

Chapter 11 Problems

1. There are six possible comparisons:

	a_1	a_2	a_3	
ψ_1	1	-1	0	$(a_1 \text{ vs. } a_2)$
ψ_2	1	0	-1	$(a_1 \text{ vs. } a_3)$
ψ_3	0	1	-1	$(a_2 \text{ vs. } a_3)$
ψ_4	2	-1	-1	$(a_1 \text{ vs. } a_2 + a_3)$
ψ_5	-1	2	-1	$(a_2 \text{ vs. } a_1 + a_3)$
ψ_6	-1	-1	2	$(a_3 \text{ vs. } a_1 + a_2)$

a. Sums of Squares (For SPSS syntax, see "Notes" section of output)

$$SS_{\psi_1} = [(\sum c_j \bar{Y})^2] / \sum c_j^2 = (7 \cdot -2.14^2) / 2 = 16.07$$

$$SS_{\psi_2} = \quad \quad \quad = (7 \cdot -1^2) / 2 = 3.50$$

$$SS_{\psi_3} = \quad \quad \quad = (7 \cdot 1.14^2) / 2 = 4.57$$

$$SS_{\psi_4} = \quad \quad \quad = (7 \cdot -3.14^2) / 6 = 11.52$$

$$SS_{\psi_5} = \quad \quad \quad = (7 \cdot 3.29^2) / 6 = 12.60$$

$$SS_{\psi_6} = \quad \quad \quad = (7 \cdot -0.14^2) / 6 = 0.01$$

b. Significance

Source	SS	df	MS	F
ψ_1	16.07	1	16.07	7.85 *
ψ_2	3.50	1	3.50	1.71
ψ_3	4.57	1	4.57	2.23
ψ_4	11.52	1	11.52	5.63 *
ψ_5	12.60	1	12.60	6.15 *
ψ_6	0.02	1	0.02	0.01
S/A	36.86	18	2.05	

* $p < .05$ with $df_A = 1$ and $df_{S/A} = 18$

2.	Source	R^2	F
	ψ_1	.30	$(.30/1) / [(1-.30)/(21-2-1)] = 7.85 *$
	ψ_2	.07	$(.07/1) / [(1-.30)/(21-2-1)] = 1.71$
	ψ_3	.09	$(.09/1) / [(1-.30)/(21-2-1)] = 2.23$
	ψ_4	.22	$(.22/1) / [(1-.30)/(21-2-1)] = 5.63 *$
	ψ_5	.24	$(.24/1) / [(1-.30)/(21-2-1)] = 6.15 *$
	ψ_6	.00	$(.00/1) / [(1-.30)/(21-2-1)] = 0.01$
	Max	.30	

* $p < .05$ with $df_A = 1$ and $df_{S/A} = 18$

Univariate Analysis of Variance - Problem 11.1

Notes

Output Created	27-OCT-2005 09:29:06	
Comments		
Input	Data	C:\Documents and Settings\Christopher Soto\My Documents\1 Work\Y Psychology 205\psych205.50webs.com\homework\data_1101.sav
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	21
Missing Value Handling	Definition of Missing Cases Used	User-defined missing values are treated as missing. Statistics are based on all cases with valid data for all variables in the model.
Syntax	UNIANOVA errors BY anova /METHOD = SSTYPE(3) /INTERCEPT = INCLUDE /PRINT = DESCRIPTIVE /CRITERIA = ALPHA(.05) /CONTRAST(anova) = SPECIAL(1 -1 0) /CONTRAST(anova) = SPECIAL(1 0 -1) /CONTRAST(anova) = SPECIAL(0 1 -1) /CONTRAST(anova) = SPECIAL(2 -1 -1) /CONTRAST(anova) = SPECIAL(-1 2 -1) /CONTRAST(anova) = SPECIAL(-1 -1 2) /DESIGN = anova .	
Resources	Elapsed Time	0:00:00.09

Descriptive Statistics

Dependent Variable: Number of errors

ANOVA code	Mean	Std. Deviation	N
Praise	5.0000	1.41421	7
Reproof	7.1429	1.06904	7
None	6.0000	1.73205	7
Total	6.0476	1.62715	21

Tests of Between-Subjects Effects

Dependent Variable: Number of errors

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	16.095 ^a	2	8.048	3.930	.038
Intercept	768.048	1	768.048	375.093	.000
anova	16.095	2	8.048	3.930	.038
Error	36.857	18	2.048		
Total	821.000	21			
Corrected Total	52.952	20			

a. R Squared = .304 (Adjusted R Squared = .227)

Custom Hypothesis Tests #1

Contrast Results (K Matrix)

ANOVA code Special Contrast		Dependent Variable	
		Number of errors	
L1	Contrast Estimate	-2.143	
	Hypothesized Value	0	
	Difference (Estimate - Hypothesized)	-2.143	
	Std. Error	.765	
	Sig.	.012	
	95% Confidence Interval for Difference	Lower Bound Upper Bound	-3.750 -.536

Test Results

Dependent Variable: Number of errors

Source	Sum of Squares	df	Mean Square	F	Sig.
Contrast	16.071	1	16.071	7.849	.012
Error	36.857	18	2.048		

Custom Hypothesis Tests #2

Contrast Results (K Matrix)

ANOVA code Special Contrast		Dependent Variable	
		Number of errors	
L1	Contrast Estimate	-1.000	
	Hypothesized Value	0	
	Difference (Estimate - Hypothesized)	-1.000	
	Std. Error	.765	
	Sig.	.208	
	95% Confidence Interval for Difference	Lower Bound Upper Bound	-2.607 .607

Test Results

Dependent Variable: Number of errors

Source	Sum of Squares	df	Mean Square	F	Sig.
Contrast	3.500	1	3.500	1.709	.208
Error	36.857	18	2.048		

Custom Hypothesis Tests #3

Contrast Results (K Matrix)

ANOVA code Special Contrast		Dependent Variable	
		Number of errors	
L1	Contrast Estimate	1.143	
	Hypothesized Value	0	
	Difference (Estimate - Hypothesized)	1.143	
	Std. Error	.765	
	Sig.	.152	
	95% Confidence Interval for Difference	Lower Bound Upper Bound	-464 2.750

Test Results

Dependent Variable: Number of errors

Source	Sum of Squares	df	Mean Square	F	Sig.
Contrast	4.571	1	4.571	2.233	.152
Error	36.857	18	2.048		

Custom Hypothesis Tests #4

Contrast Results (K Matrix)

ANOVA code Special Contrast		Dependent Variable	
		Number of errors	
L1	Contrast Estimate	-3.143	
	Hypothesized Value	0	
	Difference (Estimate - Hypothesized)	-3.143	
	Std. Error	1.325	
	Sig.	.029	
	95% Confidence Interval for Difference	Lower Bound Upper Bound	-5.926 -.360

Test Results

Dependent Variable: Number of errors

Source	Sum of Squares	df	Mean Square	F	Sig.
Contrast	11.524	1	11.524	5.628	.029
Error	36.857	18	2.048		

Custom Hypothesis Tests #5

Contrast Results (K Matrix)

ANOVA code Special Contrast		Dependent Variable	
		Number of errors	
L1	Contrast Estimate	3.286	
	Hypothesized Value	0	
	Difference (Estimate - Hypothesized)	3.286	
	Std. Error	1.325	
	Sig.	.023	
	95% Confidence Interval for Difference	Lower Bound Upper Bound	.502 6.069

Test Results

Dependent Variable: Number of errors

Source	Sum of Squares	df	Mean Square	F	Sig.
Contrast	12.595	1	12.595	6.151	.023
Error	36.857	18	2.048		

Custom Hypothesis Tests #6

Contrast Results (K Matrix)

ANOVA code Special Contrast		Dependent Variable	
		Number of errors	
L1	Contrast Estimate	-.143	
	Hypothesized Value	0	
	Difference (Estimate - Hypothesized)	-.143	
	Std. Error	1.325	
	Sig.	.915	
	95% Confidence Interval for Difference	Lower Bound Upper Bound	-2.926 2.640

Test Results

Dependent Variable: Number of errors

Source	Sum of Squares	df	Mean Square	F	Sig.
Contrast	.024	1	.024	.012	.915
Error	36.857	18	2.048		

Correlations - Problem 11.3

Correlations

		Number of errors	Contrast code 1	Contrast code 2	Contrast code 3	Contrast code 4
Number of errors	Pearson Correlation	1	-.551**	-.257	.294	-.467*
	Sig. (2-tailed)		.010	.261	.196	.033
	N	21	21	21	21	21
Contrast code 1	Pearson Correlation	-.551**	1	.500*	-.500*	.866**
	Sig. (2-tailed)	.010		.021	.021	.000
	N	21	21	21	21	21
Contrast code 2	Pearson Correlation	-.257	.500*	1	.500*	.866**
	Sig. (2-tailed)	.261	.021		.021	.000
	N	21	21	21	21	21
Contrast code 3	Pearson Correlation	.294	-.500*	.500*	1	.000
	Sig. (2-tailed)	.196	.021	.021		1.000
	N	21	21	21	21	21
Contrast code 4	Pearson Correlation	-.467*	.866**	.866**	.000	1
	Sig. (2-tailed)	.033	.000	.000	1.000	
	N	21	21	21	21	21
Contrast code 5	Pearson Correlation	.488*	-.866**	.000	.866**	-.500*
	Sig. (2-tailed)	.025	.000	1.000	.000	.021
	N	21	21	21	21	21
Contrast code 6	Pearson Correlation	-.021	.000	-.866**	-.866**	-.500*
	Sig. (2-tailed)	.927	1.000	.000	.000	.021
	N	21	21	21	21	21

Correlations

		Contrast code 5	Contrast code 6
Number of errors	Pearson Correlation	.488*	-.021
	Sig. (2-tailed)	.025	.927
	N	21	21
Contrast code 1	Pearson Correlation	-.866**	.000
	Sig. (2-tailed)	.000	1.000
	N	21	21
Contrast code 2	Pearson Correlation	.000	-.866**
	Sig. (2-tailed)	1.000	.000
	N	21	21
Contrast code 3	Pearson Correlation	.866**	-.866**
	Sig. (2-tailed)	.000	.000
	N	21	21
Contrast code 4	Pearson Correlation	-.500*	-.500*
	Sig. (2-tailed)	.021	.021
	N	21	21
Contrast code 5	Pearson Correlation	1	-.500*
	Sig. (2-tailed)		.021
	N	21	21
Contrast code 6	Pearson Correlation	-.500*	1
	Sig. (2-tailed)	.021	
	N	21	21

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).