

A SIMPLE GUIDE TO USING SPSS

by Mark A. Stellmack and Emma Estrella

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Descriptive Statistics

Purpose: To compute descriptive statistics (e.g., mean, standard deviation, minimum, maximum) for your variables. (Descriptive statistics are shown in the output when you run many types of inferential statistical tests, so you may not need to compute only descriptive statistics very often, but here are instructions for doing so.)

How to set up the data: Each variable should be in its own column. Each row contains data for a different subject.

Example: Compute descriptive statistics for Variable A and Variable B.

Example data:

	I Variable_A	🛷 Variable_B
1	3.00	12.00
2	5.00	14.00
3	7.00	16.00
4	3.00	15.00
5	8.00	11.00
0		

How to compute descriptive statistics:

1) Click on Analyze > Descriptive Statistics > Descriptives... to open the dialog box:

ta Descriptives		×
 ✓ Variable_A ✓ Variable_B 	<u>V</u> ariable(s): ♥	<u>Options</u> Sty <u>l</u> e <u>B</u> ootstrap
Save standardi <u>z</u> ed valu	ies as variables	
OK	Paste Reset Cancel Help	

Descriptives			×
	*	<u>V</u> ariable(s):	<u>O</u> ptions Sty <u>l</u> e <u>B</u> ootstrap
Save standardi <u>z</u> ed valu	ies as va	riables	
ОК	<u>P</u> aste	Reset Cancel Help	

2) Move the variables for which you want descriptive statistics to "Variable(s)":

3) Click "Options..." Check the boxes for the statistics you want to compute. Mean, standard deviation, minimum, and maximum are already selected by default:

Descriptives: Options X		
<u>M</u> ean		
Dispersion ✓ Std. deviation ✓ Mi <u>n</u> imum ☐ Variance ✓ Maximum ☐ Range □ S E mean		
Distribution		
Display Order		
⊙ Varia <u>b</u> le list		
O <u>A</u> lphabetic		
O As <u>c</u> ending means		
O <u>D</u> escending means		
<u>Continue</u> Cancel Help		

4) Click "Continue". Click "OK" in the "Descriptives" dialog box. The results will appear in the Output window.

How to read the output: Each row of the Descriptive Statistics table contains the statistics for one of the variables.

		•			
	N	Minimum	Maximum	Mean	Std. Deviation
Variable_A	5	3.00	8.00	5.2000	2.28035
Variable_B	5	11.00	16.00	13.6000	2.07364
Valid N (listwise)	5				

Descriptive Statistics

How to report the descriptive statistics in APA format:

For this example:

For Variable A, M = 5.20, SD = 2.28.

Correlation (Pearson Product-Moment Correlation Coefficient)

Purpose: To determine the strength and direction of linear relationship between two variables. The p-value that is reported by SPSS allows you to decide whether the correlation coefficient is significantly different from zero.

<u>How to set up the data</u>: SPSS can compute correlations between more than two variables at one time. If you submit more than two variables to the correlation procedure, the output will show the correlations between all possible pairs of the variables. Each variable should be in a separate column, with values that belong together entered in the same row.

Example: Compute the correlations between Variables A and B, between Variables A and C, and between Variables B and C.

Example data:

	🔗 Variable_A	🛷 Variable_B	🛷 Variable_C
1	54.00	40.00	6.00
2	35.00	31.00	4.00
3	18.00	12.00	7.00
4	12.00	9.00	5.00
5	31.00	22.00	9.00
6	26.00	20.00	2.00
-			

How to run the test:

1) Click on Analyze > Correlate > Bivariate... The "Bivariate Correlations" dialog box appears:

A	<u>V</u> ariables:	Options
Variable_A		Sty <u>l</u> e
✓ Variable_C		<u>B</u> ootstrap
	•	Confidence interval
Correlation Coefficients		
Pearson Kendall's ta	u-b 🗌 <u>S</u> pearman	
Test of Significance		
⊙ <u>T</u> wo-tailed ○ One-tailed		
Elag significant correlatio	ns 🗌 Show only the lower triangle 🗹 Sh	now diagonal

Bivariate Correlations	×
Variable_A ✓ Variable_B ✓ Variable_C	<u>Options</u> Sty <u>l</u> e <u>B</u> ootstrap <u>C</u> onfidence interval
Correlation Coefficients ✓ Pearso <u>n </u>	
● <u>T</u> wo-tailed ○ One-tai <u>l</u> ed	
Elag significant correlations Show only the lower triangle Show diagonal OK Paste Reset Cancel Help	onal

2) Move all of the variables for which you want to compute correlations to the "Variables" box:

3) Click "OK". The results will appear in the Output window.

How to read the output:

The same correlation between each pair of variables is shown in two cells of the table:



How to report the results in APA format:

General format: r(df) = #.##, p = .###

Note that the table shows N rather than df. For this test, df = N - 2.

For this example:

Correlation between A and B: r(4) = 0.981, p < .001

Correlation between A and C: r(4) = 0.073, p = .891

Correlation between B and C: r(4) = -0.042, p = .936

Note that the p-value reported by SPSS in the table is for a two-tailed (non-directional) test. If you want to do a one-tailed (directional) test, either choose the "One-tailed" option in the "Bivariate Correlations" dialog box, or divide the two-tailed p-value by 2 to get the correct p-value.

Independent-Samples t-test/Independent-Groups t-test

<u>Purpose</u>: To compare the means of two samples that contain independent observations of a variable (for example, for two different levels of an independent variable).

<u>How to set up the data</u>: One column should contain the variable being compared for the two groups/samples (the dependent variable, or DV). Another column should contain an identifier that indicates to which group/sample the observation belongs. Each row contains data for a different subject.

Example: Compare the mean reaction time for Group A and Group B.

Example data:

	🖧 Group	🛷 reaction_time
1	Α	24.60
2	Α	32.90
3	В	18.50
4	A	27.10
5	В	15.30
6	В	16.10
7	A	25.60

How to run the test:

1) Click on Analyze > Compare Means > Independent-Samples T Test... to open the dialog box:

🔚 Independent-Samples T Test		×
Group ✓ reaction_time	Test Variable(s):	Options Bootstrap
	Grouping Variable:	
	✓ Estimate effect sizes	
OK	Paste Reset Cancel Help	

 Move the DV to "Test Variable(s)" and move the grouping variable to "Grouping Variable". (Check the "Estimate effect sizes" box at the bottom to calculate Cohen's d):

🔚 Independent-Samples T Test		×
	<u>T</u> est Variable(s):	Options Bootstrap
	Grouping Variable: Group(? ?) Define Groups	
	<u> </u>	-
OK <u>P</u> ast	e <u>R</u> eset Cancel Help	

3) Click "Define Groups..." Enter the two possible values of the grouping variable exactly as they appear in your spreadsheet (e.g., in terms of upper- and lower-case letters):

Independent-Samples T Test	×
Test Variable(s):	Options Bootstrap
ta Define Groups X	
Group <u>1</u> : A Group <u>2</u> : B	
<u>Continue</u> Cancel Help	
Define Groups	
✓ Estimate effect sizes	
OK <u>P</u> aste <u>R</u> eset Cancel Help	

4) Click "Continue". Click "OK" in the "Independent-Samples T Test" dialog box. The results will appear in the Output window.

<u>low to re</u>	ead th	<u>e outp</u> _{Grou}	p Statistic	s		This table shows the
	Group	N	Mean	Std. Deviation	Std. Error Mean	for your variable in
reaction_time	A	4	27.5500	3.71169	1.85585	
	В	3	16.6333	1.66533	.96148	your two groups.

Independent Samples Test

		Levene's Test Varia	for Equality of nces				t-test for Equality	ofMeans		
							Mean	Std. Error	95% Confidenc Differ	e interval of the ence
		F	Sig.	t	df	Sig. (2-tailed)	Difference	Difference	Lower	Upper
reaction_time	Equal variances assumed	1.289	.308	4.668	5	.005	10.91667	2.33858	4.90516	16.92817
	Equal variances not assumed			5.223	4.356	.005	10.91667	2.09012	5.29584	16.53750



			Point	95% Confide	ence Interval		
		Standardizer ^a	Estimate	Lower	Upper	.	
reaction_time	Cohen's d	3.06192	3.565 ┥	.907	6.131		Cohen's d (effect size)
	Hedges' correction	3.64189	2.998	.762	5.155		is shown in this call. In
	Glass's delta	1.66533	6.555	.757	12.737		is shown in this cell. In
a. The denor Cohen's d Hedges' c Glass's de	ninator used in estima uses the pooled stand orrection uses the poo elta uses the sample s	ting the effect size dard deviation. led standard devia tandard deviation	s. ition, plus a corre of the control grou	ection factor. up.			this example, Cohen's d = 3.565.

How to report the results in APA format:

General format: t(df) = #.##, p = .###

For this example: t(5) = 4.668, p = .005

Note that the p-value reported by SPSS is for a two-tailed (non-directional) test. If you are doing a one-tailed (directional) test, you must divide the reported p-value by 2 to get the correct p-value.

Repeated-Measures t-test/Paired-Samples t-test/Related-Samples t-test

Purpose: To compare the means of two samples in which the same subjects contributed data to both samples (in a repeated-measures design) or if each subject in one group can be matched with one subject in the other group in a meaningful way (e.g., twins; brother and sister).

<u>How to set up the data</u>: One column should contain the values for one condition and another column should contain the values for the second condition, with values that belong together entered in the same row. In a repeated-measures design, each row contains values for a single subject.

Example: Compare the mean score in Condition A to the mean score in Condition B.

Example data:

	& Condition_A	🗳 Condition_B
1	21.00	12.00
2	16.00	4.00
3	15.00	6.00
4	19.00	9.00
5	20.00	10.00
6	11.00	7.00
-		

How to run the test:

1) Click on Analyze > Compare Means > Paired-Samples T Test... to open the dialog box:

😭 Paired-Samples T Test		Deired Veri				×
Condition_A		Paired <u>v</u> an Pair 1	Variable1	Variable2		Options Bootstrap
					†	
	>				†	
					\leftrightarrow	
		Estimate	effect sizes			
		Calcula	ate standardizer u	sing		
			ndard deviation of t	the difference		
		⊖ <u>C</u> orr	ected standard de	eviation of the difference		
		O <u>A</u> ver	rage of variances			
	OK	Paste R	eset Cancel	Help		

2) Move the name of the variable for one condition to the "Variable1" column and move the other variable name to the "Variable2" column. (Check the "Estimate effect sizes" box at the bottom to calculate Cohen's d.):

Paired-Samples T Test				×
		Paired <u>V</u> ariables:		Options
Condition_A		Pair Variable1 Variable2 1		Bootstrap
			†	
			+	
		└── Estimate effect sizes]	
		Calculate standardizer using		
		● <u>S</u> tandard deviation of the difference		
		$\bigcirc \underline{C} orrected$ standard deviation of the difference		
		O <u>A</u> verage of variances		
	OK	Paste Reset Cancel Help		

3) Click "OK". The results will appear in the Output window.

How to read the output:



Paired Samples Effect Sizes



How to report the results in APA format:

General format:	t(<mark>df</mark>) =	= <mark>#.##</mark> .	p =	.###
-----------------	------------------------	-----------------------	-----	------

For this example: t(5) = 8.216, p < .001

Note that the p-value reported by SPSS is for a two-tailed (non-directional) test. If you are doing a one-tailed (directional) test, you must divide the reported p-value by 2 to get the correct p-value.

One-Way Independent-Groups (Between-Subjects) ANOVA

<u>Purpose</u>: To compare the means of three or more samples that contain independent observations of a variable. If the ANOVA produces significant results, do a post hoc test to determine specifically which sample means are different from each other.

<u>How to set up the data</u>: One column should contain the variable being compared for the groups/samples (the dependent variable, or DV). Another column should contain an identifier that indicates to which group/sample the observation belongs. Each row contains data for a different subject. The grouping variable must be nominal and numeric.

Example: Compare the mean reaction times for Group 1, Group 2, and Group 3.

Example data:

	💑 Group	🔗 reaction_time
1	1	40.00
2	2	21.00
3	1	36.00
4	3	23.00
5	3	24.00
6	2	24.00
7	1	37.00
8	3	26.00
9	2	27.00

How to run the test:

1) Click on Analyze > Compare Means > One-Way ANOVA... to open the dialog box:

🕼 One-Way ANOVA		×
Group	Dependent List: → Eactor:	Contrasts Post <u>H</u> oc Qptions Bootstrap
	Estimate effect size for overall tests	
OK !	Paste <u>R</u> eset Cancel Help	

One-Way ANOVA		×
	Dependent List:	Contrasts Post <u>H</u> oc Options Bootstrap
	Eactor:	
OK [Paste Reset Cancel Help	

2) Move the DV to "Dependent List" and move the grouping variable to "Factor". Check the box labeled "Estimate effect size for overall tests".:

3) Click "Options..." Check the box labeled "Descriptive", then click Continue:

🔄 One-Way ANOVA: Options 🛛 🗙
Statistics
Descriptive
<u>H</u> omogeneity of variance test
Brown-Forsythe test
<u>W</u> elch test
<u>M</u> eans plot
Missing Values
\odot Exclude cases analysis by analysis
O Exc <u>l</u> ude cases listwise
Confidence Intervals
Le <u>v</u> el(%): 0.95
Continue Cancel Help

4) In the "One-Way ANOVA" dialog box, click "Post Hoc..." Check the box labeled "Tukey", then click "Continue":

ia One-Way ANOVA: Post Hoc Multiple Comparisons X				
Equal Variances A	ssumed			
	<u>S-N-K</u>	<u>W</u> aller-Duncan		
Bonferroni	✓ <u>T</u> ukey	Type I/Type II Error Ratio: 100		
Sidak	Tu <u>k</u> ey's-b	Dunnett		
Scheffe	<u>D</u> uncan	Control Category : Last		
□ <u>R</u> -E-G-W F	<u>H</u> ochberg's GT2	Test		
R-E-G-W Q	<u>G</u> abriel	O <u>2</u> -sided O < C <u>o</u> ntrol O > Co <u>n</u> trol		
Equal Variances Not Assumed Ta <u>m</u> hane's T2 Dunnett's T <u>3</u> G <u>a</u> mes-Howell D <u>u</u> nnett's C Null Hypothesis test				
Ose the same s	significance level [alpha	a) as the setting in Options		
Level: 0.05	nincance ievei [aipha]	for the post noc test		
	Continue	Cancel Help		

5) In the "One-Way ANOVA" dialog box, click "OK". The results will appear in the Output window.

How to read the output:

reaction	n_time							
					95% Confiden Me	ce Interval for an		
	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
1	3	37.6667	2.08167	1.20185	32.4955	42.8378	36.00	40.00
2	3	24.0000	3.00000	1 73205	16.5476	31.4524	21.00	27.00
3	3	24.3333	1.52753	.88192	20.5388	28.1279	23.00	26.00
Total	9	28.6667	7.03562	2.34521	23.2586	34.0747	21.00	40.00

Descriptives

ANOVA

reaction_time						
	Sum of Squares	df		Mean Square	F	Sig.
Between Groups	364.667		2	182.333	34.915	<.001
Within Groups	31.333	1	6	5.222		
Total	396.000	11	8			

This table shows the descriptive statistics for the DV in the different groups.

How to report the results in APA format:

General format: $F(df_{BG}, df_{WG}) = \frac{\#, \#\#}{\#, p} = \frac{\#, \#\#}{\#, p}$

For this example: F(2, 6) = 34.915, p < .001

ANOVA Effect Sizes^a

		Point Estimate	95% Confide Lower	nce Interval Upper	
reaction_time	Eta-squared	.921	.530	.951	
	Epsilon-squared	.895	.374	.935	
	Omega-squared Fixed- effect	.883	.347	.928	Eta-squared is an
	Omega-squared Random-effect	.790	.210	.865	estimate of effect size. In this example, eta-
a. Eta-squared and Epsilon-squared are estimated based on the fixed-effect			squared equals .921.		

a. Eta-squared and Epsilon-squared are estimated based on the fixed-effect model.

Г

Because the results of the ANOVA are significant, you should look at the results of the post hoc test:

Post Hoc Tests

Multiple Comparisons Dependent Variable: reaction_time Tukey HSD							The p-values (Sig.) show which pairs of sample means are	
		Mean Difference (I-			95% Confid	ence Interval		significantly different.
(I) Group	(J) Group	J)	Std. Error	Sig.	Lower Bound	Upper Bound		Groups 1 and 2 are
1	2	13.66667*	1.86587	<.001 <	7.9417	19.3917		significantly different.
	3	13.33333	1.86587	<.001 <	7 6083	19.0583	-	Groups 1 and 3 are
2	1	-13.66667	1.86587	<.001	-19.3917	-7.9417		significantly different
	3	33333	1.86587	.983 ┥	-6.0583	5.3917		Significantly unreferre.
3	1	-13.33333	1.86587	<.001	-19.0583	-7.6093		Groups 2 and 3 are not
	2	.33333	1.86587	.983	-5.3917	6.0583		significantly different.

*. The mean difference is significant at the 0.05 level.

There are no statistics to report in APA format for the post hoc test. Simply report which means are significantly different.

One-Way Repeated-Measures (Within-Subjects) ANOVA

<u>Purpose</u>: To compare the means of three or more measures that were performed on a single group of subjects. If the ANOVA produces significant results, do a post hoc test to determine specifically which sample means are different from each other.

How to set up the data: The different measures should be placed in different columns. Each row contains values for a single subject.

Example: A group of 5 subjects takes a test at three different times. Test whether the scores are significantly different at different times.

Example data:

	🔗 Time_1	🔗 Time_2	Fime_3
1	18.00	21.00	25.00
2	19.00	20.00	21.00
3	16.00	19.00	18.00
4	18.00	24.00	22.00
5	20.00	23.00	25.00
0			

How to run the test:

1) Click on Analyze > General Linear Model > Repeated Measures... to open the dialog box:

Repeated Measures Define Factor(s)			
Within-Subject Factor Name:			
factor1			
Number of <u>L</u> evels:			
Add			
<u>C</u> hange			
Re <u>m</u> ove			
Measure <u>N</u> ame:			
A <u>d</u> d			
C <u>h</u> ange			
Remo <u>v</u> e			
Define <u>R</u> eset Cancel Help			

2) Enter the number of levels of the repeated-measures variable in the "Number of Levels" box, then click "Add":

Repeated Measures Define Factor(s) X	Repeated Measures Define Factor(s) X
Within-Subject Factor Name:	Within-Subject Factor Name:
Number of Levels: 3	Number of Levels:
Add	Add factor1(3)
<u>C</u> hange	<u>C</u> hange
Remove	Re <u>m</u> ove
Measure <u>N</u> ame:	Measure <u>N</u> ame:
A <u>d</u> d	A <u>d</u> d
C <u>h</u> ange	C <u>h</u> ange
Remo <u>v</u> e	Remo <u>v</u> e
Define <u>R</u> eset Cancel Help	Define Reset Cancel Help

3) Click "Define" to open the "Repeated Measures" dialog box:

Repeated Measures			×
A Time 1	l	Within-Subjects Variables	Model
Vilme_1		(iactori). ? (1)	Contrasts
Time_3	7 +	_?_(2)	Plo <u>t</u> s
		?(3)	Post <u>H</u> oc
			EM Means
			<u>S</u> ave
			Options
	•	Between-Subjects Factor(s):	
-		<u>C</u> ovariates:	
	>		
OK	<u>P</u> aste	Reset Cancel Help	

Repeated Measures		×
	<u>W</u> ithin-Subjects Variables (factor1):	Model
	Time_1(1)	Contrasts
	Time_2(2)	Plo <u>t</u> s
	Time_3(3)	Post <u>H</u> oc
✓		EM Means
		<u>S</u> ave
		Options
	Between-Subjects Factor(s):	
\$		
	<u>C</u> ovariates:	
*		
OK <u>P</u> aste	Reset Cancel Help	

4) Move the three levels of the variable to the "Within-Subjects Variables" box:

5) Click "EM Means". Move "factor1" to the "Display Means for" box. Check the "Compare main effects" box. From the "Confidence interval adjustment" drop-down menu, select "LSD(none)". Click "Continue".

Repeated Measures: Estimated Marginal Means	Repeated Measures: Estimated Marginal Means X
Estimated Marginal Means Eactor(s) and Factor Interactions: Display Means for: Display Means for: COVERALL) factor1 Compare main effects Confidence interval adjustment: LSD(none)	Estimated Marginal Means Factor(s) and Factor Interactions: (OVERALL) factor1 Display Means for: factor1
Continue Cancel Help	Continue Cancel Help

6) In the "Repeated Measures" dialog box, click "Options..." In the "Repeated Measures: Options" dialog box, check "Descriptive statistics" and "Estimates of effect size". Click "Continue":

take Repeated Measures: Options	>
Display	
✓ Descriptive statistics	<u>H</u> omogeneity tests
Estimates of effect size	Spread-vslevel plots
Observed power	Residual plots
Parameter estimates	Lack-of-fit test
SCP matrices	<u>General estimable function(s)</u>
Residual SS <u>C</u> P matrix	
Significance le <u>v</u> el: .05 Confide	ence intervals are 95.0 % Cancel Help

7) In the "Repeated Measures" dialog box, click "OK". The results will appear in the Output window.

How to read the output: The output will contain many tables. Only some of the tables contain important information for our purposes. Not all of the tables are shown below.

	Descript	ive Statistics			
	Mean	Std. Deviation	Ν	_	This table sho
Time_1	18.2000	1.48324	5		descriptive sta
Time_2	21.4000	2.07364	5		the three levels
Time_3	22.2000	2.94958	5		repeated-meas
				_	variable.

Tests of Within-Subjects Effects

Measure: ME/	ASURE_1	Type III Supp					Partial Eta
Source		of Squares	df	Mean Square	F	Sig.	Squared
factor1	Sphericity Assumed	44.800	2	22.400	10.030	.007	.715
	Greenhouse-Geisser	44.800	1.811	24.740	10.030	.009	.715
	Huynh-Feldt	44.800	2.000	22.400	10.030	.007	.715
	Lower-bound	44.800	1.000	44.800	10.030	.034	.715
Error(factor1)	Sphericity Assumed	17.867	8	2.233			
	Greenhouse-Geisser	17.867	7.243	2.467			
	Huynh-Feldt	17.887	8.000	2.233			
	Lower-bound	17.867	4.000	4.467			
How to report the results in APA format:							
eneral format: $F(df_{BG}, df_{Error}) = #.##, p = .###$ Partial eta-squared is a measure of effect size.							ect size.
or this example: $F(2, 8) = 10.030$, $p = .007$ In this example, partial eta-squared equals .715.					e, partial quals .715.		

Because the results of the ANOVA are significant, you should look at the results of the post hoc test:

Pairwise Comparisons							
Measure:	MEASURE_1						The
		Mean Difference (I-			95% Confider Differ	ice Interval for ence ^b	sho sar
(I) factor1	(J) factor1	J)	Std. Error	Sig. ^b	Lower Bound	Upper Bound	sig
1	2	-3.200	.800	.016 🗸	-5.421	979	
	3	-4.000*	.949	.014 <	-6.634	-1.366	Gro
2	1	3.200	.800	.016	.979	5.121	sig
	3	800	1.068	.495 🚽	-3.764	2.164	Gru
3	1	4.000*	.949	.014	1.366	6.634	sig
	2	.800	1.068	.495	-2.164	3.764	Sig

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

There are no statistics to report in APA format for the post hoc test. Simply report which means are significantly different.

The p-values (Sig.) show which pairs of sample means are significantly different.

Groups 1 and 2 are significantly different.

Groups 1 and 3 are significantly different.

Groups 2 and 3 are not significantly different.

Two-Way Independent-Groups ANOVA

<u>Purpose</u>: To compare the means for a dependent variable when there are two independent variables, and there are different subjects in each condition of the experiment. This allows you to evaluate the significance of the two main effects and the interaction.

<u>How to set up the data</u>: Each row contains data for a single subject. One column shows the level of IV1 that the subject experienced and another column shows the level of IV2 for that subject. The remaining column shows the value of the DV for that subject.

Example: All subjects take a math test. The score on the math test is the DV. Each subject takes the test in either a cold room or a warm room, and either with quiet music or loud music playing. IV1: cold room or warm room. IV2: quiet music or loud music. There are four groups in this 2x2 design, and there are three subjects in each group.

	💑 room_temp	💑 music_vol	🛷 test_score
1	cold	quiet	10.00
2	cold	quiet	12.00
3	cold	quiet	11.00
4	cold	loud	12.00
5	cold	loud	14.00
6	cold	loud	11.00
7	warm	quiet	17.00
8	warm	quiet	18.00
9	warm	quiet	20.00
10	warm	loud	9.00
11	warm	loud	11.00
12	warm	loud	12.00
40			

Example data:

How to run the test:

1) Click on Analyze > General Linear Model > Univariate... to open the dialog box:



Univariate		×
	Dependent Variable:	<u>M</u> odel
	V test_score	Contrasts
	Fixed Factor(s):	Plo <u>t</u> s
	a music_vol	Post <u>H</u> oc
	Random Factor(s):	EM Means
		<u>S</u> ave
	\$	Options
	Covariate(s):	<u>B</u> ootstrap
	*	
	₩LS Weight:	
OK	Paste <u>R</u> eset Cancel He	lp

2) Move the DV to "Dependent Variable" and move the IVs to "Fixed Factor(s)":

3) Click "Options..." Check the box labeled "Descriptive statistics", then click Continue:

🕼 Univariate: Options	×			
Display				
☑ Descriptive statistics	<u>Homogeneity</u> tests			
<u>E</u> stimates of effect size	Spread-vslevel plots			
Observed power	<u>R</u> esidual plots			
Parameter estimates	Lack-of-fit test			
Contrast coefficient matrix	<u>General estimable function(s)</u>			
Heteroskedasticity Tests				
Modified Breusch-Pagan test	F test			
Model	Model			
Breusch-Pagan test	White's test			
Model				
Parameter estimates with rob <u>u</u> st s	standard errors			
● HC <u>0</u>				
● HC <u>1</u>				
● HC <u>2</u>				
● HC <u>3</u>				
Significance level: .05 Confidence intervals are 95.0 % Continue Cancel Help				

4) In the "Univariate" dialog box, click "OK". The results will appear in the Output window.

How to read the output:

Descriptive Statistics

Dependent Variable: test_score

room_temp	music_vol	Mean	Std. Deviation	Ν	
cold	loud	12.3333	1.52753	3	
	quiet	11.0000	1.00000	3	-
	Total	11.6667	1.36626	6	
warm	loud	10.6667	1.52753	3	
	quiet	18.3333	1.52753	3	
	Total	14.5000	4.41588	6	
Total	loud	11.5000	1.64317	6	
	quiet	14.6667	4.17931	6	
	Total	13.0833	3.44986	12	

This table shows the				
descriptive statistics for				
the DV in the different				
groups, defined by				
different combinations				
of the levels of the IVs.				

Tests of Between-Subjects Effects

Dependent Variable: test_score						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	
Corrected Model	114.917 ^a	3	38.306	19.153	<.001	
Intercept	2054.083	1	2054.083	1027.042	<.001	
room_temp	24.083	1	24.083	12.042	.008	k
music_vol	30.083	1	30.083	15.042	.005	\mathbf{x}
room_temp * music_vol	60.750	1	60.750	30.375	<.001	
Error	16.000	8	2.000			
Total	2185.000	12				
Corrected Total	132.917	11				
a. R Squared = .878 (Adjusted R Squared = .832)						

a. R Squared = .878 (Adjusted R Squared = .832)

How to report the results in APA format:

General format: $F(df_{BG}, df_{WG}) = #.##, p = .###$

For this example:

For the main effect of room temp: F(1, 8) = 12.042, p = .008

For the main effect of music vol: F(1, 8) = 15.042, p = .005

For the interaction: F(1, 8) = 30.375, p < .001

Results for the two main effects and the interaction are in these rows. (Note the "Source" in the first column.)

Two-Way Repeated-Measures ANOVA

Purpose: To compare the means for a dependent variable when there are two independent variables, and all subjects experience all levels of both IVs (i.e., the same subjects are in all groups). This allows you to evaluate the significance of the two main effects and the interaction.

<u>How to set up the data</u>: Each row contains data for a single subject. Each column contains the value of the DV for one of the combinations of levels of the IVs.

Example: All subjects take a test of attention. The score on the attention test is the DV. Each subject takes the test four times, once in each of the following conditions: (1) in a cold room with quiet music, (2) in a cold room with loud music, (3) in a warm room with quiet music, and (4) in a warm room with loud music. IV1: cold room or warm room. IV2: quiet music or loud music. There are five subjects and four groups (conditions) in this 2x2 design. Each subject provides a score in each of the four conditions.

	🖋 cold_quiet	🖋 cold_loud	🛷 warm_quiet	🛷 warm_loud
1	20.00	12.00	24.00	19.00
2	18.00	14.00	26.00	16.00
3	22.00	11.00	22.00	14.00
4	21.00	16.00	19.00	17.00
5	16.00	12.00	21.00	16.00
<u> </u>				

Example data:

How to run the test:

1) Click on Analyze > General Linear Model > Repeated Measures... to open the dialog box:

🔚 Repeated Measures Define Factor(s) 🛛 $ imes$				
Within-Subject Factor Name:				
factor1				
Number of Levels:				
<u>A</u> dd				
<u>C</u> hange				
Re <u>m</u> ove				
Measure <u>N</u> ame:				
A <u>d</u> d				
C <u>h</u> ange				
Remove				
Define <u>R</u> eset Cancel Help]			

2) For each IV, enter the name of the variable in the "Within-Subject Factor Name" box and the number of levels in the "Number of Levels" box, then click on "Add". After you have added both IVs (as in the box on the right below), click "Define":

Repeated Measures Define Factor(s)	Repeated Measures Define Factor(s) ×
Within-Subject Factor Name:	Within-Subject Factor Name:
Number of Levels: 2	Number of Levels:
<u>A</u> dd <u>C</u> hange	Add room_temp(2) music_vol(2)
. Re <u>m</u> ove	Re <u>m</u> ove
Measure <u>N</u> ame:	Measure <u>N</u> ame:
A <u>d</u> d	A <u>d</u> d
C <u>h</u> ange	C <u>h</u> ange
Remo <u>v</u> e	Remo <u>v</u> e
Define <u>R</u> eset Cancel Help	Define <u>R</u> eset Cancel Help

3) The "Repeated Measures" dialog box appears:

tailer Repeated Measures			×
 cold_quiet cold_loud warm_quiet warm_loud 	∱ ↓	<pre><u>W</u>ithin-Subjects Variables (room_temp,music_vol): _?_(1,1) _?_(1,2) _?_(2,1) _?_(2,2)</pre>	Model Contrasts Plots Post Hoc EM Means Save Options
	y	<u>B</u> etween-Subjects Factor(s): <u>C</u> ovariates:	
OK	<u>P</u> aste	Reset Cancel Help	

4) Move the four conditions from the left to "Within-Subjects Variables". Be sure to keep track of the levels of the two variables and move them correctly. In this example cold = 1, warm = 2, quiet = 1, loud = 2. Move the cold_quiet variable to the Within-Subjects Variable identified as (1,1).

Repeated Measures		×
	<u>W</u> ithin-Subjects Variables (room temp.music vol):	Model
	cold_quiet(1,1)	Contrasts
Τ *	cold_loud(1,2)	Plo <u>t</u> s
	warm_quiet(2,1)	Post <u>H</u> oc
•	warm_loud(2,2)	EM Means
		<u>S</u> ave
		Options
*	Between-Subjects Factor(s):	
	<u>C</u> ovariates:	
*		
OK Paste	Reset Cancel Help	

5) Click "Options...", check the box labeled "Descriptive statistics", and click "Continue":

Repeated Measures: Options	>
Descriptive statistics	Homogeneity tests
<u>E</u> stimates of effect size	Spread-vslevel plots
Observed power	Residual plots
Parameter estimates	Lack-of-fit test
SCP matrices	<u>General estimable function(s)</u>
Residual SS <u>C</u> P matrix	
Significance level: .05 Confid	dence intervals are 95.0 %
<u>C</u> ontinue	Cancel Help

6) In the "Repeated Measures" dialog box, click "OK". The results will appear in the Output window.

How to read the output: The output will contain many tables. Only some of the tables contain important information for our purposes. Not all of the tables are shown below.

Descriptive Statistics					This table shows the
	Mean	Std. Deviation	N	_	descriptive statistics for
cold_quiet	19.4000	2.40832	5		the DV in the different
cold_loud	13.0000	2.00000	5		conditions, defined by
warm_quiet	22.4000	2.70185	5		different combinations
warm_loud	16.4000	1.81659	5	-	of the levels of the IVs.

Descriptive Statistics

How to report the first main effect:

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
room_temp	Sphericity Assumed	51.200	1	51.200	7.642	.051
	Greenhouse-Geisser	51.200	1,000	51.200	7.642	.051
	Huynh-Feldt	51.200	1.000	51.200	7.642	.051
	Lower-bound	51.200	1.000	51.200	7.642	.051
Error(room_temp)	Sphericity Assumed	26.800	4	6.700		
	Greenhouse-Geisser	26.800	4,000	6.700		
	Huynh-Feldt	26.800	1.000	6.700		
	Lower-bound	26 300	4.000	6.700		
music_vol	Sphericity Assumed	192.200	1	192.200	35.266	.004
	Greenhouse-Geisser	92.200	1.000	192.200	35.266	.004
	Huynh-Feldt	192.200	1.000	192.200	35.266	.004
	Lower-bound	192.700	1.000	192.200	35.266	.004
Error(music_vol)	Sphericity Assumed	21.800	4	5.450		
	Greenhouse-Geisser	21.800	4.000	5.450		
	Huynh-Feldt	21.800	4.000	5.450		
	Lower-bound	21.800	4.000	5.450		
room_temp * music_vol	Sphericity Assumed	.200	1	.200	.051	.833
	Greenhouse-Grisser	.200	1.000	.200	.051	.833
	Huynh-Feldt	.200	1.000	.200	.051	.833
	Lower-bound	.200	1.000	.200	.051	.833
Error	Sphericity Assumed	15.800	4	3.950		
(room_temp*music_vol)	Greenhouse-Geisser	15.800	4.000	3.950		
	Huynb-Feldt	15.800	4.000	3.950		
	Lower-bound	15.800	4.000	3.950		

Tests of Within-Subjects Effects

How to report the results in APA format:

General format: $F(df_{BG}, df_{Error}) = \frac{\#.\#\#}{\#.}, p = .\#\#\#$

For this example:

For the main effect of **<u>ROOM TEMP</u>**: F(1, 4) = 7.642, p = .051

How to report the second main effect:

Measure: MEASURE_1						
Source		Type III Sum of Squares	df	Mean Square	F	Sig.
room_temp	Sphericity Assumed	51.200	1	51.200	7.642	.051
	Greenhouse-Geisser	51.200	1.000	51.200	7.642	.051
	Huynh-Feldt	51.200	1.000	51.200	7.642	.051
	Lower-bound	51.200	1.000	51.200	7.642	.051
Error(room_temp)	Sphericity Assumed	26.800	4	6.700		
	Greenhouse-Geisser	26.800	4.000	6.700		
	Huynh-Feldt	26.800	4.000	6.700		
	Lower-bound	26.800	4.000	6.700		
music_vol	Sphericity Assumed	192.200	1	192.200	35.266	.004
	Greenhouse-Geisser	192.200	1 000	192.200	35.266	.004
	Huynh-Feldt	192.200	1.000	192.200	35.266	.004
	Lower-bound	192.200	1.000	192.200	35.266	.004
Error(music_vol)	Sphericity Assumed	21.800	4	5.450		
	Greenhouse-Geisser	21.900	4.000	5.450		
	Huynh-Feldt	21.800	4.000	5.450		
	Lower-bound	21.800	4.000	5.450		
room_temp * music_vol	Sphericity Assumed	.200	1	.200	.051	.833
	Greenhouse-Geisser	.200	1.000	.200	.051	.833
	Huynh-Feldt	.200	1.000	.200	.051	.833
	Lower-bound	.200	1.000	.200	.051	.833
Error	Sphericity Assumed	15.800	4	3.950		
(room_temp*music_vol)	Greenhouse-Geisser	15.800	4.000	3.950		
	Huynh-Felat	15.800	4.000	3.950		
	Lower-bound	15.800	4.000	3.950		

Tests of Within-Subjects Effects

How to report the results in APA format:

General format: $F(df_{BG}, df_{Error}) = \frac{\#.\#\#}{\#.}, p = \frac{\#\#\#}{\#.}$

For this example:

For the main effect of **<u>MUSIC VOL</u>**: F(1, 4) = 35.266, p = .004

How to report the interaction:

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
room_temp	Sphericity Assumed	51.200	1	51.200	7.642	.051
	Greenhouse-Geisser	51.200	1.000	51.200	7.642	.051
	Huynh-Feldt	51.200	1.000	51.200	7.642	.051
	Lower-bound	51.200	1.000	51.200	7.642	.051
Error(room_temp)	Sphericity Assumed	26.800	4	6.700		
	Greenhouse-Geisser	26.800	4.000	6.700		
	Huynh-Feldt	26.800	4.000	6.700		
	Lower-bound	26.800	4.000	6.700		
music_vol	Sphericity Assumed	192.200	1	192.200	35.266	.004
	Greenhouse-Geisser	192.200	1.000	192.200	35.266	.004
	Huynh-Feldt	192.200	1.000	192.200	35.266	.004
	Lower-bound	192.200	1.000	192.200	35.266	.004
Error(music_vol)	Sphericity Assumed	21.800	4	5.450		
	Greenhouse-Geisser	21.800	4.000	5.450		
	Huynh-Feldt	21.800	4.000	5.450		
	Lower-bound	21.800	4.000	5.450		
room_temp * music_vol	Sphericity Assumed	.200	_ 1	.200	.051	.833
	Greenhouse-Geisser	.200	1.000	.200	.051	.833
	Huynh-Feldt	.200	1.000	.200	.051	.833
	Lower-bound	200	1.000	.200	.051	.833
Error	Sphericity Assumed	15.800	4	3.950		
(room_temp*music_vol)	Greenhouse-Geisser	15.800	4.000	3.950		
	Huynh-Feldt	15.800	4.000	3.950		
	Lower-bound	15.800	4.000	3.950		

How to report the results in APA format:

General format: $F(df_{BG}, df_{Error}) = \frac{\#.\#\#}{\#.\#}, p = .\#\#\#$

For this example:

For the **INTERACTION**: F(1, 4) = 0.200, p = .833

Two-Way Mixed ANOVA

Purpose: To compare the means for a dependent variable when there are two independent variables. One of the IVs is manipulated between subjects (as an independent-groups variable) and the other IV is manipulated within subjects (as a repeated-measures variable). This allows you to evaluate the significance of the two main effects and the interaction.

<u>How to set up the data</u>: Each row contains data for a single subject. One column contains an identifier indicating which level of the independent-groups IV the subject experienced. Two other columns show the value of the DV for the two levels of the repeated-measures IV.

Example: All subjects perform a dexterity task. The score on the dexterity task is the DV. Half of the subjects watch an instructional video before performing the task. The other half of the subjects do not watch an instructional video. Therefore, "video vs. no video" is an IV manipulated between subjects (as an independent-groups variable). Each subject performs the dexterity task twice, once in a room with quiet music playing, and a second time in a room with loud music playing. Therefore, "music volume" is an IV manipulated within subjects (as a repeated-measures variable). There are four conditions in this 2x2 design: (1) video, quiet music, (2) video, loud music, (3) no video, quiet music, and (4) no video, loud music. Each subject provides a score in two of the four conditions. The numbers in the table are the scores on the dexterity task (the DV).

Example data:

	🚜 video_novideo	🛷 quiet_music	🖋 loud_music	
1	video	17.00	15.00	
2	video	14.00	12.00	
3	video	19.00	13.00	
4	video	22.00	12.00	
5	no video	10.00	7.00	
6	no video	8.00	4.00	
7	no video	9.00	6.00	
8	no video	10.00	5.00	
0				

How to run the test:

1) Click on Analyze > General Linear Model > Repeated Measures... to open the dialog box:

😭 Repeated Measures Define Factor(s) 🛛 🗙
Within-Subject Factor Name:
factor1
Number of Levels:
Add
Change
Re <u>m</u> ove
Measure <u>N</u> ame:
A <u>d</u> d
C <u>h</u> ange
Remo <u>v</u> e
Define <u>R</u> eset Cancel Help

2) For the repeated-measures IV (music volume), enter the name of the variable in the "Within-Subject Factor Name" box and the number of levels in the "Number of Levels" box, then click on "Add" (to get to the right-hand box below). Click "Define":

🙀 Repeated Measures Define Factor(s) 🛛 🗙	Repeated Measures Define Factor(s)
Within-Subject Factor Name:	Within-Subject Factor Name:
Number of Levels: 2	Number of Levels:
Add	Add music_vol(2)
<u>C</u> hange	Change
Remove	Remove
Measure <u>N</u> ame:	Measure <u>N</u> ame:
A <u>d</u> d	A <u>d</u> d
C <u>h</u> ange	C <u>h</u> ange
Remo <u>v</u> e	Remo <u>v</u> e
Define <u>R</u> eset Cancel Help	Define Reset Cancel Help

🕼 Repeated Measures		×
 ✓ video_novideo ✓ quiet_music ✓ loud_music 	Within-Subjects Variables (music_vol): → -?_(1) _?_(2)	Model Contrasts Plots Post Hoc EM Means Save Options
	<u>B</u> etween-Subjects Factor(s): → <u>C</u> ovariates:	
OK	Paste Reset Cancel Help	

3) The "Repeated Measures" dialog box appears:

4) Move the two levels of the repeated-measures variable from the left to "Within-Subjects Variables":

🕼 Repeated Measures			×
		Within-Subjects Variables	Model
a video_novideo		quiet_music(1)	Contrasts
	* +	loud_music(2)	Plo <u>t</u> s
			Post <u>H</u> oc
	*		EM Means
			<u>S</u> ave
			Options
		Between-Subjects Factor(s):	
		<u>C</u> ovariates:	
	+		
ОК	<u>P</u> aste	Reset Cancel Help	

ta Repeated Measures			×
		Within-Subjects Variables	Model
		quiet music(1)	Contrasts
	* +	loud_music(2)	Plo <u>t</u> s
			Post <u>H</u> oc
	*		EM Means
			<u>S</u> ave
			Options
	*	Between-Subjects Factor(s):	
		<u>C</u> ovariates:	
ОК	<u>P</u> aste	Reset Cancel Help	

5) Move the independent-groups variable to "Between-Subjects Factor(s)":

6) Click "Options...", check the box labeled "Descriptive statistics", and click "Continue":

Repeated Measures: Options	×
Display	
✓ Descriptive statistics	<u>H</u> omogeneity tests
<u>E</u> stimates of effect size	Spread-vslevel plots
Observed power	<u>R</u> esidual plots
Parame <u>t</u> er estimates	Lack-of-fit test
SCP matrices	General estimable function(s)
Residual SS <u>C</u> P matrix	
Significance le <u>v</u> el: .05 Confide	nce intervals are 95.0 %
<u>C</u> ontinue	ancel Help

7) In the "Repeated Measures" dialog box, click "OK". The results will appear in the Output window.

How to read the output: The output will contain many tables. Only some of the tables contain important information for our purposes. Not all of the tables are shown below.

	•				
	video_novideo	Mean	Std. Deviation	Ν	. [
quiet_music	no video	9.2500	.95743	4	
	video	18.0000	3.36650	4	
	Total	13.6250	5.20817	8	
loud_music	no video	5.5000	1.29099	4	
	video	13.0000	1.41421	4	
	Total	9.2500	4.20034	8	

Descriptive Statistics

This table shows the descriptive statistics for the DV in the different conditions, defined by different combinations of the levels of the IVs.

The following table shows the results for the <u>repeated-measures variable</u> (music_vol) and for the <u>interaction</u>:

Measure:	MEASURE	1
weasure.	MLAGONE_	_ '

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
music_vol	Sphericity Assumed	76.563	1	76.563	19.652	.004
	Greenhouse-Geisser	76.563	1,000	76.563	19.652	.004
	Huynh-Feldt	76.563	.000	76.563	19.652	.004
	Lower-bound	76.563	1.000	76.563	19.652	.004
music_vol *	Sphericity Assumed	1.563	1	1.563	.401	.550
video_novideo	Greenhouse-Geisser	1.563	1.000	1.563	.401	.550
	Huynh-Feldt	1.563	1.000	1.563	.401	.550
	Lower-bound	1.5/3	1.000	1.563	.401	.550
Error(music_vol)	Sphericity Assumed	23 375	6	3.896		
	Greenhouse-Geisser	23.375	6.000	3.896		
	Huynh-Feldt	23.375	6.000	3.896		
	Lower-bound	23.375	6.000	3.896		

How to report the results in APA format:

General format: $F(df_{BG}, df_{Error}) = #.##, p = .###$

For this example:

For the main effect of **MUSIC VOL**: F(1, 6) = 19.652, p = .004

For the **INTERACTION**: F(1, 6) = 0.401, p = .550

The following table shows the results for the <u>independent-groups variable</u> (video/no video):

Tests of Between-Subjects Effects								
Measure: MEAS	Measure: MEASURE_1							
Transformed Var	iable: Average							
Source	Type III Sum of Squares	df	Mean Square	F	Sig.			
Intercept	2093.062	1	2093.062	515.215	<.001			
video_novideo	264.062	1	264.062	65.000	<.001			
Error	rror 24.375 <u>6</u> 4.062							
How to report the results in APA format:								
General format: $F(df_{BG}, df_{Error}) = #.##, p = .###$								
For this example:								
For the main effect of <u>VIDEO_NOVIDEO</u> : $F(1, 6) = 65.000, p < .001$								

Chi-Square (Chi-Square Test of Independence)

Purpose: To assess the significance of the relationship between two nominal (categorical) variables.

You can perform the chi-square test when your data are set up in either of these two ways:

- (1) When your data table shows the value of each nominal variable for each subject.
- (2) When your data shows the total number of observations for each combination of values of the nominal variables.

Both are shown below.

DATA FORMAT OPTION 1

<u>How to set up the data</u>: (1) When your data table shows the value of each nominal variable for each subject.

Organize the data in two columns, one for each nominal variable. Each row represents data for a different subject.

Example: Each subject reports whether they believe they are a dog person or a cat person and whether they think they are introverted or extraverted.

Example data 1: (There is a total of 20 subjects. Only some of the data are shown below.)

	윩 Animal	뤎 Personality
1	cat	introvert
2	cat	extravert
3	cat	extravert
4	dog	introvert
5	cat	introvert
6	dog	extravert
7	dog	extravert
8	dog	extravert
q	cat	introvert

How to run the test:

1) Click on Analyze > Descriptive Statistics > Crosstabs... The "Crosstabs" dialog box appears:

🔚 Crosstabs		×
Animal	R <u>o</u> w(s):	E <u>x</u> act Statistics
Ga Personality		C <u>e</u> lls
	<u>C</u> olumn(s):	<u>F</u> ormat
		Sty <u>l</u> e
	Layer 1 of 1	Bootstr <u>a</u> p
	Pre⊻ious <u>N</u> ext	
Display clustered <u>b</u> ar charts Suppress tables	Disp <u>l</u> ay layer variables in table laye	ers
OK	Paste Reset Cancel Help	

2) Move one variable to the "Row(s)" box and one variable to the "Column(s)" box:

Crosstabs	×
Row(s): Animal Column(s): Column(s): Layer 1 of 1 Previous Next	E <u>xact</u> Statistics C <u>e</u> lls Eormat Sty <u>l</u> e Bootstr <u>a</u> p
Display layer variables in table layers Display clustered <u>b</u> ar charts Suppress <u>t</u> ables OK Paste Reset Cancel Help	3

3) Click "Statistics..." Check the box labeled "Chi-square," then click Continue:

taistics Crosstabs: Statistics	×	
<mark>⊠</mark> C <u>h</u> i-square	Co <u>r</u> relations	
Nominal	Ordinal	
Contingency coefficient	<u>G</u> amma	
Phi and Cramer's V	Somers' d	
<u>L</u> ambda	🗌 Kendall's tau- <u>b</u>	
Uncertainty coefficient	Kendall's tau-c	
Nominal by Interval	Карра	
<u>E</u> ta	Risk	
	<u>M</u> cNemar	
Cochr <u>a</u> n's and Mantel-Ha	enszel statistics	
Test common odds ratio	equals: 1	
<u>C</u> ontinue Cance	l Help	

4) In the Crosstabs dialog box, click "OK." The results will appear in the Output window.

How to read the output:

Animal * Personality Crosstabulation

Count		Perso extravert	nality introvert	Total	This table shows the total number of subjects for each combination of values
Animal	cat	4	5	9	at different numbers in the output
	dog	8	3	11	table below depending on whether any
Total		12	8	20	cell total is less than 5.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2- sided)	Exact Sig. sided)	Use this row if all cell totals above are 5 or
Pearson Chi-Square	1.650 ^a	1	.199	+		greater.
Continuity Correction ^b	.682	1	.409			Lice this row if any coll
Likelihood Ratio	1.664	1	.197			total above is less
Fisher's Exact Test				.362		than 5.
N of Valid Cases	20					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 3.60.

b. Computed only for a 2x2 table

How to report the results in APA format:

General format: $X^2(df) = #.##, p = .###$

For this example: $X^2(1) = 0.682, p = .409$

Note: As indicated above, if the total in every cell of the contingency table is 5 or greater, use the results in the "Pearson Chi-Square" row of the output. If the total in any cell is less than 5 (as in this example), use the results in the "Continuity Correction" row of the output.

(The second way to run the chi-square test is shown on the next page.)

DATA FORMAT OPTION 2

<u>How to set up the data</u>: (2) When your data show the total number of observations for each combination of values of the nominal variables.

Each variable is represented by a column, and a third column shows a total count or frequency. Each row represents a different combination of the levels of both variables. For example, if there are 2 levels in each variable, there will be $2x^2 = 4$ rows; if there are 2 levels in one variable and 3 in the other, there will be $2x^3 = 6$ rows; if there are 3 levels in both variables, there will be $3x^3 = 9$ rows, and so on...

Example: Each subject reports whether they believe they are a dog person or a cat person and whether they think they are introverted or extraverted.

Example data 2:

	💑 Animal	뤎 Personality	Count
1	cat	introvert	5.00
2	cat	extravert	4.00
3	dog	introvert	3.00
4	dog	extravert	8.00
5			

How to run the test:

1) Click on "Data" > "Weight Cases..." The Weight Cases dialog box appears:

tases Weight Cases	×
Secont Count	● <u>D</u> o not weight cases ○ <u>W</u> eight cases by
	Frequency Variable:
	Current Status: Do not weight cases
OK <u>P</u> aste	Reset Cancel Help

 Check "Weight cases by" and move "Count" from the left to "Frequency Variable", then click "OK":

ta Weight Cases	×
	 ○ <u>D</u>o not weight cases ● <u>W</u>eight cases by Erequency Variable: ✓ Count
	Current Status: Do not weight cases
OK Paste	Reset Cancel Help

3) Back in the Data Editor window, click on Analyze > Descriptive Statistics > Crosstabs... The "Crosstabs" dialog box appears:

ta Crosstabs		×
 Animal A Personality ✓ Count 	R <u>o</u> w(s): Column(s): ↓ Layer 1 of 1 Previous Next	Exact Statistics C <u>e</u> lls <u>F</u> ormat Sty <u>l</u> e Bootstr <u>a</u> p
Display clustered <u>b</u> ar charts	Disp <u>l</u> ay layer variables in table layers Paste Reset Cancel Help	3

Count	Row(s):	E <u>x</u> act
• ooun		Statistics
	Column(s):	C <u>e</u> lls
		<u>F</u> ormat
	•	Sty <u>l</u> e
	Layer 1 of 1	Bootstr <u>a</u> p
	Pre <u>v</u> ious <u>N</u> ext	t
	\	
	Disp <u>l</u> ay layer variables in table	layers
	ar charte	

4) Move one variable to the "Row(s)" box and one variable to the "Column(s)" box:

5) Click "Statistics..." Check the box labeled "Chi-square," then click Continue:

Crosstabs: Statistics					
<mark>⊠</mark> C <u>h</u> i-square	Correlations				
Nominal	Ordinal				
Contingency coefficient	Gamma				
Phi and Cramer's V	Somers' d				
Lambda	Kendall's tau-b				
Uncertainty coefficient	Kendall's tau- <u>c</u>				
Nominal by Interval	<u>K</u> appa				
<u>E</u> ta	Risk				
	<u>M</u> cNemar				
Cochran's and Mantel-Haenszel statistics					
Test common odds ratio equals: 1					
<u>C</u> ontinue Cance	Help				

6) In the Crosstabs dialog box, click "OK." The results will appear in the Output window.

How to read the output:

Animal * Personality Crosstabulation

Count					This table shows the total number of
		Perso	nality		subjects for each combination of values
		extravert	introvert	Total	of the nominal variables. You will look
Animal	cat	4	5	Q	at different numbers in the output
Annai	cat	4	5	3	
	dog	8	3	11	table below depending on whether any
Total		12	8	20	cell total is less than 5.

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