2810</td><td>0.2641</td></tr> <tr><td>Median</td><td>6.000</td><td>8.000</td></tr> <tr><td>Mode</td><td>3.000<sup>a</sup></td><td>10.00</td></tr> <tr><td>Std. Deviation</td><td>2.710</td><td>2.519</td></tr> <tr><td>Variance</td><td>7.345</td><td>6.346</td></tr> <tr><td>Skewness</td><td>-0.1318</td><td>-0.9472</td></tr> <tr><td>Std. Error of Skewness</td><td>0.2500</td><td>0.2527</td></tr> <tr><td>Kurtosis</td><td>-0.7606</td><td>0.1598</td></tr> <tr><td>Std. Error of Kurtosis</td><td>0.4952</td><td>0.5003</td></tr> <tr><td>Range</td><td>10.00</td><td>9.500</td></tr> <tr><td>Minimum</td><td>0.000</td><td>0.5000</td></tr> <tr><td>Maximum</td><td>10.00</td><td>10.00</td></tr> <tr><td>Sum</td><td>531.5</td><td>671.5</td></tr> <tr><td>25th percentile</td><td>3.500</td><td>6.000</td></tr> <tr><td>50th percentile</td><td>6.000</td><td>8.000</td></tr> <tr><td>75th percentile</td><td>7.500</td><td>9.500</td></tr> <tr><td>25th percentile</td><td>3.500</td><td>6.000</td></tr> <tr><td>50th percentile</td><td>6.000</td><td>8.000</td></tr> <tr><td>75th percentile</td><td>7.500</td><td>9.500</td></tr> </tbody> </table> <p><sup>a</sup> More than one mode exists, only the first is reported</p>		Lo D, Lo F	Lo D, Hi F	Valid	93	91	Missing	0	2	Mean	5.715	7.379	Std. Error of Mean	0.2810	0.2641	Median	6.000	8.000	Mode	3.000 <sup>a</sup>	10.00	Std. Deviation	2.710	2.519	Variance	7.345	6.346	Skewness	-0.1318	-0.9472	Std. Error of Skewness	0.2500	0.2527	Kurtosis	-0.7606	0.1598	Std. Error of Kurtosis	0.4952	0.5003	Range	10.00	9.500	Minimum	0.000	0.5000	Maximum	10.00	10.00	Sum	531.5	671.5	25th percentile	3.500	6.000	50th percentile	6.000	8.000	75th percentile	7.500	9.500	25th percentile	3.500	6.000	50th percentile	6.000	8.000	75th percentile	7.500	9.500
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4.	<p>If you scroll down further in the results section, plots and visuals will also appear such as the example included here.</p>	<p>Lo D, Hi F</p>  <p>Lo D, Lo F</p> 																																																																					

## Reliability Analysis

We will be using the example data set "**Bugs.**"

1. Click "Descriptives" at the top left-hand corner and "Reliability Analysis" from the drop-down menu.

		Gender	Region	Education
1	1	Female	North	some
2	2	Female	North	advance
3	3	Female	Europe	college
4	4	Female	North	college
5	5	Female	North	some
6	6	Female	Europe	some

2. The Scale Statistics list refers to a series of test statistics that JASP can produce to determine reliability of the measurements for all the variables on the whole. In other words, with higher reliability, results should be consistent under the same conditions.

Individual Item Statistics include the reliability test values (if an item dropped), and the mean, standard deviation and item-rest correlation.

In the Reverse Coding Items area, we can have the scale of the variable reverse (e.g. on a scale from 1-7, 1 becomes 7 and 7 becomes 1, etc.). This will cause the scale and item statistics in the output to change to reflect the changes in the way that the variable is scaled.

**Scale Statistics**

- Cronbach's  $\alpha$
- Gutmann's  $\lambda_6$
- McDonald's  $\omega$
- Greatest lower bound
- Average interitem correlation
- Mean
- Standard deviation

**Individual Item Statistics**

- Cronbach's  $\alpha$  (if item dropped)
- Gutmann's  $\lambda_6$  (if item dropped)
- McDonald's  $\omega$  (if item dropped)
- Mean
- Standard deviation
- Item-rest correlation

3.

Your results will be displayed in the right-hand space.

### Reliability Analysis

#### Scale Reliability Statistics

	mean	sd	Cronbach's $\alpha$	Guttman's $\lambda_6$	McDonalds' $\omega$	Average interitem correlation
scale	6.547	2.302	0.731	0.577	0.732	0.577

Note. Of the observations, 91 were used, 2 were excluded, and 93 were provided.

### Item Statistics

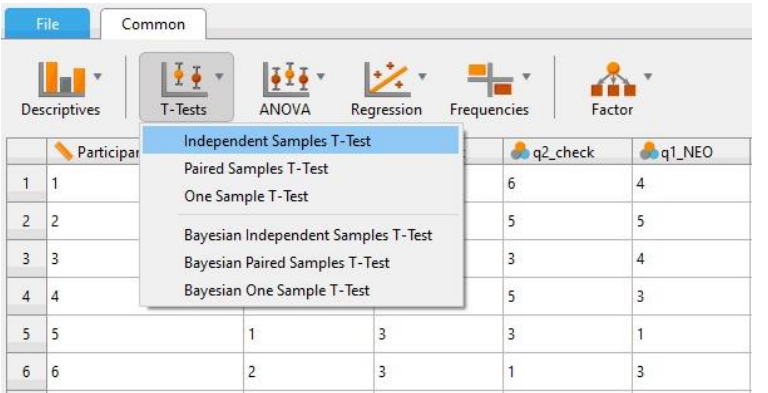
#### Item Reliability Statistics

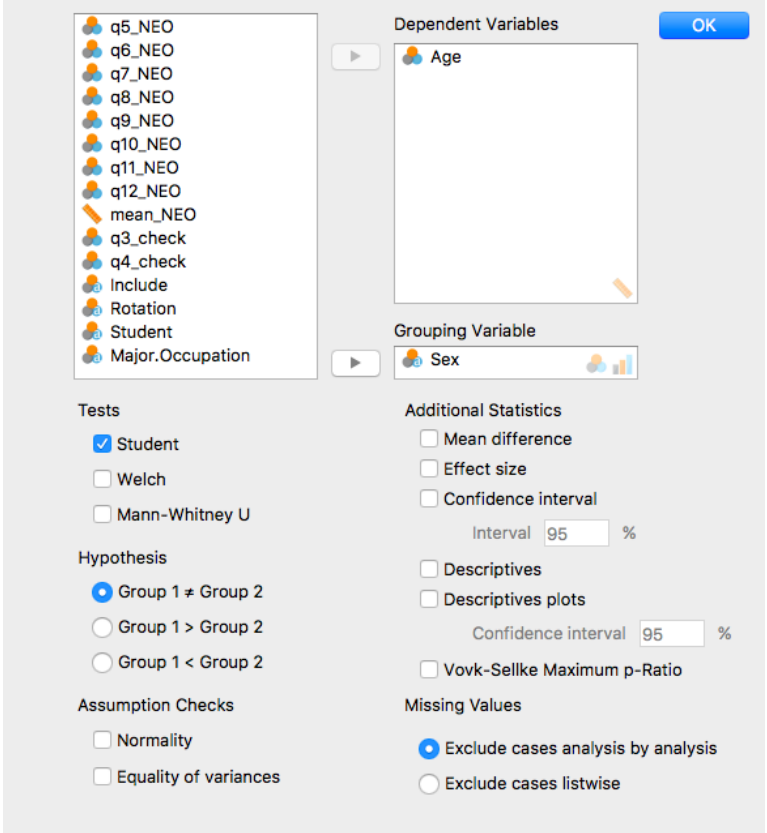
	mean	sd	item-rest correlation	If item dropped		
				Cronbach's $\alpha$	Guttman's $\lambda_6$	McDonalds' $\omega$
Lo D, Lo F	5.714	2.666	0.577	0.333	NaN	
Lo D, HI F	7.379	2.519	0.577	0.577	0.333	

*End of procedure*

# T-Test

A T-test is a parametric test that is used to evaluate the difference between two means. The means can be independent from one another (there are different participants across the two groups) or they can be dependent (the same participants were measured on two occasions). Alternatively, a researcher may only have one mean and he or she would like to test it against a known or hypothesized mean. These three analyses, Independent Samples, Paired Samples, and One Sample, are discussed below.

Step	Action	Result																					
Independent Samples																							
<p>The Independent Samples T-Test allows you to test the null hypothesis that the means of two independent groups are equal.</p>																							
<p>We will be using the example data set "<b>Kitchen Rolls</b>." Suppose we wondered if there was a difference in age based on sex. Here, sex gives us two independent groups (male and female).</p>																							
1.	Click "T-Tests" at the top left-hand corner and "Independent Samples T-Test" from the drop-down menu.	 <p>The screenshot shows the SPSS 'Common' ribbon with the 'T-Tests' dropdown menu open. The menu options are: Independent Samples T-Test (highlighted), Paired Samples T-Test, One Sample T-Test, Bayesian Independent Samples T-Test, Bayesian Paired Samples T-Test, and Bayesian One Sample T-Test. The background data table is as follows:</p> <table border="1" data-bbox="771 955 1534 1218"> <thead> <tr> <th>Participant</th> <th>q2_check</th> <th>q1_NEO</th> </tr> </thead> <tbody> <tr><td>1</td><td>6</td><td>4</td></tr> <tr><td>2</td><td>5</td><td>5</td></tr> <tr><td>3</td><td>3</td><td>4</td></tr> <tr><td>4</td><td>5</td><td>3</td></tr> <tr><td>5</td><td>1</td><td>3</td></tr> <tr><td>6</td><td>2</td><td>3</td></tr> </tbody> </table>	Participant	q2_check	q1_NEO	1	6	4	2	5	5	3	3	4	4	5	3	5	1	3	6	2	3
Participant	q2_check	q1_NEO																					
1	6	4																					
2	5	5																					
3	3	4																					
4	5	3																					
5	1	3																					
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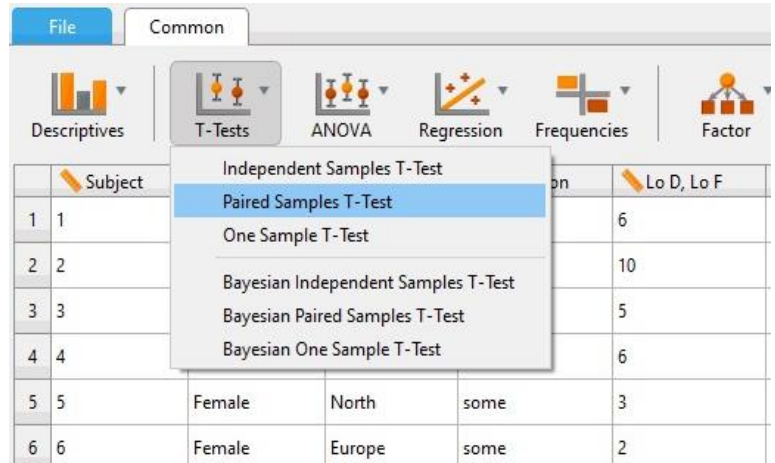
Step	Action	Result								
2.	<p>Add your Dependent Variable and Grouping Variable. As mentioned, in this example, we will be using Age as a dependent variable and Sex as a grouping variable. Keep in mind the following constraints:</p> <ul style="list-style-type: none"> <li>• The dependent variable must be scale</li> <li>• The grouping variable must have exactly 2 levels</li> </ul> <p>Check “Student” under Tests and “Group 1 ≠ Group 2” under Hypothesis.</p> <p>Explore other options given in the menu space. For instance, it may be useful to look at Assumption Checks, as an Independent Samples <i>t</i>-Test assumes Normality and Equality of Variance. It is also helpful to select “Effect Size,” under Additional Statistics. When you have made your selections, click “OK.”</p>									
3.	<p>Your results will be displayed in the right-hand space.</p> <p>In this case, there is no evidence of a significant difference in age between males and females, as our <i>p</i>-value is greater than .05.</p>	<h2 style="text-align: center;">T-Test</h2> <p style="text-align: center;"><b>Independent Samples T-Test</b></p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="border-top: 1px solid black; border-bottom: 1px solid black;"></th> <th style="border-top: 1px solid black; border-bottom: 1px solid black;">t</th> <th style="border-top: 1px solid black; border-bottom: 1px solid black;">df</th> <th style="border-top: 1px solid black; border-bottom: 1px solid black;">p</th> </tr> </thead> <tbody> <tr> <td style="border-bottom: 1px solid black;">Age</td> <td style="border-bottom: 1px solid black;">-1.329</td> <td style="border-bottom: 1px solid black;">100.0</td> <td style="border-bottom: 1px solid black;">0.187</td> </tr> </tbody> </table> <p><i>Note.</i> Student's T-Test.</p>		t	df	p	Age	-1.329	100.0	0.187
	t	df	p							
Age	-1.329	100.0	0.187							

## Paired Samples

The Paired Samples T-Test allows you to test the null hypothesis that the means of two dependent groups are equal.

We will be using the example data set "**Bugs.**"

1. Click "T-Tests" at the top left-hand corner and "Paired Samples T-Test" from the drop-down menu.

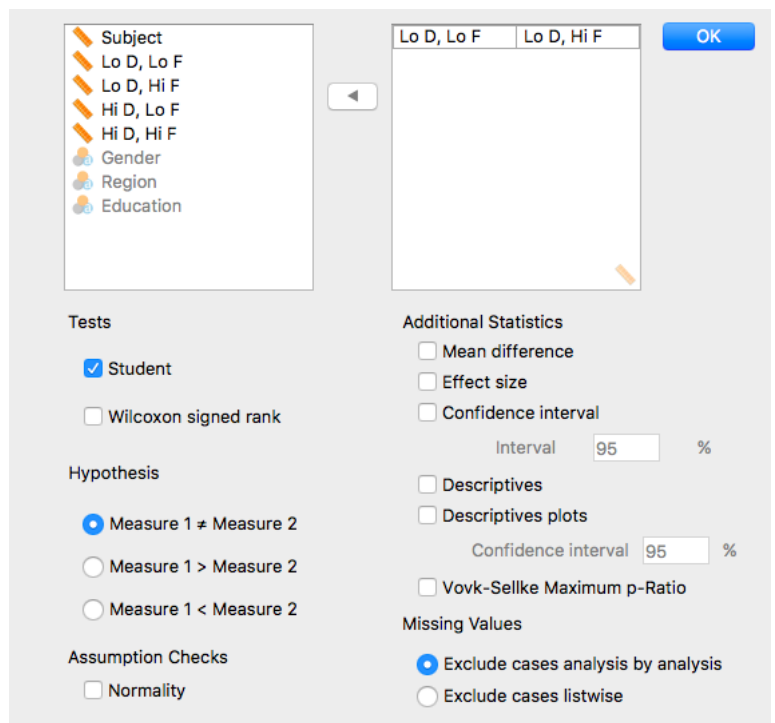


2. Add your conditions to right box. In this example, we will be using Lo D, Lo F and Lo D, Hi F as the levels that we would like to compare. Keep in mind the following constraints:

- The variable must be scale

Check "Student" under Tests and "Group 1 ≠ Group 2" under Hypothesis.

Explore other options given in the menu space. For instance, it may be useful to look at Assumption Checks, as a Paired Samples *t*-Test assumes Normality. It is also helpful to select "Effect Size," under Additional Statistics. When you have made your selections, click "OK."

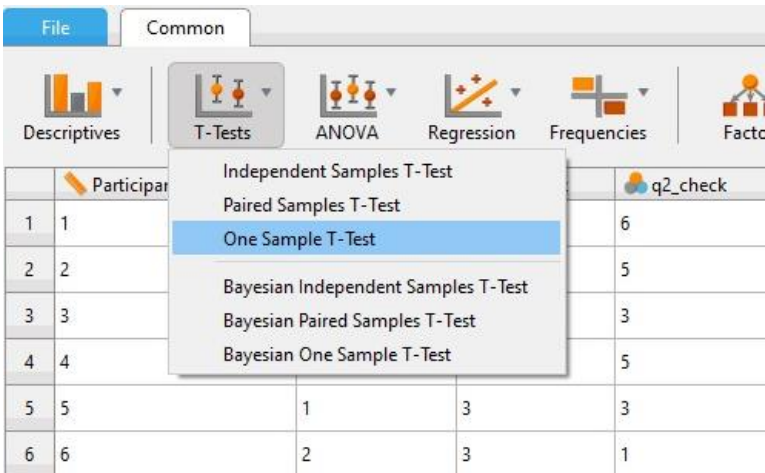


3.	<p>Your results will be displayed in the right-hand space.</p> <p>In this case, there is evidence of a significant difference between the two conditions, with a <math>p</math>-value less than .05.</p>	<p><b>T-Test</b></p> <p>Paired Samples T-Test</p> <table border="1"> <thead> <tr> <th></th> <th>t</th> <th>df</th> <th>p</th> </tr> </thead> <tbody> <tr> <td>Lo D, Lo F - Lo D, Hi F</td> <td>-6.649</td> <td>90</td> <td>&lt; .001</td> </tr> </tbody> </table> <p>Note. Student's T-Test.</p>		t	df	p	Lo D, Lo F - Lo D, Hi F	-6.649	90	< .001
	t	df	p							
Lo D, Lo F - Lo D, Hi F	-6.649	90	< .001							

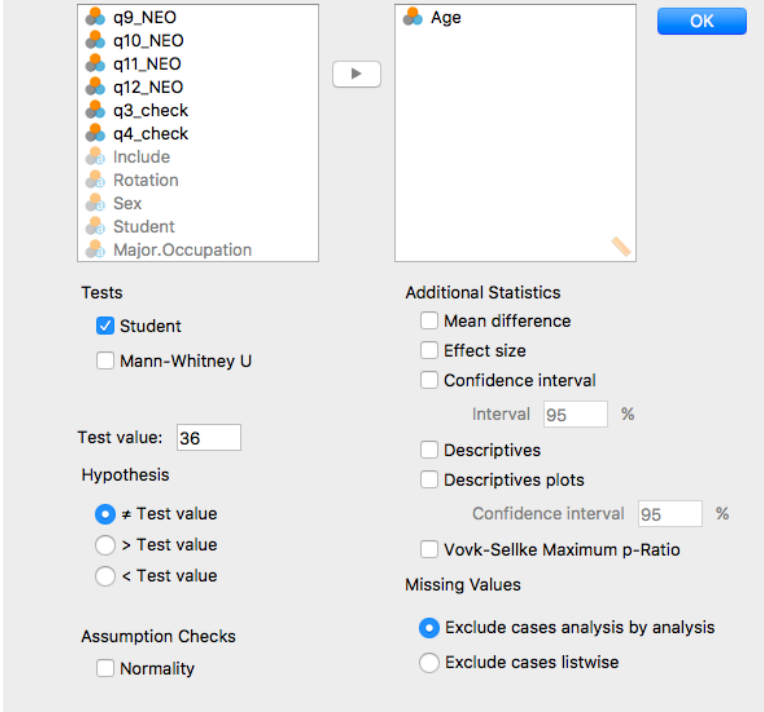
## One Sample

The One Sample T-Test allows you to test the mean of a set of data against a known or hypothesized mean.

We will be using the example data set "**Kitchen Rolls**." Suppose we wondered if this group's age differs from the average age of a general population.

1.	<p>Click "T-Tests" at the top left-hand corner and "One Sample T-Test" from the drop-down menu.</p>	 <p>The screenshot shows the SPSS 'Common' menu with 'T-Tests' selected. The dropdown menu includes: Independent Samples T-Test, Paired Samples T-Test, <b>One Sample T-Test</b>, Bayesian Independent Samples T-Test, Bayesian Paired Samples T-Test, and Bayesian One Sample T-Test. The data grid below shows:</p> <table border="1"> <thead> <tr> <th></th> <th>Participant</th> <th>q2_check</th> </tr> </thead> <tbody> <tr><td>1</td><td>1</td><td>6</td></tr> <tr><td>2</td><td>2</td><td>5</td></tr> <tr><td>3</td><td>3</td><td>3</td></tr> <tr><td>4</td><td>4</td><td>5</td></tr> <tr><td>5</td><td>5</td><td>3</td></tr> <tr><td>6</td><td>6</td><td>1</td></tr> </tbody> </table>		Participant	q2_check	1	1	6	2	2	5	3	3	3	4	4	5	5	5	3	6	6	1
	Participant	q2_check																					
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5	5	3																					
6	6	1																					

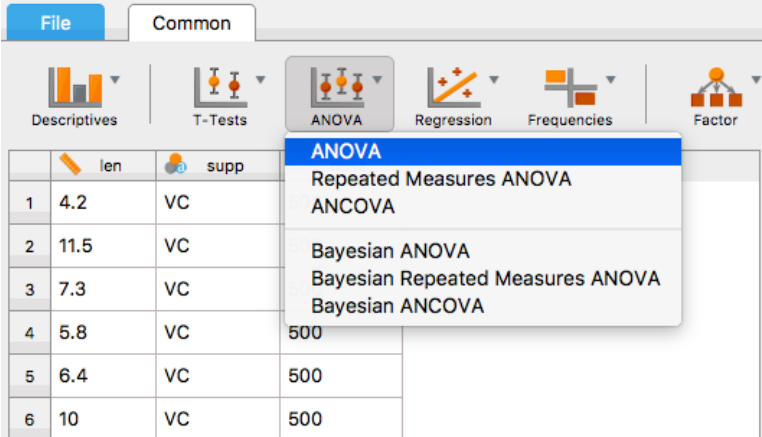


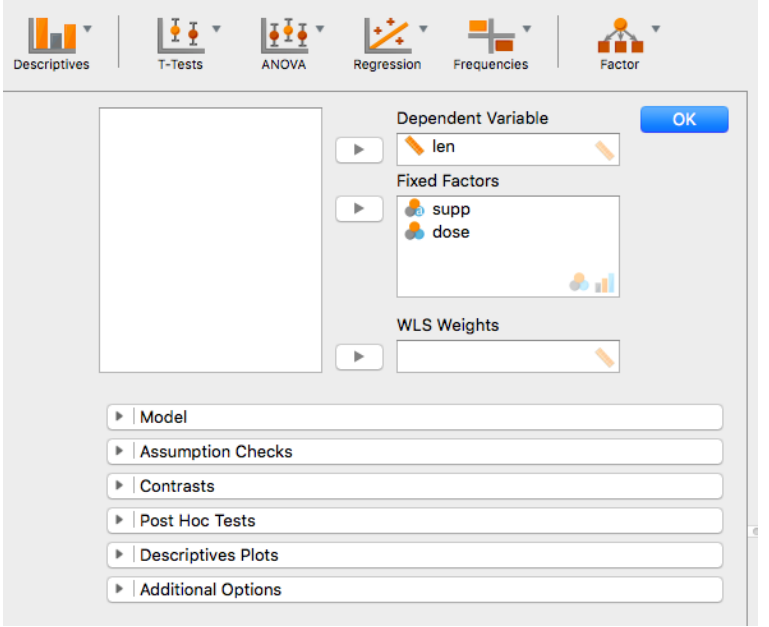
<p>2.</p>	<p>Add your dependent variable. As mentioned, in this example, we will be using Age as a dependent variable. Keep in mind the following constraints:</p> <ul style="list-style-type: none"> <li>The dependent variable must be scale</li> </ul> <p>Check “Student” under Tests and “≠ Test Value” under Hypothesis. Under Test Value, input the number that you would like your group to be compared against. In this example, you may find research indicating that the general population in the United States has an average age of 36 years.</p> <p>Explore other options given in the menu space. For instance, it may be useful to look at Assumption Checks, as a One Sample <i>t</i>-Test assumes Normality. It is also helpful to select “Effect Size,” under Additional Statistics. When you have made your selections, click “OK.”</p>									
<p>3.</p>	<p>Your results will be displayed in the right-hand space.</p> <p>In this case, there is evidence of a significant difference between this group and our test value, as our <i>p</i>-value is less than .05. By going back to Step 3 and clicking “Descriptives” under Additional Statistics, you will see that the group’s average age was 22.10, which our test has just told us is significantly less than 36.</p>	<h2 style="text-align: center;">T-Test</h2> <h3 style="text-align: center;">One Sample T-Test</h3> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="border-top: 1px solid black; border-bottom: 1px solid black;"></th> <th style="border-top: 1px solid black; border-bottom: 1px solid black;">t</th> <th style="border-top: 1px solid black; border-bottom: 1px solid black;">df</th> <th style="border-top: 1px solid black; border-bottom: 1px solid black;">p</th> </tr> </thead> <tbody> <tr> <td style="border-bottom: 1px solid black;">Age</td> <td style="border-bottom: 1px solid black;">-30.42</td> <td style="border-bottom: 1px solid black;">101</td> <td style="border-bottom: 1px solid black;">&lt; .001</td> </tr> </tbody> </table> <p><b>Note. Student’s T-Test.</b>  <b>Note. All tests, hypothesis is population mean is different from 36.</b></p>		t	df	p	Age	-30.42	101	< .001
	t	df	p							
Age	-30.42	101	< .001							

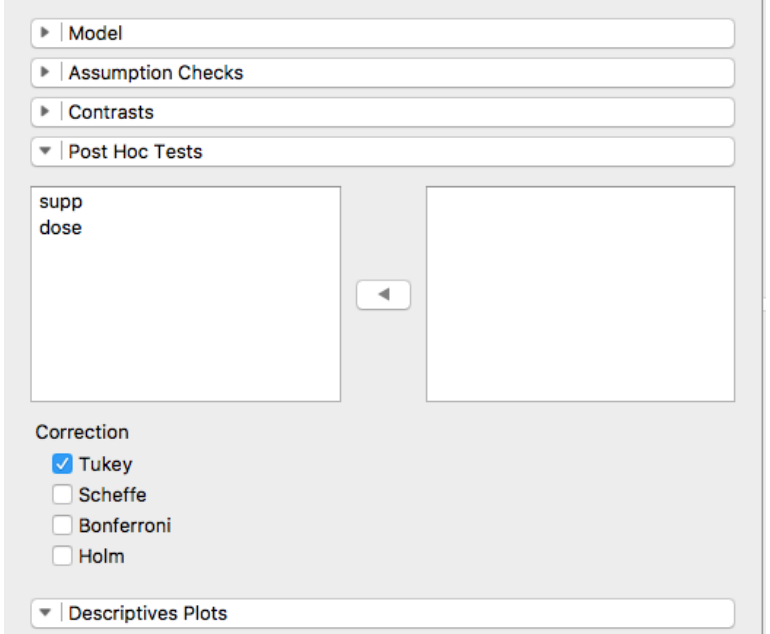
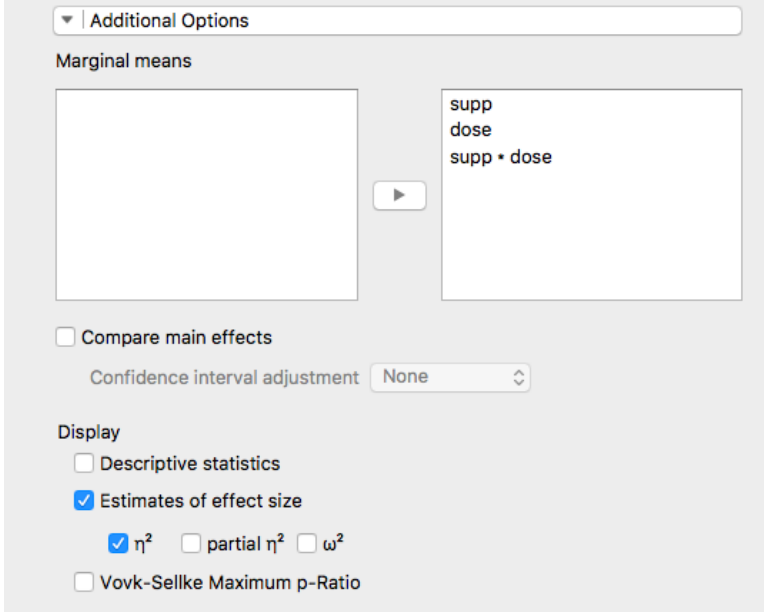
*End of procedure*

# ANOVA

An ANOVA is a parametric test that is used to evaluate the difference between groups. It can be used with at least two groups (e.g. men and women), and is preferred over a t-Test when there are three or more groups (e.g. primary school, high school, graduate school). It can also be used to evaluate more than one independent variable (e.g. gender and educational achievement) and see if there is an interaction between the variables. The ANOVA is an omnibus test which means that the outcome of the test only tells you if there is a difference somewhere among the groups. For a variable with more than two levels (e.g. educational achievement, here), follow-up tests are required to determine which groups differ.

Step	Action	Result																					
ANOVA																							
<p>The ANOVA allows you to test the null hypothesis that the mean for all groups are the same.</p> <p>We will be using the example data set "<b>Tooth Growth</b>." Supposed we wondered about variables that affect length and how those variables may interact to affect length.</p>																							
1.	Click "ANOVA" at the top left-hand corner and "ANOVA" from the drop-down menu.	 <p>The screenshot shows the SPSS software interface. The 'Common' toolbar is visible, with the 'ANOVA' icon selected. A dropdown menu is open, listing the following options: ANOVA, Repeated Measures ANOVA, ANCOVA, Bayesian ANOVA, Bayesian Repeated Measures ANOVA, and Bayesian ANCOVA. Below the toolbar, a data table is visible with columns 'len' and 'supp', and rows 1 through 6.</p> <table border="1" data-bbox="771 1031 1169 1318"> <thead> <tr> <th></th> <th>len</th> <th>supp</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>4.2</td> <td>VC</td> </tr> <tr> <td>2</td> <td>11.5</td> <td>VC</td> </tr> <tr> <td>3</td> <td>7.3</td> <td>VC</td> </tr> <tr> <td>4</td> <td>5.8</td> <td>VC</td> </tr> <tr> <td>5</td> <td>6.4</td> <td>VC</td> </tr> <tr> <td>6</td> <td>10</td> <td>VC</td> </tr> </tbody> </table>		len	supp	1	4.2	VC	2	11.5	VC	3	7.3	VC	4	5.8	VC	5	6.4	VC	6	10	VC
	len	supp																					
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3	7.3	VC																					
4	5.8	VC																					
5	6.4	VC																					
6	10	VC																					

Step	Action	Result																																			
2.	<p>Add your Dependent Variable and Fixed Factors. For the ANOVA, “Fixed Factors” refers to your independent variable(s). As mentioned, in this example, we will be using Len as a dependent variable and Supp and Dose as independent variables. Keep in mind the following constraints:</p> <ul style="list-style-type: none"> <li>• The dependent variable must be scale</li> <li>• The fixed factors must be ordinal categorical</li> </ul> <p>Explore other options given in the menu space. For instance, it may be useful to look at Assumption Checks, as an ANOVA assumes Normality (Q-Q plot of residuals) and Homoscedasticity (Homogeneity tests). It is also helpful to select “Estimates of effect size” and “partial <math>\eta^2</math>.” When you have made your selections, click “OK.”</p>																																				
3.	<p>Your results will be displayed in the right-hand space.</p> <p>In this case, there is a significant main effect of Supp, a significant main effect of Dose, and a significant interaction between Supp and Dose. All these effects have a <math>p</math>-value less than .05.</p>	<p><b>ANOVA</b></p> <p>ANOVA - len</p> <table border="1" data-bbox="776 1268 1507 1402"> <thead> <tr> <th>Cases</th> <th>Sum of Squares</th> <th>df</th> <th>Mean Square</th> <th>F</th> <th>p</th> <th><math>\eta^2_p</math></th> </tr> </thead> <tbody> <tr> <td>supp</td> <td>205.4</td> <td>1</td> <td>205.35</td> <td>15.572</td> <td>&lt; .001</td> <td>0.224</td> </tr> <tr> <td>dose</td> <td>2426.4</td> <td>2</td> <td>1213.22</td> <td>92.000</td> <td>&lt; .001</td> <td>0.773</td> </tr> <tr> <td>supp * dose</td> <td>108.3</td> <td>2</td> <td>54.16</td> <td>4.107</td> <td>0.022</td> <td>0.132</td> </tr> <tr> <td>Residual</td> <td>712.1</td> <td>54</td> <td>13.19</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>Note. Type III Sum of Squares</p>	Cases	Sum of Squares	df	Mean Square	F	p	$\eta^2_p$	supp	205.4	1	205.35	15.572	< .001	0.224	dose	2426.4	2	1213.22	92.000	< .001	0.773	supp * dose	108.3	2	54.16	4.107	0.022	0.132	Residual	712.1	54	13.19			
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Step	Action	Result																								
4.	<p>As the ANOVA showed a significant overall effect in each main effect case and in the case of the interaction, some follow-up tests are required. Supp only has two levels, so we do not need a follow-up test. However, dose has three levels. Click on the bar labeled Post Hoc Tests. In the left box there will be a list of your factors and below that there will be a list of four tests (Tukey, Scheffe, Bonfferoni, and Holm). In this case, we will select "Tukey" and move Dose to the right.</p>	 <p>The screenshot shows the 'Post Hoc Tests' dialog box. Under the 'Post Hoc Tests' section, 'supp' and 'dose' are listed in the left box. In the right box, 'Tukey' is selected under the 'Correction' section. Other options like 'Scheffe', 'Bonferroni', and 'Holm' are unselected. The 'Descriptives Plots' section is also visible at the bottom.</p>																								
5.	<p>The results of this test will be displayed in the right-hand space.</p> <p>The Tukey gives each combination of Dose level comparisons. The <math>p_{tukey}</math> column gives the p-value. The differences between all the combinations are significantly different, as our p-values are less than .05.</p>	<p><b>Post Hoc Tests</b></p> <p>Post Hoc Comparisons – dose</p> <table border="1" data-bbox="792 1045 1481 1171"> <thead> <tr> <th></th> <th></th> <th>Mean Difference</th> <th>SE</th> <th>t</th> <th><math>p_{tukey}</math></th> </tr> </thead> <tbody> <tr> <td>500</td> <td>1000</td> <td>-9.130</td> <td>1.148</td> <td>-7.951</td> <td>&lt; .001</td> </tr> <tr> <td></td> <td>2000</td> <td>-15.495</td> <td>1.148</td> <td>-13.493</td> <td>&lt; .001</td> </tr> <tr> <td>1000</td> <td>2000</td> <td>-6.365</td> <td>1.148</td> <td>-5.543</td> <td>&lt; .001</td> </tr> </tbody> </table>			Mean Difference	SE	t	$p_{tukey}$	500	1000	-9.130	1.148	-7.951	< .001		2000	-15.495	1.148	-13.493	< .001	1000	2000	-6.365	1.148	-5.543	< .001
		Mean Difference	SE	t	$p_{tukey}$																					
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1000	2000	-6.365	1.148	-5.543	< .001																					
6.	<p>It is also information to ask for Marginal means. This can be found under Additional Options. Move the effects to the right side.</p>	 <p>The screenshot shows the 'Additional Options' dialog box. Under the 'Marginal means' section, 'supp', 'dose', and 'supp * dose' are listed in the right box. In the 'Display' section, 'Estimates of effect size' is checked, and 'eta squared' is selected. Other options like 'Compare main effects', 'Descriptive statistics', and 'Vovk-Sellke Maximum p-Ratio' are unselected.</p>																								

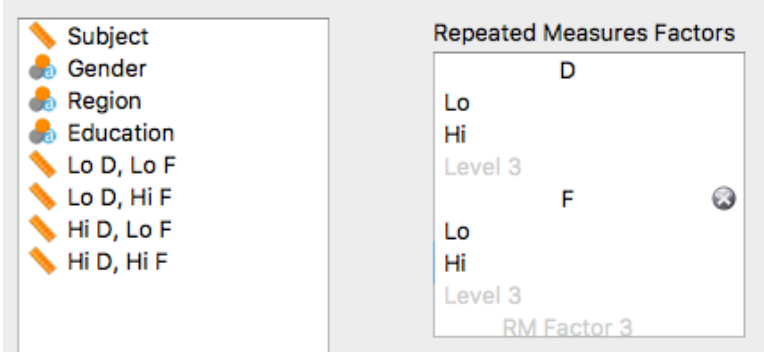
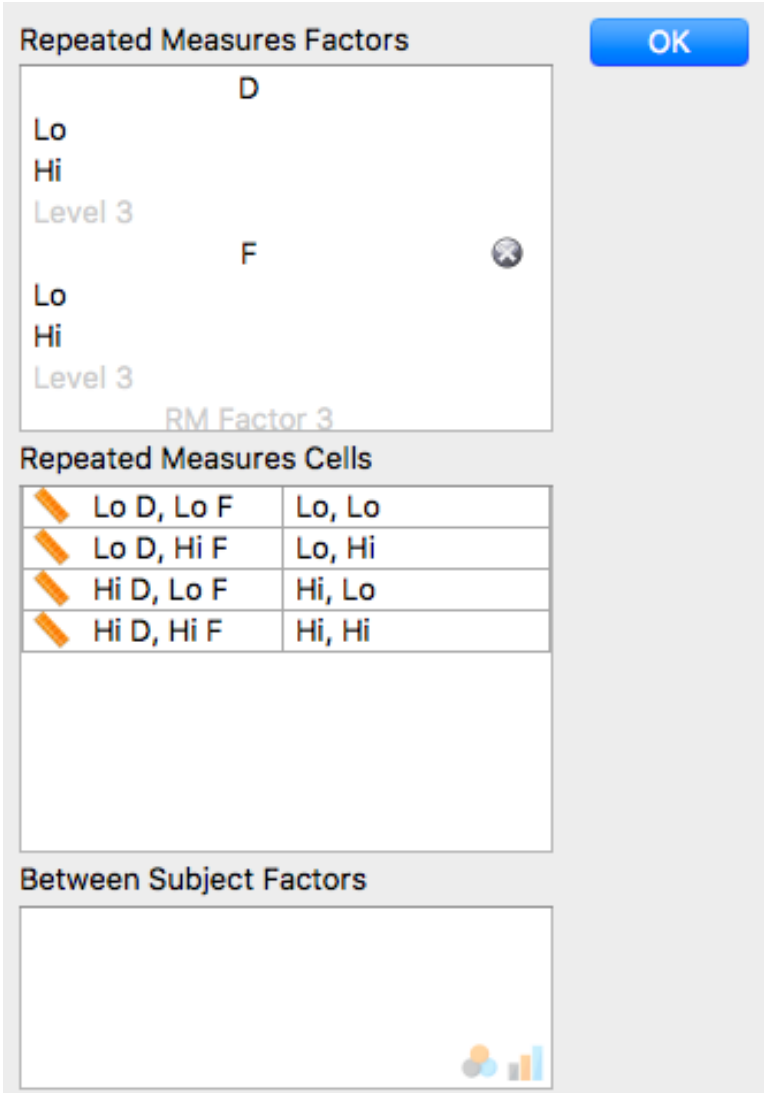
Step	Action	Result																																																																									
7.	<p>The results will be displayed in the right-hand space.</p> <p>Marginal Means for Supp is tells us that the mean for OJ is higher than the mean for VC. This is informative, as, with two levels, we did not perform a Tukey. We now know which level is higher and that the difference is significant because we had a main effect of Supp from the original output. This output, as with the latter two outputs, give us means and confidence intervals that we should report when describing the analysis.</p>	<p><b>Marginal Means</b></p> <p>Marginal Means - supp</p> <table border="1"> <thead> <tr> <th>supp</th> <th>Marginal Mean</th> <th>SE</th> <th>Lower CI</th> <th>Upper CI</th> </tr> </thead> <tbody> <tr> <td>OJ</td> <td>20.66</td> <td>0.663</td> <td>19.33</td> <td>21.99</td> </tr> <tr> <td>VC</td> <td>16.96</td> <td>0.663</td> <td>15.63</td> <td>18.29</td> </tr> </tbody> </table> <p>Marginal Means - dose</p> <table border="1"> <thead> <tr> <th>dose</th> <th>Marginal Mean</th> <th>SE</th> <th>Lower CI</th> <th>Upper CI</th> </tr> </thead> <tbody> <tr> <td>500</td> <td>10.61</td> <td>0.812</td> <td>8.977</td> <td>12.23</td> </tr> <tr> <td>1000</td> <td>19.73</td> <td>0.812</td> <td>18.107</td> <td>21.36</td> </tr> <tr> <td>2000</td> <td>26.10</td> <td>0.812</td> <td>24.472</td> <td>27.73</td> </tr> </tbody> </table> <p>Marginal Means - supp * dose</p> <table border="1"> <thead> <tr> <th>supp</th> <th>dose</th> <th>Marginal Mean</th> <th>SE</th> <th>Lower CI</th> <th>Upper CI</th> </tr> </thead> <tbody> <tr> <td rowspan="3">OJ</td> <td>500</td> <td>13.230</td> <td>1.148</td> <td>10.928</td> <td>15.53</td> </tr> <tr> <td>1000</td> <td>22.700</td> <td>1.148</td> <td>20.398</td> <td>25.00</td> </tr> <tr> <td>2000</td> <td>26.060</td> <td>1.148</td> <td>23.758</td> <td>28.36</td> </tr> <tr> <td rowspan="3">VC</td> <td>500</td> <td>7.980</td> <td>1.148</td> <td>5.678</td> <td>10.28</td> </tr> <tr> <td>1000</td> <td>16.770</td> <td>1.148</td> <td>14.468</td> <td>19.07</td> </tr> <tr> <td>2000</td> <td>26.140</td> <td>1.148</td> <td>23.838</td> <td>28.44</td> </tr> </tbody> </table>	supp	Marginal Mean	SE	Lower CI	Upper CI	OJ	20.66	0.663	19.33	21.99	VC	16.96	0.663	15.63	18.29	dose	Marginal Mean	SE	Lower CI	Upper CI	500	10.61	0.812	8.977	12.23	1000	19.73	0.812	18.107	21.36	2000	26.10	0.812	24.472	27.73	supp	dose	Marginal Mean	SE	Lower CI	Upper CI	OJ	500	13.230	1.148	10.928	15.53	1000	22.700	1.148	20.398	25.00	2000	26.060	1.148	23.758	28.36	VC	500	7.980	1.148	5.678	10.28	1000	16.770	1.148	14.468	19.07	2000	26.140	1.148	23.838	28.44
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### Repeated Measures ANOVA

The Repeated Measures ANOVA differs from the ANOVA because the same participants are in multiple conditions. Thus, while the above ANOVA was for between-groups, the Repeated Measures ANOVA is for within-subjects.

We will be using the example data set "**Bugs.**"

1.	Click "ANOVA" at the top left-hand corner and "Repeated Measures ANOVA" from the drop-down menu.	
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Step	Action	Result
2.	<p>For each repeated measure or the within-subjects variable, label the variable under Repeated Measures Factors in “RM Factor” and then the levels of the variable in “Level.”</p>	
3.	<p>The repeated measures of Lo D, Lo F, Lo D, Hi F, Hi D, Lo F, and Hi D, Hi F should be placed in each section within the Repeated Measures Cells box, aligning with the appropriate labeling which JASP created based on your Repeated Measures Factors. Keep in mind the following constraints:</p> <ul style="list-style-type: none"> <li>The variables must be scale</li> </ul> <p>If we were using a mixed-methods design, with both within-subjects and between-subjects variables, we could put the between-subjects variables in Between Subject Factors, as well. For these variables, keep in mind the following constraints:</p> <ul style="list-style-type: none"> <li>The variables must be ordinal or categorical</li> </ul> <p>Explore other options given in the menu space. For instance, it may be useful to look at Assumption Checks, as a Repeated Measures ANOVA assumes Sphericity. It is also helpful to select “Estimates of effect size” and “partial <math>\eta^2</math>.” When you have made your selections, click “OK.”</p>	

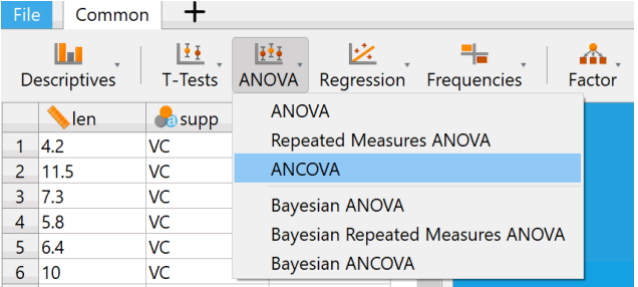
Step	Action	Result																																																	
4.	<p>Your results will be displayed in the right-hand space.</p> <p>In this case, there is a significant main effect of D and a significant main effect of F, with <math>p</math>-values less than .05. There is not evidence for a significant interaction.</p> <p>Follow the steps given in the ANOVA "Steps 4-7." In this example, we do not need a post-hoc test because there are only two levels of each of our variables.</p>	<p><b>Repeated Measures ANOVA</b></p> <p>Within Subjects Effects</p> <table border="1"> <thead> <tr> <th></th> <th>Sum of Squares</th> <th>df</th> <th>Mean Square</th> <th>F</th> <th>p</th> <th><math>\eta^2_p</math></th> </tr> </thead> <tbody> <tr> <td>D</td> <td>48.753</td> <td>1</td> <td>48.753</td> <td>12.175</td> <td>&lt; .001</td> <td>0.123</td> </tr> <tr> <td>Residual</td> <td>348.372</td> <td>87</td> <td>4.004</td> <td></td> <td></td> <td></td> </tr> <tr> <td>F</td> <td>177.557</td> <td>1</td> <td>177.557</td> <td>41.630</td> <td>&lt; .001</td> <td>0.324</td> </tr> <tr> <td>Residual</td> <td>371.068</td> <td>87</td> <td>4.265</td> <td></td> <td></td> <td></td> </tr> <tr> <td>D * F</td> <td>6.545</td> <td>1</td> <td>6.545</td> <td>2.152</td> <td>0.146</td> <td>0.024</td> </tr> <tr> <td>Residual</td> <td>264.580</td> <td>87</td> <td>3.041</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p><i>Note.</i> Type III Sum of Squares</p>		Sum of Squares	df	Mean Square	F	p	$\eta^2_p$	D	48.753	1	48.753	12.175	< .001	0.123	Residual	348.372	87	4.004				F	177.557	1	177.557	41.630	< .001	0.324	Residual	371.068	87	4.265				D * F	6.545	1	6.545	2.152	0.146	0.024	Residual	264.580	87	3.041			
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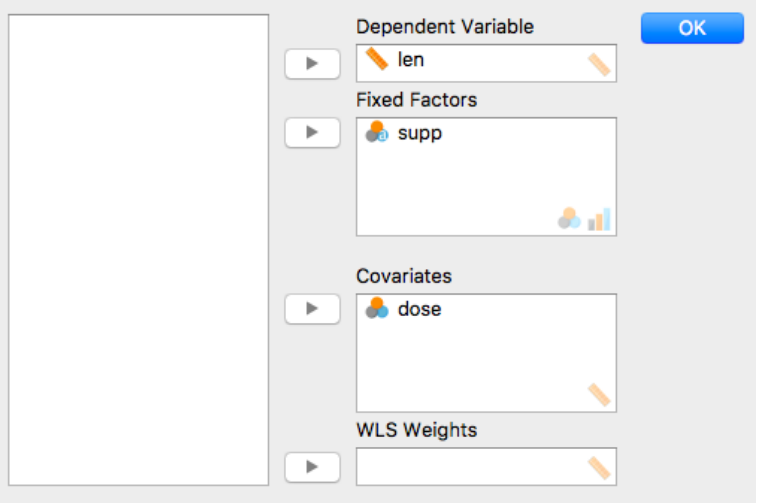
Step	Action	Result
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**ANCOVA**

The ANCOVA allows you to test the null hypothesis that the mean for all groups are the same while controlling for an extraneous variables that affects the outcome variable.

We will be using the example data set "**Tooth Growth.**"

1.	Click "ANOVA" at the top left-hand corner and "ANCOVA" from the drop-down menu.	
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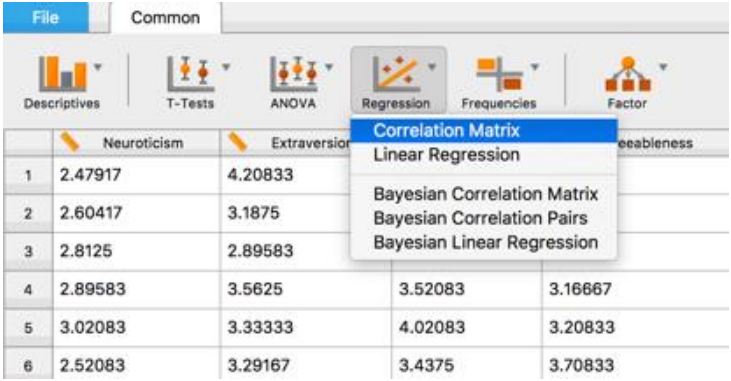
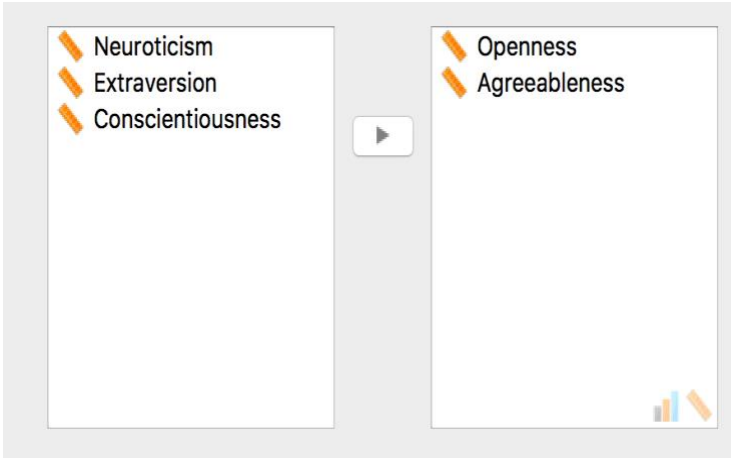
Step	Action	Result																								
2.	<p>Add your Dependent Variable and Fixed Factors. For the ANOVA, “Fixed Factors” refers to your independent variable(s). This time, the display gives you the option to add a Covariate. In this example, we want to know the effect of Supp on Len, while controlling for the effects of Dose.</p> <p>Keep in mind the following constraints:</p> <ul style="list-style-type: none"> <li>• The dependent variable must be scale</li> <li>• The fixed factors must be ordinal or categorical</li> <li>• The covariate can be scale or categorical</li> </ul> <p>Explore other options given in the menu space. For instance, it may be useful to look at Assumption Checks, as an ANOVA assumes Normality (Q-Q plot of residuals) and Homoscedasticity (Homogeneity tests). It is also helpful to select “Estimates of effect size” and “partial <math>\eta^2</math>.” When you have made your selections, click “OK.”</p>																									
3.	<p>Your results will be displayed in the right-hand space.</p> <p>In this case, there is evidence of a significant effect of the Covariate, Dose. There is also a significant effect of Supp over and above the effect of Dose, as these <math>p</math>-values are less than .05.</p> <p>Follow the steps given in the ANOVA “Steps 4-7.” In this example, we do not need a post-hoc test because there are only two levels of each of our variables.</p>	<p><b>ANCOVA</b></p> <p>ANCOVA - len</p> <table border="1" data-bbox="786 1436 1455 1570"> <thead> <tr> <th>Cases</th> <th>Sum of Squares</th> <th>df</th> <th>Mean Square</th> <th>F</th> <th>p</th> </tr> </thead> <tbody> <tr> <td>supp</td> <td>205.3</td> <td>1</td> <td>205.35</td> <td>11.45</td> <td>0.001</td> </tr> <tr> <td>dose</td> <td>2224.3</td> <td>1</td> <td>2224.30</td> <td>123.99</td> <td>&lt; .001</td> </tr> <tr> <td>Residual</td> <td>1022.6</td> <td>57</td> <td>17.94</td> <td></td> <td></td> </tr> </tbody> </table> <p><i>Note.</i> Type III Sum of Squares</p>	Cases	Sum of Squares	df	Mean Square	F	p	supp	205.3	1	205.35	11.45	0.001	dose	2224.3	1	2224.30	123.99	< .001	Residual	1022.6	57	17.94		
Cases	Sum of Squares	df	Mean Square	F	p																					
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Residual	1022.6	57	17.94																							

End of procedure



# Regression

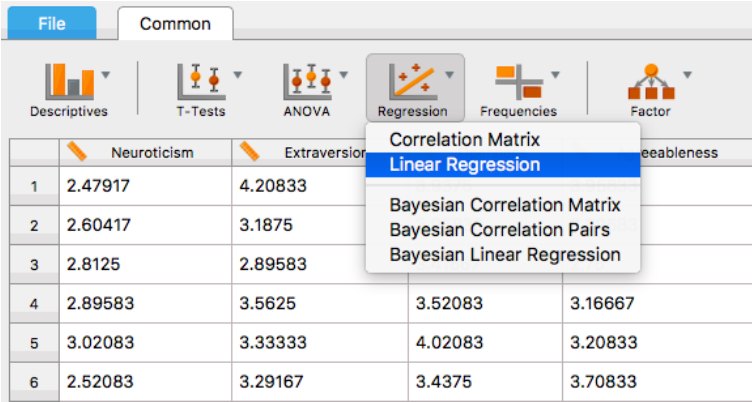
Correlation and regression tell you about the relationship between variables. Correlation describes if the variables tend to increase or decrease together or go in opposite directions. Regression is a form of statistical modeling that examines how much variance is explained by the model we have created with various variables.

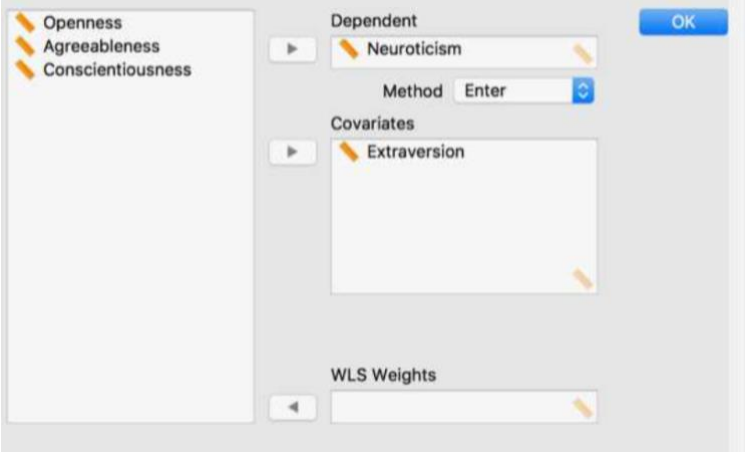
Step	Action	Result																												
Correlation																														
<p>Correlation tells us if variables are positively related (they move in the same direction) or negatively correlated (they move in opposing directions).</p> <p>We will be using the example data set "<b>Big 5</b>." Suppose we were interested in the relationship between Openness and Agreeableness.</p>																														
1.	<p>Click "Regression" at the top left-hand corner and "Correlation Matrix" from the drop-down menu.</p>	 <table border="1" data-bbox="769 898 1495 1157"> <thead> <tr> <th></th> <th>Neuroticism</th> <th>Extraversion</th> <th>Agreeableness</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>2.47917</td> <td>4.20833</td> <td></td> </tr> <tr> <td>2</td> <td>2.60417</td> <td>3.1875</td> <td></td> </tr> <tr> <td>3</td> <td>2.8125</td> <td>2.89583</td> <td></td> </tr> <tr> <td>4</td> <td>2.89583</td> <td>3.5625</td> <td>3.52083</td> </tr> <tr> <td>5</td> <td>3.02083</td> <td>3.33333</td> <td>4.02083</td> </tr> <tr> <td>6</td> <td>2.52083</td> <td>3.29167</td> <td>3.4375</td> </tr> </tbody> </table>		Neuroticism	Extraversion	Agreeableness	1	2.47917	4.20833		2	2.60417	3.1875		3	2.8125	2.89583		4	2.89583	3.5625	3.52083	5	3.02083	3.33333	4.02083	6	2.52083	3.29167	3.4375
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2.	<p>Add your variable of interest. As mentioned, in this example, we will be using Openness and Agreeableness. Keep in mind the following constraints:</p> <ul style="list-style-type: none"> <li>The variables must be scale or ordinal</li> </ul> <p>Explore other options given in the menu space. For instance, the correlation coefficient will depend on what type of variables we are working with. In this case, both variables are scale, so we will use Pearson. We can also ask it to report significant (<math>p</math>-values) and to flag significant correlations to tell us when a <math>p</math>-value indicates significance. When you have made your selections, click "OK."</p>																													

Step	Action	Result																		
3.	<p>Your results will be displayed in the right-hand space.</p> <p>The matrix matches each variable with the others that we selected. In this case, there is evidence of a significant positive correlation between Openness and Agreeableness, as the <i>p</i>-value is less than .05. This is a small effect (0.159).</p>	<p><b>Correlation Matrix</b></p> <p>Pearson Correlations</p> <table border="1"> <thead> <tr> <th colspan="2"></th> <th>Openness</th> <th>Agreeableness</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Openness</td> <td>Pearson's r</td> <td>—</td> <td>0.159***</td> </tr> <tr> <td>p-value</td> <td>—</td> <td>&lt; .001</td> </tr> <tr> <td rowspan="2">Agreeableness</td> <td>Pearson's r</td> <td>—</td> <td>—</td> </tr> <tr> <td>p-value</td> <td>—</td> <td>—</td> </tr> </tbody> </table> <p>* <i>p</i> &lt; .05, ** <i>p</i> &lt; .01, *** <i>p</i> &lt; .001</p>			Openness	Agreeableness	Openness	Pearson's r	—	0.159***	p-value	—	< .001	Agreeableness	Pearson's r	—	—	p-value	—	—
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	p-value	—	—																	

Regression

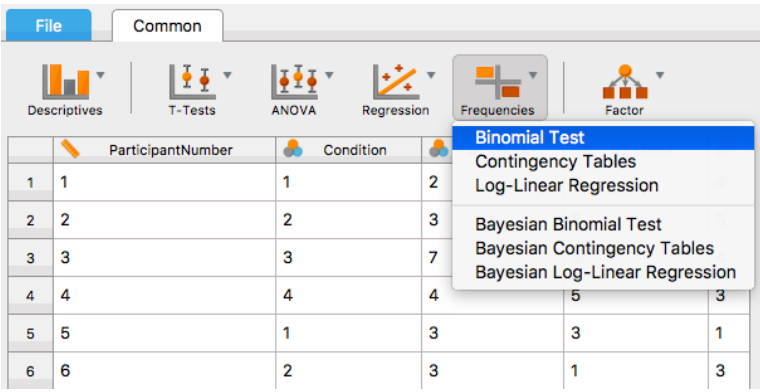
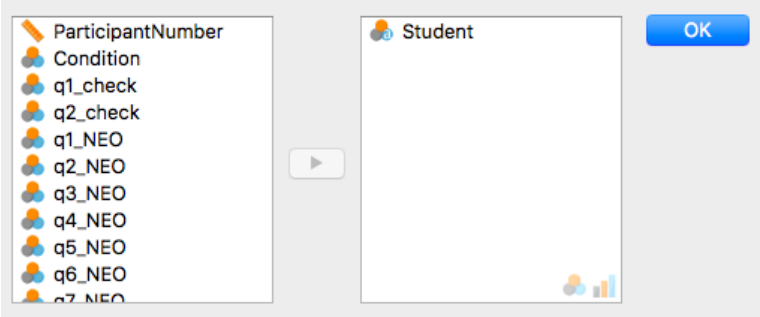
We will be using the example data set "Big 5."

1.	<p>Click "Regression" at the top left-hand corner and "Linear Regression" from the drop-down menu.</p>	 <p>The screenshot shows the SPSS 'Common' toolbar with the 'Regression' icon highlighted. A dropdown menu is open, listing 'Correlation Matrix', 'Linear Regression' (which is selected), 'Bayesian Correlation Matrix', 'Bayesian Correlation Pairs', and 'Bayesian Linear Regression'. Below the toolbar, a data table is visible with columns for Neuroticism, Extraversion, and Agreeableness, and rows numbered 1 through 6.</p>
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Step	Action	Result																																																									
2.	<p>Add your variable of interest. In this example, we will be using Neuroticism as the Dependent Variable and Extraversion as the Covariate. In Regression, a “Covariate” refers to variables that will be included in the model. Keep in mind the following constraints:</p> <ul style="list-style-type: none"> <li>The variables must be scale</li> </ul> <p>Explore other options given in the menu space. For instance, the Method can be “Enter,” “Backward,” “Forward,” or “Stepwise,” referring to the order in which our Covariates (if we have multiple) will be entered into the model. When you have made your selections, click “OK.”</p>																																																										
3.	<p>Your results will be displayed in the right-hand space.</p> <p>In this case, <math>R^2</math> tells us that 12.3% of the total variance is explained by the model including Extraversion. The Coefficients output tells us that Extraversion is a significant predictor for the model, as the <math>p</math>-value is less than .05.</p>	<p><b>Linear Regression</b></p> <p>Model Summary</p> <table border="1" data-bbox="776 1129 1230 1186"> <thead> <tr> <th>Model</th> <th>R</th> <th>R<sup>2</sup></th> <th>Adjusted R<sup>2</sup></th> <th>RMSE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0.350</td> <td>0.123</td> <td>0.121</td> <td>0.424</td> </tr> </tbody> </table> <p>ANOVA</p> <table border="1" data-bbox="776 1262 1474 1354"> <thead> <tr> <th>Model</th> <th></th> <th>Sum of Squares</th> <th>df</th> <th>Mean Square</th> <th>F</th> <th>p</th> </tr> </thead> <tbody> <tr> <td rowspan="2">1</td> <td>Regression</td> <td>12.53</td> <td>1</td> <td>12.530</td> <td>69.56</td> <td>&lt; .001</td> </tr> <tr> <td>Residual</td> <td>89.71</td> <td>498</td> <td>0.180</td> <td></td> <td></td> </tr> <tr> <td></td> <td>Total</td> <td>102.24</td> <td>499</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>Coefficients</p> <table border="1" data-bbox="776 1430 1511 1507"> <thead> <tr> <th>Model</th> <th></th> <th>Unstandardized</th> <th>Standard Error</th> <th>Standardized</th> <th>t</th> <th>p</th> </tr> </thead> <tbody> <tr> <td rowspan="2">1</td> <td>intercept</td> <td>4.383</td> <td>0.188</td> <td></td> <td>23.366</td> <td>&lt; .001</td> </tr> <tr> <td>Extraversion</td> <td>-0.446</td> <td>0.054</td> <td>-0.350</td> <td>-8.340</td> <td>&lt; .001</td> </tr> </tbody> </table>	Model	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	RMSE	1	0.350	0.123	0.121	0.424	Model		Sum of Squares	df	Mean Square	F	p	1	Regression	12.53	1	12.530	69.56	< .001	Residual	89.71	498	0.180				Total	102.24	499				Model		Unstandardized	Standard Error	Standardized	t	p	1	intercept	4.383	0.188		23.366	< .001	Extraversion	-0.446	0.054	-0.350	-8.340	< .001
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*End of procedure*

# Frequencies

Step	Action	Result																	
Binomial Test																			
We will be using the example data set " <b>Kitchen Rolls.</b> "																			
1.	Click "Frequencies" at the top left-hand corner and "Binomial Test" from the drop-down menu.																		
2.	Add your variable of interest. Keep in mind the following constraints: <ul style="list-style-type: none"> <li>The variable must be ordinal or categorical</li> </ul> Explore other options given in the menu space. When you have made your selections, click "OK."																		
3.	Your results will be displayed in the right-hand space.  In this case, we wondered how many participants are students and how many are not. The output gives us the count for each level of this categorical variable.	<p><b>Binomial Test</b></p> <p>Binomial Test</p> <table border="1"> <thead> <tr> <th></th> <th>Level</th> <th>Counts</th> <th>Total</th> <th>Proportion</th> <th>p</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Student</td> <td>N</td> <td>7</td> <td>102</td> <td>0.069</td> <td>&lt; .001</td> </tr> <tr> <td>Y</td> <td>95</td> <td>102</td> <td>0.931</td> <td>&lt; .001</td> </tr> </tbody> </table> <p><i>Note.</i> Proportions tested against value: 0.5.</p>		Level	Counts	Total	Proportion	p	Student	N	7	102	0.069	< .001	Y	95	102	0.931	< .001
	Level	Counts	Total	Proportion	p														
Student	N	7	102	0.069	< .001														
	Y	95	102	0.931	< .001														

## Contingency Tables

We will be using the example data set "**Kitchen Rolls.**"

1. Click "Frequencies" at the top left-hand corner and "Contingency Tables" from the drop-down menu.

The screenshot shows the SPSS 'Common' toolbar with the 'Frequencies' icon selected. A dropdown menu is open, listing options: Binomial Test, Contingency Tables (highlighted), Log-Linear Regression, Bayesian Binomial Test, Bayesian Contingency Tables, and Bayesian Log-Linear Regression. Below the toolbar is a data table with columns 'ParticipantNumber' and 'Condition'.

	ParticipantNumber	Condition			
1	1	1	2		
2	2	2	3		
3	3	3	7		
4	4	4	4		
5	5	1	3	3	1
6	6	2	3	1	3

2. Add your variables of interest (two different variables) to Rows and Columns. Keep in mind the following constraints:
  - The variables must be ordinal or categorical

Explore other options given in the menu space. When you have made your selections, click "OK."

The screenshot shows the 'Frequencies: Display' dialog box. On the left is a list of variables: q1\_NEO, q2\_NEO, q3\_NEO, q4\_NEO, q5\_NEO, q6\_NEO, q7\_NEO, q8\_NEO, q9\_NEO, q10\_NEO, q11\_NEO, q12\_NEO, mean\_NEO, q3\_check, q4\_check, Include, Rotation, Age, and Major.Occupation. On the right, 'Sex' is assigned to the 'Rows' field and 'Student' is assigned to the 'Columns' field. There are 'OK' and 'Cancel' buttons.

3. Your results will be displayed in the right-hand space.

The main output tells us the association between two variables. In this case, we see that there is a large discrepancy between the number of women included and the number of men included. Related to Student, the majority of both women and men are students.

## Contingency Tables

### Contingency Tables

Sex	Student		Total
	N	Y	
F	6	71	77
M	1	24	25
Total	7	95	102

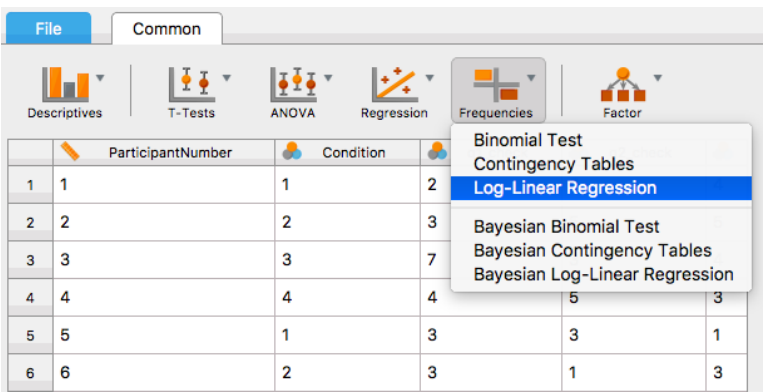
### Chi-Squared Tests

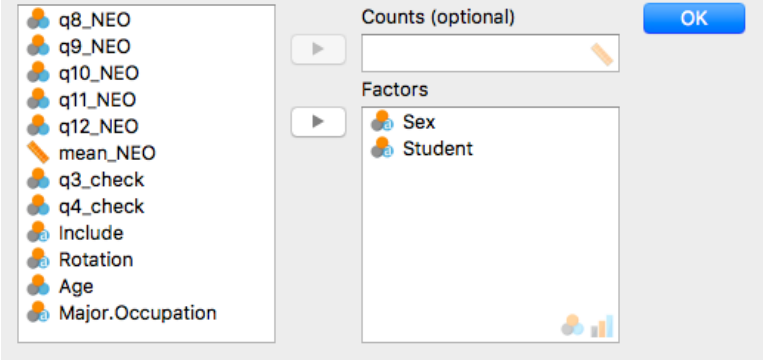
	Value	df	p
$\chi^2$	0.425	1	0.515
N	102		

## Log-Linear Regression

We will be using the example data set "**Kitchen Rolls.**"

1. Click "Frequencies" at the top left-hand corner and "Log-Linear Regression" from the drop-down menu.

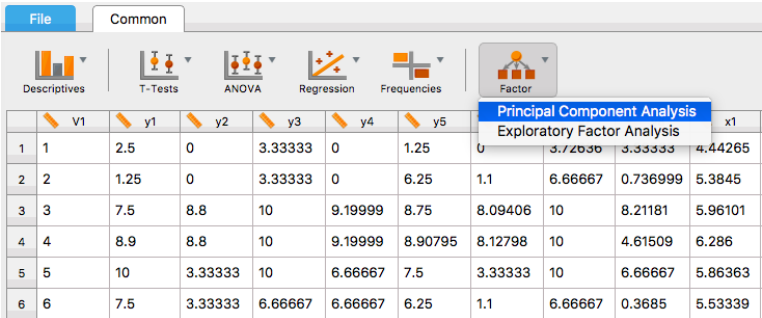
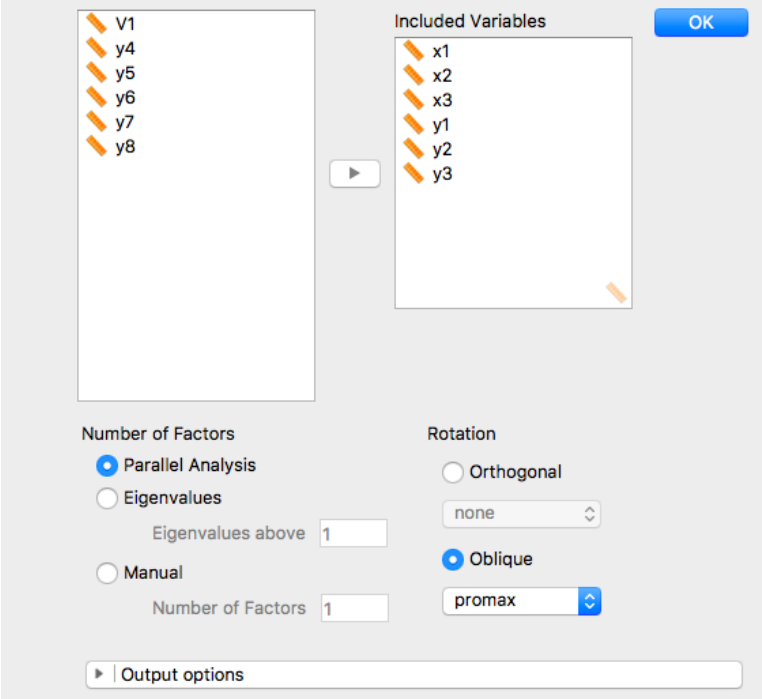


<p>2.</p>	<p>Add your variable(s) of interest to Factors. Keep in mind the following constraints:</p> <ul style="list-style-type: none"> <li>The variables must be ordinal or categorical</li> </ul> <p>Explore other options given in the menu space. When you have made your selections, click “OK.”</p>																															
<p>3.</p>	<p>Your results will be displayed in the right-hand space.</p> <p>In this case, we were interested in a model produced by these categorical variables. There is evidence of a significant influence of Sex and Student with <math>p</math>-values less than .05.</p>	<p><b>Log-Linear Regression</b></p> <p>ANOVA</p> <table border="1" data-bbox="776 724 1513 856"> <thead> <tr> <th></th> <th>df</th> <th>Deviance</th> <th>Residual df</th> <th>Residual Deviance</th> <th>p</th> </tr> </thead> <tbody> <tr> <td>NULL</td> <td></td> <td></td> <td>3</td> <td>118.658</td> <td></td> </tr> <tr> <td>Sex</td> <td>1</td> <td>27.797</td> <td>2</td> <td>90.860</td> <td>&lt; .001</td> </tr> <tr> <td>Student</td> <td>1</td> <td>90.387</td> <td>1</td> <td>0.474</td> <td>&lt; .001</td> </tr> <tr> <td>Sex * Student</td> <td>1</td> <td>0.474</td> <td>0</td> <td>0.000</td> <td>0.491</td> </tr> </tbody> </table>		df	Deviance	Residual df	Residual Deviance	p	NULL			3	118.658		Sex	1	27.797	2	90.860	< .001	Student	1	90.387	1	0.474	< .001	Sex * Student	1	0.474	0	0.000	0.491
	df	Deviance	Residual df	Residual Deviance	p																											
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Sex	1	27.797	2	90.860	< .001																											
Student	1	90.387	1	0.474	< .001																											
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*End of procedure*

# Factor Analysis

Factor analysis is a way to describe the variability of correlated variables. The idea is that two or more variables might reflect a single unknown variable. In other words, the aim is to create a fewer number of factors by combining two or more variables. This technique is particularly useful for personality theories, biology, or marketing. These fields may easily hypothesize too many variables, so factor analysis helps to find essentials of a theory. JASP can do two types of factor analysis: principal component analysis (PCA) and exploratory factor analysis (EFA).

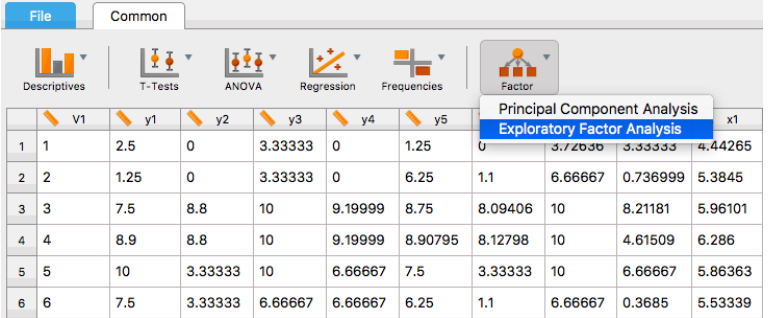
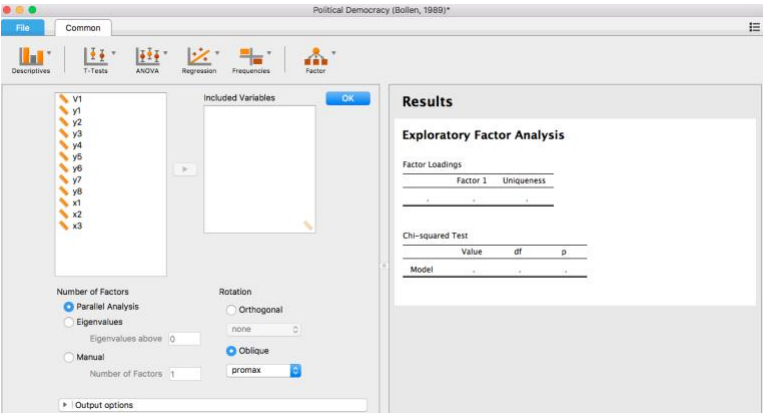
Step	Action	Result																																																																													
Principal Component Analysis																																																																															
We will be using the example data set " <b>Political Democracy.</b> "																																																																															
1.	Click "Factor" at the top and "Principal Component Analysis" from the drop-down menu.	 <table border="1" data-bbox="771 835 1528 1045"> <thead> <tr> <th></th> <th>V1</th> <th>y1</th> <th>y2</th> <th>y3</th> <th>y4</th> <th>y5</th> <th></th> <th></th> <th></th> <th>x1</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1</td> <td>2.5</td> <td>0</td> <td>3.33333</td> <td>0</td> <td>1.25</td> <td>0</td> <td>3.72636</td> <td>3.33333</td> <td>4.44265</td> </tr> <tr> <td>2</td> <td>2</td> <td>1.25</td> <td>0</td> <td>3.33333</td> <td>0</td> <td>6.25</td> <td>1.1</td> <td>6.66667</td> <td>0.736999</td> <td>5.3845</td> </tr> <tr> <td>3</td> <td>3</td> <td>7.5</td> <td>8.8</td> <td>10</td> <td>9.19999</td> <td>8.75</td> <td>8.09406</td> <td>10</td> <td>8.21181</td> <td>5.96101</td> </tr> <tr> <td>4</td> <td>4</td> <td>8.9</td> <td>8.8</td> <td>10</td> <td>9.19999</td> <td>8.90795</td> <td>8.12798</td> <td>10</td> <td>4.61509</td> <td>6.286</td> </tr> <tr> <td>5</td> <td>5</td> <td>10</td> <td>3.33333</td> <td>10</td> <td>6.66667</td> <td>7.5</td> <td>3.33333</td> <td>10</td> <td>6.66667</td> <td>5.86363</td> </tr> <tr> <td>6</td> <td>6</td> <td>7.5</td> <td>3.33333</td> <td>6.66667</td> <td>6.66667</td> <td>6.25</td> <td>1.1</td> <td>6.66667</td> <td>0.3685</td> <td>5.53339</td> </tr> </tbody> </table>		V1	y1	y2	y3	y4	y5				x1	1	1	2.5	0	3.33333	0	1.25	0	3.72636	3.33333	4.44265	2	2	1.25	0	3.33333	0	6.25	1.1	6.66667	0.736999	5.3845	3	3	7.5	8.8	10	9.19999	8.75	8.09406	10	8.21181	5.96101	4	4	8.9	8.8	10	9.19999	8.90795	8.12798	10	4.61509	6.286	5	5	10	3.33333	10	6.66667	7.5	3.33333	10	6.66667	5.86363	6	6	7.5	3.33333	6.66667	6.66667	6.25	1.1	6.66667	0.3685	5.53339
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Step	Action	Result																												
3.	Your results will be displayed in the right-hand space.  The primary output for a principal component analysis shows the correlation between each variable of a principal component and the principal component itself (displayed under the RC 1 and RC 2 columns for the two principal components).	<h3>Principal Component Analysis</h3> <p>Component Loadings</p> <table border="1"> <thead> <tr> <th></th> <th>RC 1</th> <th>RC 2</th> <th>Uniqueness</th> </tr> </thead> <tbody> <tr> <td>x1</td> <td>0.929</td> <td>.</td> <td>0.100</td> </tr> <tr> <td>x2</td> <td>0.957</td> <td>.</td> <td>0.068</td> </tr> <tr> <td>x3</td> <td>0.952</td> <td>.</td> <td>0.129</td> </tr> <tr> <td>y1</td> <td>.</td> <td>0.894</td> <td>0.180</td> </tr> <tr> <td>y2</td> <td>.</td> <td>0.819</td> <td>0.356</td> </tr> <tr> <td>y3</td> <td>.</td> <td>0.827</td> <td>0.300</td> </tr> </tbody> </table>		RC 1	RC 2	Uniqueness	x1	0.929	.	0.100	x2	0.957	.	0.068	x3	0.952	.	0.129	y1	.	0.894	0.180	y2	.	0.819	0.356	y3	.	0.827	0.300
	RC 1	RC 2	Uniqueness																											
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## Exploratory Factor Analysis

We will be using the example data set "**Political Democracy.**"

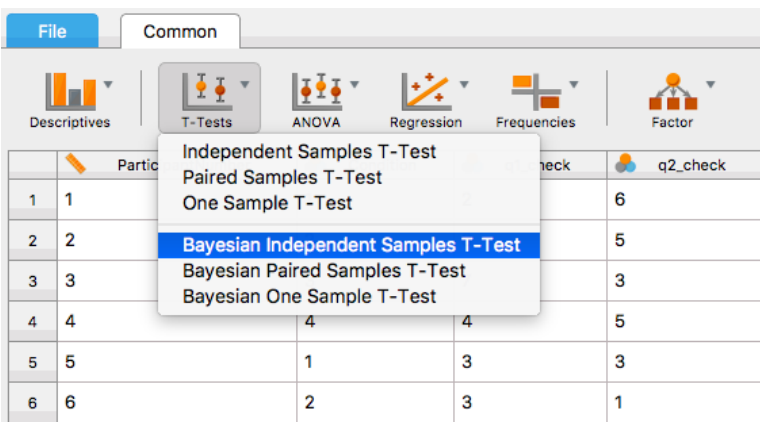
1.	Click "Factor" at the top and "Exploratory Factor Analysis" from the drop-down menu.	 <table border="1" style="margin-top: 10px;"> <thead> <tr> <th></th> <th>V1</th> <th>y1</th> <th>y2</th> <th>y3</th> <th>y4</th> <th>y5</th> <th>x1</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1</td> <td>2.5</td> <td>0</td> <td>3.33333</td> <td>0</td> <td>1.25</td> <td>0</td> </tr> <tr> <td>2</td> <td>2</td> <td>1.25</td> <td>0</td> <td>3.33333</td> <td>0</td> <td>6.25</td> <td>1.1</td> </tr> <tr> <td>3</td> <td>3</td> <td>7.5</td> <td>8.8</td> <td>10</td> <td>9.19999</td> <td>8.75</td> <td>8.09406</td> </tr> <tr> <td>4</td> <td>4</td> <td>8.9</td> <td>8.8</td> <td>10</td> <td>9.19999</td> <td>8.90795</td> <td>8.12798</td> </tr> <tr> <td>5</td> <td>5</td> <td>10</td> <td>3.33333</td> <td>10</td> <td>6.66667</td> <td>7.5</td> <td>3.33333</td> </tr> <tr> <td>6</td> <td>6</td> <td>7.5</td> <td>3.33333</td> <td>6.66667</td> <td>6.66667</td> <td>6.25</td> <td>1.1</td> </tr> </tbody> </table>		V1	y1	y2	y3	y4	y5	x1	1	1	2.5	0	3.33333	0	1.25	0	2	2	1.25	0	3.33333	0	6.25	1.1	3	3	7.5	8.8	10	9.19999	8.75	8.09406	4	4	8.9	8.8	10	9.19999	8.90795	8.12798	5	5	10	3.33333	10	6.66667	7.5	3.33333	6	6	7.5	3.33333	6.66667	6.66667	6.25	1.1
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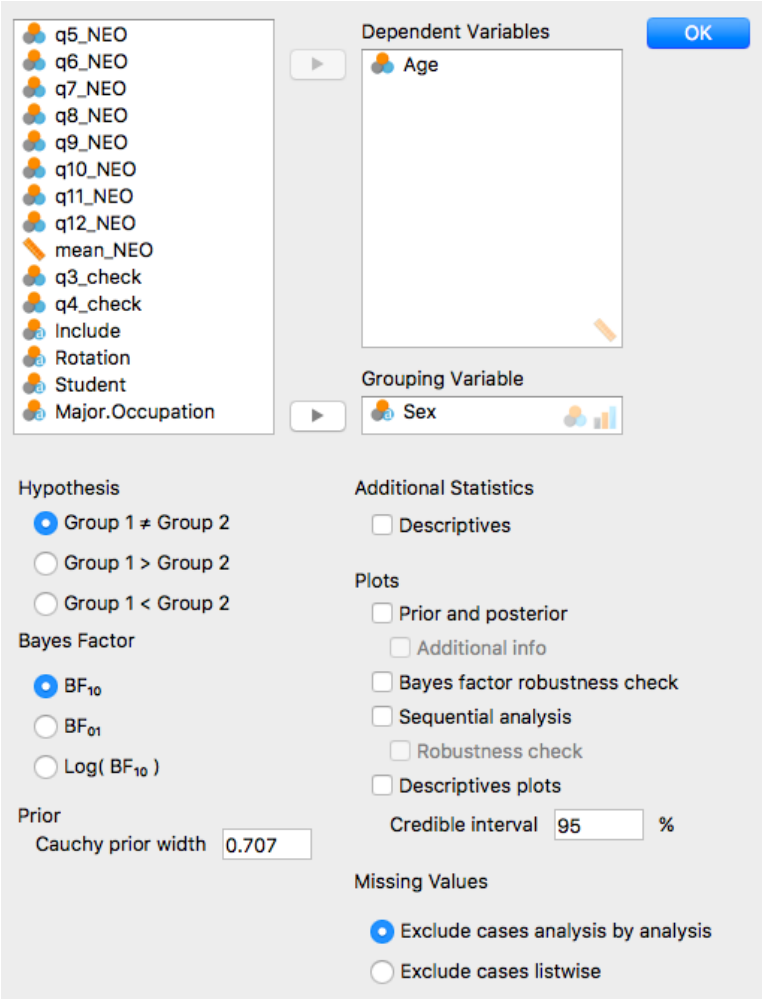
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3.	<p>Your results will be displayed in the right-hand space.</p> <p>The primary output shows how the variables load into factors.</p>	<p><b>Exploratory Factor Analysis</b></p> <p>Factor Loadings</p> <table border="1"> <thead> <tr> <th></th> <th>Factor 1</th> <th>Factor 2</th> <th>Uniqueness</th> </tr> </thead> <tbody> <tr> <td>x1</td> <td>0.885</td> <td>.</td> <td>0.152</td> </tr> <tr> <td>x2</td> <td>0.979</td> <td>.</td> <td>0.049</td> </tr> <tr> <td>x3</td> <td>0.895</td> <td>.</td> <td>0.236</td> </tr> <tr> <td>y1</td> <td>.</td> <td>1.007</td> <td>0.035</td> </tr> <tr> <td>y2</td> <td>.</td> <td>0.615</td> <td>0.620</td> </tr> <tr> <td>y3</td> <td>.</td> <td>0.677</td> <td>0.514</td> </tr> </tbody> </table> <p>Chi-squared Test</p> <table border="1"> <thead> <tr> <th></th> <th>Value</th> <th>df</th> <th>p</th> </tr> </thead> <tbody> <tr> <td>Model</td> <td>3.761</td> <td>4</td> <td>0.439</td> </tr> </tbody> </table>		Factor 1	Factor 2	Uniqueness	x1	0.885	.	0.152	x2	0.979	.	0.049	x3	0.895	.	0.236	y1	.	1.007	0.035	y2	.	0.615	0.620	y3	.	0.677	0.514		Value	df	p	Model	3.761	4	0.439
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*End of procedure*

# Bayesian Methods

JASP offers Bayesian alternatives to many of the analyses. Particularly, there are alternatives for Independent Samples T-Test, Paired Samples T-Test, One Sample T-Test, ANOVA, Repeated Measures ANOVA, ANCOVA, Correlation Matrix, Correlation Pairs, Linear Regression, Binomial Test, Contingency Tables, and Log-Linear Regression. Below we include some examples of procedures for these analyses. Bayesian statistics are an alternative to null hypothesis testing that is becoming increasingly preferred in fields that use statistics.

Step	Action	Result
<b>Bayesian Independent Samples T-Test</b>		
We will be using the example data set " <b>Kitchen Rolls.</b> "		
1.	Click "T-Tests" at the top left-hand corner and "Bayesian Independent Samples T-Test" from the drop-down menu.	 <p>The screenshot shows the JASP software interface. The 'Common' menu is open, and the 'T-Tests' option is selected, which has opened a sub-menu. In this sub-menu, 'Bayesian Independent Samples T-Test' is highlighted in blue. The background shows a data table with 6 rows and 4 columns, and a toolbar with icons for Descriptives, T-Tests, ANOVA, Regression, Frequencies, and Factor.</p>

Step	Action	Result						
2.	<p>Add your Dependent Variable and Grouping Variable. In this example, we will be using Age as a dependent variable and Sex as a grouping variable. Keep in mind the following constraints:</p> <ul style="list-style-type: none"> <li>The dependent variable must be scale</li> <li>The grouping variable must have exactly 2 levels</li> </ul> <p>When you have made your selections, click “OK.”</p>							
3.	Your results will be displayed in the right-hand space.	<h2 style="text-align: center;">Bayesian T-Test</h2> <p style="text-align: center;">Bayesian Independent Samples T-Test</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;"></th> <th style="width: 35%; text-align: center;">BF<sub>10</sub></th> <th style="width: 35%; text-align: center;">error %</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Age</td> <td style="text-align: center;">0.509</td> <td style="text-align: center;">7.833e -5</td> </tr> </tbody> </table>		BF <sub>10</sub>	error %	Age	0.509	7.833e -5
	BF <sub>10</sub>	error %						
Age	0.509	7.833e -5						

## Bayesian Paired Samples T-Test

We will be using the example data set "**Bugs.**"

- Click "T-Tests" at the top left-hand corner and "Bayesian Paired Samples T-Test" from the drop-down menu.

Subject	Gender	Region	Education	Lo D, Lo F
1				6
2				10
3				5
4	Female	North	college	6
5	Female	North	some	3
6	Female	Europe	some	2

- Add the combination of variables of interest. Keep in mind the following constraints:
  - The variable must be scale

When you have made your selections, click "OK."

**Hypothesis**

Measure 1 ≠ Measure 2  
 Measure 1 > Measure 2  
 Measure 1 < Measure 2

**Bayes Factor**

BF<sub>10</sub>  
 BF<sub>01</sub>  
 Log( BF<sub>10</sub> )

**Prior**

Cauchy prior width:

**Additional Statistics**

Descriptives

**Plots**

Prior and posterior  
 Additional info  
 Bayes factor robustness check  
 Sequential analysis  
 Robustness check  
 Descriptives plots  
 Credible interval:  %

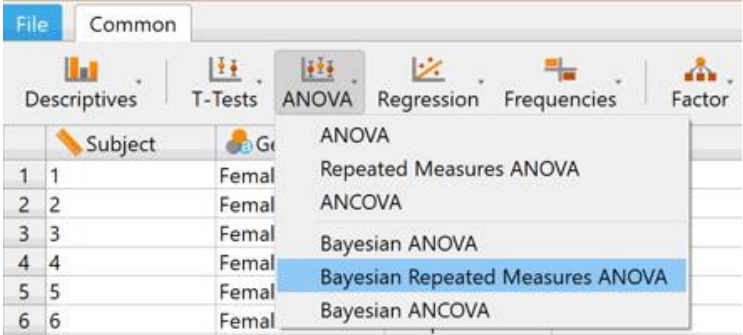
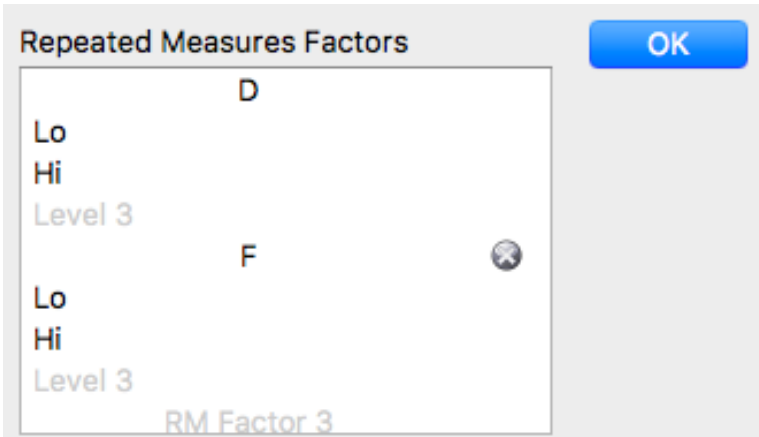
**Missing Values**

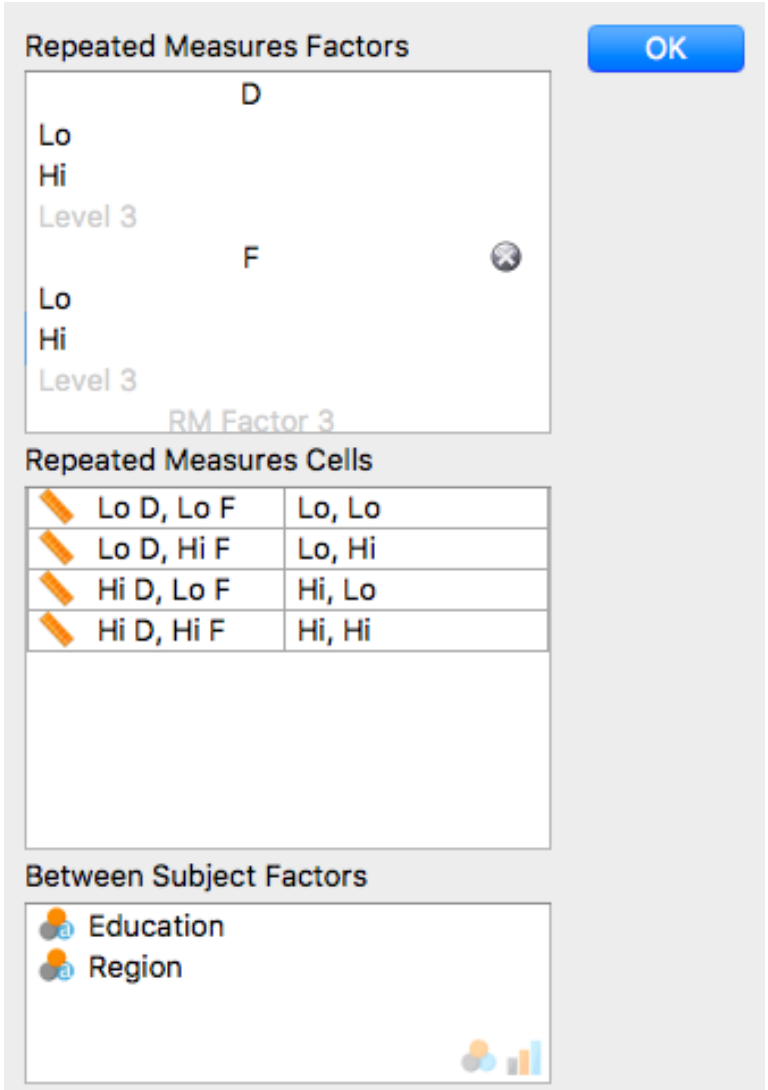
Exclude cases analysis by analysis  
 Exclude cases listwise

3.	Your results will be displayed in the right-hand space.	<h3 style="text-align: center;">Bayesian T-Test</h3> <p style="text-align: center;">Bayesian Paired Samples T-Test</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="3"></th> <th style="text-align: center;">BF<sub>10</sub></th> <th style="text-align: center;">error %</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Lo D, Lo F</td> <td style="text-align: center;">-</td> <td style="text-align: center;">Lo D, Hi F</td> <td style="text-align: center;">4.762e +6</td> <td style="text-align: center;">1.595e -14</td> </tr> <tr> <td style="text-align: center;">Lo D, Lo F</td> <td style="text-align: center;">-</td> <td style="text-align: center;">Hi D, Lo F</td> <td style="text-align: center;">24.734</td> <td style="text-align: center;">3.449e -9</td> </tr> <tr> <td style="text-align: center;">Lo D, Hi F</td> <td style="text-align: center;">-</td> <td style="text-align: center;">Hi D, Hi F</td> <td style="text-align: center;">0.574</td> <td style="text-align: center;">2.236e -7</td> </tr> <tr> <td style="text-align: center;">Hi D, Lo F</td> <td style="text-align: center;">-</td> <td style="text-align: center;">Hi D, Hi F</td> <td style="text-align: center;">43.486</td> <td style="text-align: center;">1.413e -9</td> </tr> </tbody> </table>				BF <sub>10</sub>	error %	Lo D, Lo F	-	Lo D, Hi F	4.762e +6	1.595e -14	Lo D, Lo F	-	Hi D, Lo F	24.734	3.449e -9	Lo D, Hi F	-	Hi D, Hi F	0.574	2.236e -7	Hi D, Lo F	-	Hi D, Hi F	43.486	1.413e -9
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Hi D, Lo F	-	Hi D, Hi F	43.486	1.413e -9																							

## Bayesian Repeated Measures ANOVA

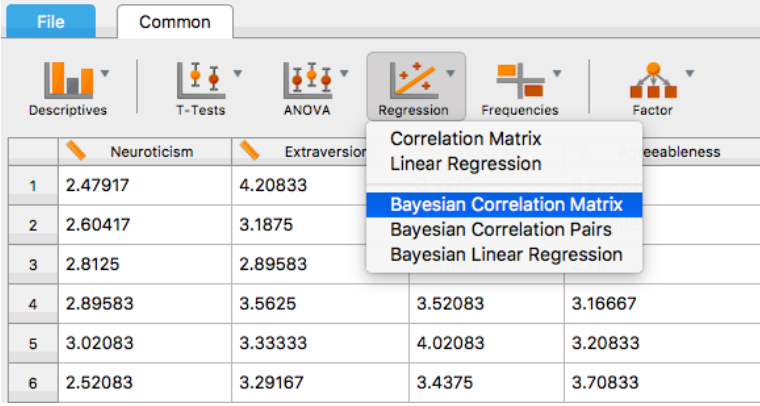
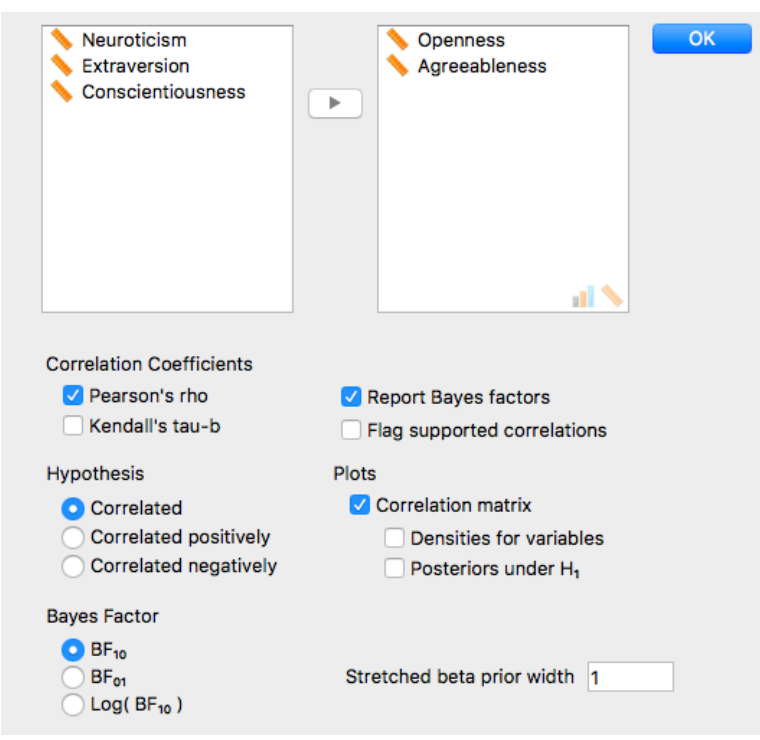
We will be using the example data set "**Bugs.**"

1.	Click "ANOVA" at the top left-hand corner and select "Bayesian Repeated Measures ANOVA" from the drop-down menu.	
2.	For each repeated measure or the within-subjects variable, label the variable under Repeated Measures Factors in "RM Factor" and then the levels of the variable in "Level."	

<p>3.</p>	<p>The repeated measures of Lo D, Lo F, Lo D, Hi F, Hi D, Lo F, and Hi D, Hi F should be placed in each section within the Repeated Measures Cells box, aligning with the appropriate labeling which JASP created based on your Repeated Measures Factors. Keep in mind the following constraints:</p> <ul style="list-style-type: none"> <li>The variables must be scale</li> </ul> <p>We will use a mixed-methods design, with both within-subjects and between-subjects variables. Add between-subjects variables in Between Subject Factors, as well. For these variables, keep in mind the following constraints:</p> <ul style="list-style-type: none"> <li>The variables must be ordinal or categorical</li> </ul> <p>Explore other options given in the menu space. When you have made your selections, click “OK.”</p>	
<p>4.</p>	<p>Your results will be displayed in the right-hand space.</p>	<p><b>Bayesian Repeated Measures ANOVA</b></p> <p>Model Comparison C</p> <hr/> <p>Null model (incl. subject)  D  Education  D + Education  D + Education + D*Education  Region  D + Region  Education + Region  D + Education + Region  D + Education + D*Education + Region  D + Region + D*Region  D + Education + Region + D*Region  D + Education + D*Education + Region + D*Region  Education + Region + Education*Region  D + Education + Region + Education*Region  D + Education + D*Education + Region + Education*Region  D + Education + Region + D*Region + Education*Region  D + Education + D*Education + Region + D*Region + Education*Region  D + Education + D*Education + Region + D*Region + Education*Region + D*Education*Region</p>

## Bayesian Correlation Matrix

We will be using the example data set "Big 5."

1.	<p>Click "Regression" at the top left-hand corner and "Bayesian Correlation Matrix" from the drop-down menu.</p>	 <p>The screenshot shows the SPSS software interface. The 'Regression' menu is open, and 'Bayesian Correlation Matrix' is highlighted. The background shows a data table with columns for Neuroticism, Extraversion, and Agreeableness, and rows numbered 1 to 6.</p>
2.	<p>Add your variables of interest. Keep in mind the following constraints:</p> <ul style="list-style-type: none"> <li>• The variable must be scale or ordinal</li> </ul> <p>Select "Correlation matrix" under Plots. Explore other options given in the menu space. When you have made your selections, click "OK."</p>	 <p>The screenshot shows the 'Bayesian Correlation Matrix' dialog box. On the left, 'Neuroticism', 'Extraversion', and 'Conscientiousness' are listed. On the right, 'Openness' and 'Agreeableness' are listed. The 'OK' button is visible in the top right corner.</p> <p>Correlation Coefficients</p> <p><input checked="" type="checkbox"/> Pearson's rho      <input checked="" type="checkbox"/> Report Bayes factors  <input type="checkbox"/> Kendall's tau-b      <input type="checkbox"/> Flag supported correlations</p> <p>Hypothesis</p> <p><input checked="" type="radio"/> Correlated      <input checked="" type="checkbox"/> Correlation matrix  <input type="radio"/> Correlated positively      <input type="checkbox"/> Densities for variables  <input type="radio"/> Correlated negatively      <input type="checkbox"/> Posteriors under H<sub>1</sub></p> <p>Bayes Factor</p> <p><input checked="" type="radio"/> BF<sub>10</sub>      Stretched beta prior width <input type="text" value="1"/>  <input type="radio"/> BF<sub>01</sub>  <input type="radio"/> Log( BF<sub>10</sub> )</p>



3.

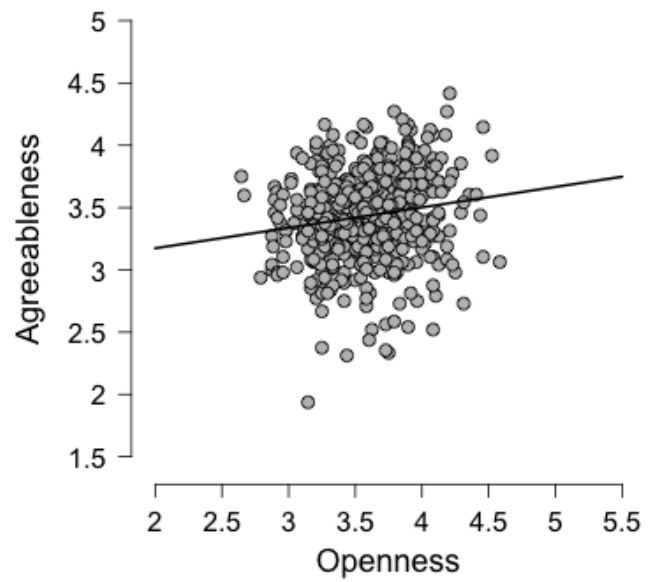
Your results will be displayed in the right-hand space.

### Bayesian Correlation Matrix

Bayesian Pearson Correlations

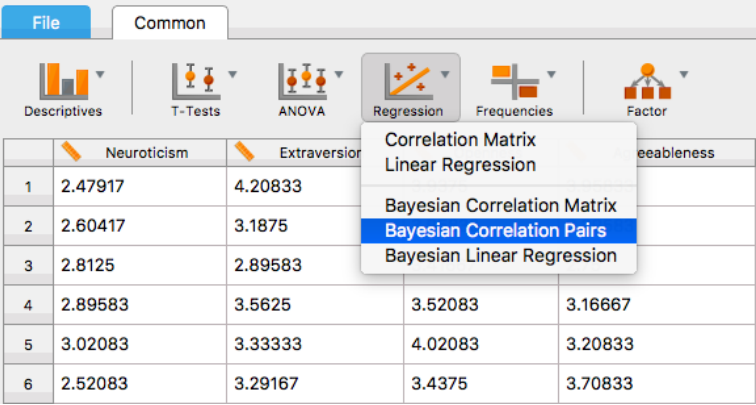
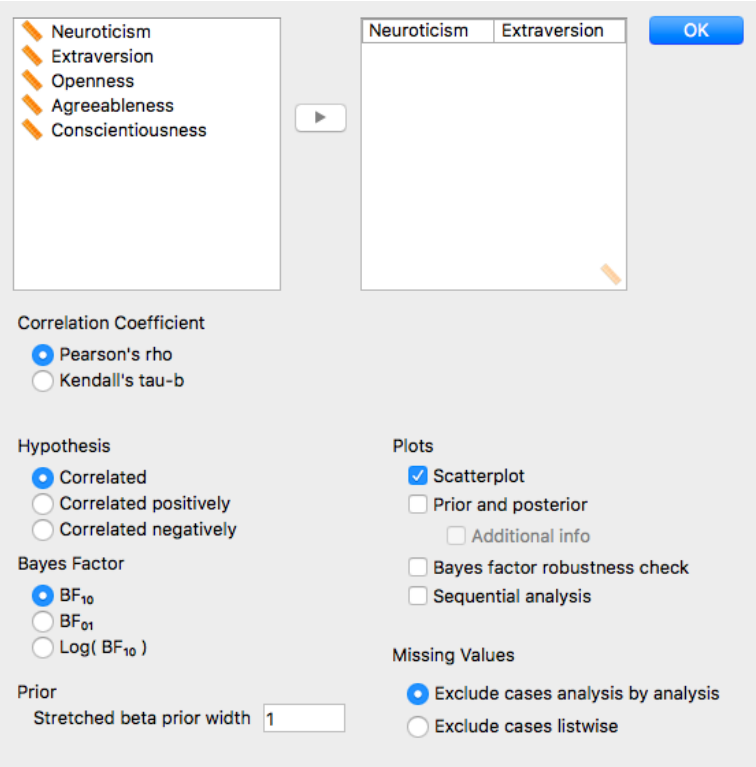
		Openness	Agreeableness
Openness	Pearson's r	—	0.159
	BF <sub>10</sub>	—	32.64
Agreeableness	Pearson's r	—	—
	BF <sub>10</sub>	—	—

### Correlation Plot



## Bayesian Correlation Pairs

We will be using the example data set "Big 5."

<p>1.</p>	<p>Click "Regression" at the top left-hand corner and "Bayesian Correlation Pairs" from the drop-down menu.</p>	 <p>The screenshot shows the SPSS 'Regression' menu open. The 'Bayesian Correlation Pairs' option is highlighted in blue. The background shows a data table with columns for Neuroticism, Extraversion, and Agreeableness.</p> <table border="1" data-bbox="776 478 1528 743"> <thead> <tr> <th></th> <th>Neuroticism</th> <th>Extraversion</th> <th>Agreeableness</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>2.47917</td> <td>4.20833</td> <td></td> </tr> <tr> <td>2</td> <td>2.60417</td> <td>3.1875</td> <td></td> </tr> <tr> <td>3</td> <td>2.8125</td> <td>2.89583</td> <td></td> </tr> <tr> <td>4</td> <td>2.89583</td> <td>3.5625</td> <td>3.52083</td> </tr> <tr> <td>5</td> <td>3.02083</td> <td>3.33333</td> <td>4.02083</td> </tr> <tr> <td>6</td> <td>2.52083</td> <td>3.29167</td> <td>3.4375</td> </tr> </tbody> </table>		Neuroticism	Extraversion	Agreeableness	1	2.47917	4.20833		2	2.60417	3.1875		3	2.8125	2.89583		4	2.89583	3.5625	3.52083	5	3.02083	3.33333	4.02083	6	2.52083	3.29167	3.4375
	Neuroticism	Extraversion	Agreeableness																											
1	2.47917	4.20833																												
2	2.60417	3.1875																												
3	2.8125	2.89583																												
4	2.89583	3.5625	3.52083																											
5	3.02083	3.33333	4.02083																											
6	2.52083	3.29167	3.4375																											
<p>2.</p>	<p>Add your variables of interest. Keep in mind the following constraints:</p> <ul style="list-style-type: none"> <li>The variable must be scale</li> </ul> <p>Select "Scatterplot" under Plots. Explore other options given in the menu space. When you have made your selections, click "OK."</p>	 <p>The screenshot shows the 'Bayesian Correlation Pairs' dialog box. The 'Neuroticism' and 'Extraversion' variables are selected in the 'Variables' list. The 'Correlation Coefficient' is set to 'Pearson's rho'. Under 'Hypothesis', 'Correlated' is selected. Under 'Plots', 'Scatterplot' is checked. The 'Bayes Factor' is set to 'BF<sub>10</sub>'. The 'Prior' section has 'Stretched beta prior width' set to 1. The 'Missing Values' section has 'Exclude cases analysis by analysis' selected.</p>																												

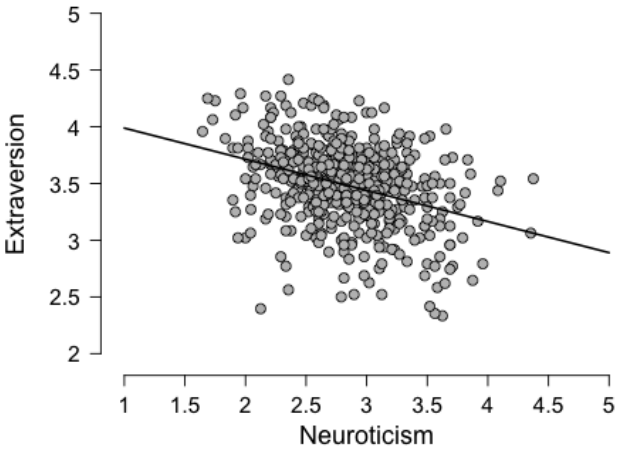
3. Your results will be displayed in the right-hand space.

**Bayesian Correlation Pairs**

Bayesian Pearson Correlation

		r	BF <sub>10</sub>
Neuroticism	- Extraversion	-0.350	1.072e +14

**Plots**  
**Neuroticism - Extraversion**  
**Scatterplot**



**Bayesian Linear Regression**

We will be using the example data set "Big 5."

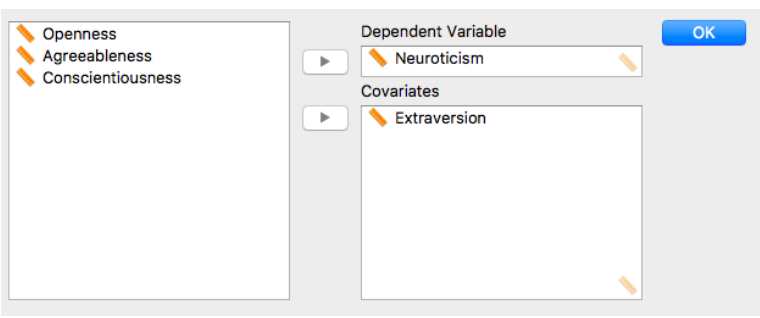
1. Click "Regression" at the top left-hand corner and "Bayesian Linear Regression" from the drop-down menu.

	Neuroticism	Extraversion	Agreeableness
1	2.47917	4.20833	
2	2.60417	3.1875	
3	2.8125	2.89583	
4	2.89583	3.5625	3.52083
5	3.02083	3.33333	4.02083
6	2.52083	3.29167	3.4375
			3.16667
			3.20833
			3.70833

2. Add your variable of interest. In this example, we will be using Neuroticism as the Dependent Variable and Extraversion as the Covariate. In Regression, a “Covariate” refers to variables that will be included in the model. Keep in mind the following constraints:

- The variables must be scale

When you have made your selections, click “OK.”



3. Your results will be displayed in the right-hand space.

**Bayesian Linear Regression**

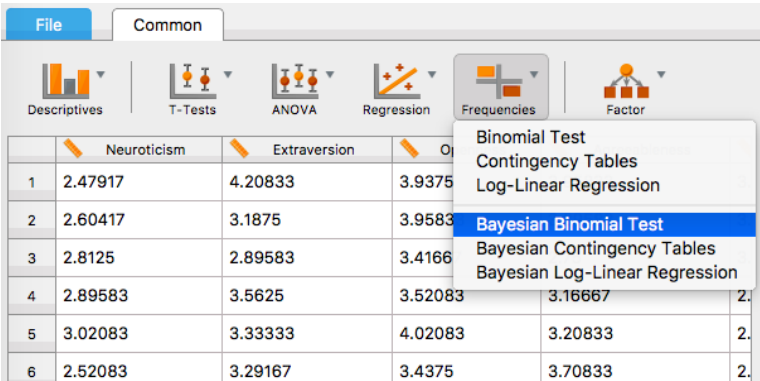
Model Comparison - Neuroticism

Models	P(M)	P(M data)	BFM	BF10	error %
Null model	0.500	1.415e -13	1.415e -13	1.000	
Extraversion	0.500	1.000	7.069e +12	7.069e +12	1.464e -6

**Bayesian Binomial Test**

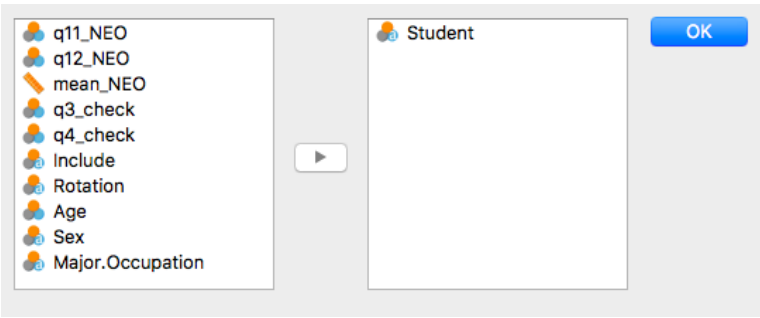
We will be using the example data set "Kitchen Rolls."

1. Click “Frequencies” at the top left-hand corner and “Bayesian Binomial Test” from the drop-down menu.



	Neuroticism	Extraversion	Openness
1	2.47917	4.20833	3.9375
2	2.60417	3.1875	3.9583
3	2.8125	2.89583	3.4166
4	2.89583	3.5625	3.52083
5	3.02083	3.33333	4.02083
6	2.52083	3.29167	3.4375

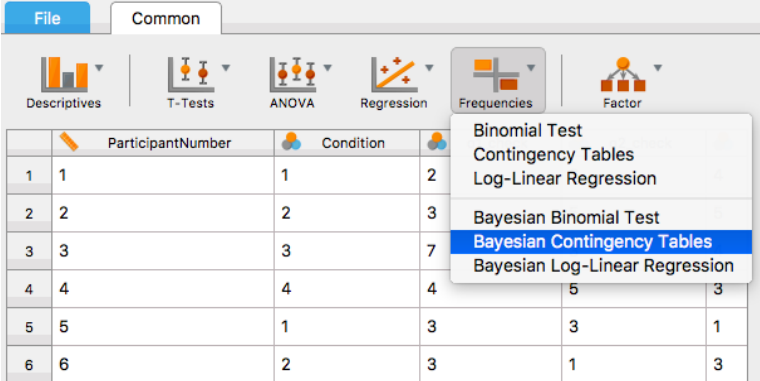
2. Add your variable of interest. Explore other options given in the menu space. When you have made your selections, click “OK.”

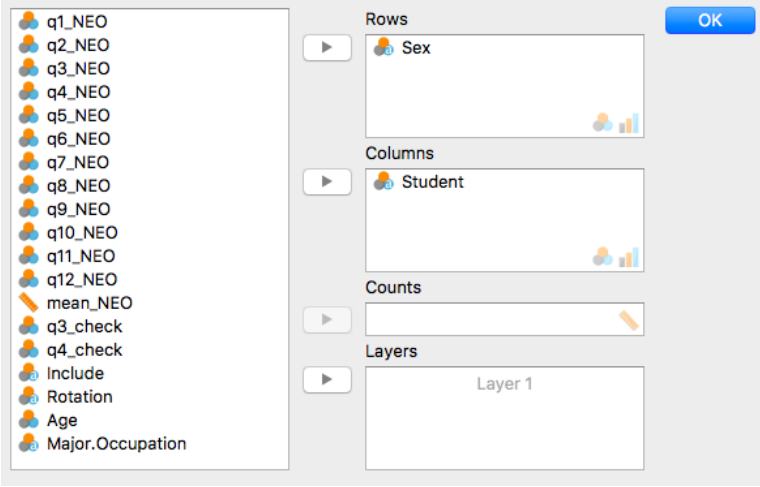


3.	Your results will be displayed in the right-hand space.	<h3 style="text-align: center;">Bayesian Binomial Test</h3> <p>Bayesian Binomial Test</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Level</th> <th>Counts</th> <th>Total</th> <th>Proportion</th> <th>BF<sub>10</sub></th> </tr> </thead> <tbody> <tr> <td rowspan="2">Student</td> <td>N</td> <td>7</td> <td>102</td> <td>0.069</td> <td>2.666e + 18</td> </tr> <tr> <td>Y</td> <td>95</td> <td>102</td> <td>0.931</td> <td>2.666e + 18</td> </tr> </tbody> </table> <p><i>Note.</i> Proportions tested against value: 0.5.</p>		Level	Counts	Total	Proportion	BF <sub>10</sub>	Student	N	7	102	0.069	2.666e + 18	Y	95	102	0.931	2.666e + 18
	Level	Counts	Total	Proportion	BF <sub>10</sub>														
Student	N	7	102	0.069	2.666e + 18														
	Y	95	102	0.931	2.666e + 18														

**Bayesian Contingency Tables**

We will be using the example data set "**Kitchen Rolls.**"

1.	Click "Frequencies" at the top left-hand corner and "Bayesian Contingency Tables" from the drop-down menu.	
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2.	<p>Add your variables of interest (two different variables) to Rows and Columns. Keep in mind the following constraints:</p> <ul style="list-style-type: none"> <li>The variables must be ordinal or categorical</li> </ul> <p>Explore other options given in the menu space. When you have made your selections, click "OK."</p>	
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3. Your results will be displayed in the right-hand space.

## Bayesian Contingency Tables

### Bayesian Contingency Tables

Sex	Student		Total
	N	Y	
F	6	71	77
M	1	24	25
Total	7	95	102

### Bayesian Contingency Tables Tests

	Value
BF <sub>10</sub> independent multinomial	0.158
N	102

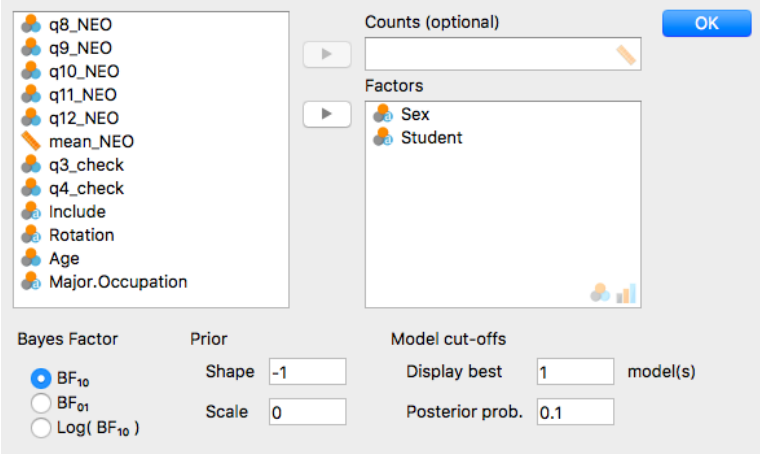
## Bayesian Log-Linear Regression

We will be using the example data set "Kitchen Rolls."

1. Click "Frequencies" at the top left-hand corner and "Bayesian Log-Linear Regression" from the drop-down menu.

The screenshot shows the SPSS 'Common' toolbar with the 'Frequencies' icon highlighted. A dropdown menu is open, listing the following options: Binomial Test, Contingency Tables, Log-Linear Regression, Bayesian Binomial Test, Bayesian Contingency Tables, and Bayesian Log-Linear Regression (which is highlighted in blue). Below the toolbar, a data table is visible with columns for ParticipantNumber, Condition, and other variables.

	ParticipantNumber	Condition			
1	1	1	2		
2	2	2	3		
3	3	3	7		
4	4	4	4	5	3
5	5	1	3	3	1
6	6	2	3	1	3

<p>2.</p>	<p>Add your variable(s) of interest to Factors. Keep in mind the following constraints:</p> <ul style="list-style-type: none"> <li>The variables must be ordinal or categorical</li> </ul> <p>Explore other options given in the menu space. When you have made your selections, click “OK.”</p>									
<p>3.</p>	<p>Your results will be displayed in the right-hand space.</p>	<h3 style="text-align: center;">Bayesian Log-Linear Regression</h3> <p>Model Comparison</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 10%;"></th> <th style="width: 40%;">Models</th> <th style="width: 20%;">P(M data)</th> <th style="width: 30%;">BF10</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Sex + Student</td> <td>0.873</td> <td>1.000</td> </tr> </tbody> </table> <p><i>Note.</i> Total number of models visited = 2</p>		Models	P(M data)	BF10	1	Sex + Student	0.873	1.000
	Models	P(M data)	BF10							
1	Sex + Student	0.873	1.000							

*End of procedure*

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