

Two-factor ANOVA Example Neuendorf

Using Denny Thesis data set Analyze --> General Linear Model --> Univariate

```
UNIANOVA
  mrrecent BY condtion bwpropg3
  /METHOD = SSTYPE(3)
  /INTERCEPT = INCLUDE
  /POSTHOC = bwpropg3 ( SNK TUKEY DUNCAN SCHEFFE LSD BONFERRONI DUNNETT)
  /PLOT = PROFILE( condtion*bwpropg3 )
  /EMMEANS = TABLES(condtion)
  /EMMEANS = TABLES(OVERALL)
  /EMMEANS = TABLES(bwpropg3)
  /EMMEANS = TABLES(condtion*bwpropg3)
  /PRINT = DESCRIPTIVE ETASQ OPOWER HOMOGENEITY
  /PLOT = RESIDUALS
  /CRITERIA = ALPHA(.05)
  /DESIGN = condtion bwpropg3 condtion*bwpropg3 .
```

Univariate Analysis of Variance

Between-Subjects Factors

		Value Label	N
Condition the participant experienced.	1	Color footage	44
	2	Black and white footage	56
bw prop 3 groups	.00	0%	36
	1.00	1--more than 0%, less than 50%	43
	2.00	2--50% through 100%	21

Descriptive Statistics

Dependent Variable: The film footage seemed more recent than I would have imagined.

Condition the participant	bw prop 3 groups	Mean	Std. Deviation	N
Color footage	0%	4.5833	1.50504	12
	1--more than 0%, less than 50%	3.5217	1.95098	23
	2--50% through 100%	3.2222	1.30171	9
	Total	3.7500	1.76694	44
Black and white footage	0%	3.0833	1.28255	24
	1--more than 0%, less than 50%	3.0000	1.77705	20
	2--50% through 100%	2.2500	.86603	12
	Total	2.8750	1.42781	56
Total	0%	3.5833	1.51893	36
	1--more than 0%, less than 50%	3.2791	1.86861	43
	2--50% through 100%	2.6667	1.15470	21
	Total	3.2600	1.63682	100

Levene's Test of Equality of Error Variances^a

Dependent Variable: The film footage seemed more recent than I would have imagined.

F	df1	df2	Sig.
5.554	5	94	.000

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept+condition+bwpropg3+condition * bwpropg3

Tests of Between-Subjects Effects

Dependent Variable: The film footage seemed more recent than I would have imagined.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	36.945 ^b	5	7.389	3.042	.014	.139
Intercept	936.108	1	936.108	385.441	.000	.804
condition	21.708	1	21.708	8.938	.004	.087
bwpropg3	15.558	2	7.779	3.203	.045	.064
condition * bwpropg3	4.384	2	2.192	.903	.409	.019
Error	228.295	94	2.429			
Total	1328.000	100				
Corrected Total	265.240	99				

Tests of Between-Subjects Effects

Dependent Variable: The film footage seemed more recent than I would have imagined.

Source	Noncent. Parameter	Observed Power ^a
Corrected Model	15.212	.849
Intercept	385.441	1.000
condition	8.938	.841
bwpropg3	6.406	.599
condition * bwpropg3	1.805	.202
Error		
Total		
Corrected Total		

a. Computed using alpha = .05

b. R Squared = .139 (Adjusted R Squared = .094)

Estimated Marginal Means

1. Condition the participant experienced.

Dependent Variable: The film footage seemed more recent than I would have imagined.

Condition the participant experienced.	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Color footage	3.776	.253	3.273	4.279
Black and white footage	2.778	.217	2.346	3.209

2. Grand Mean

Dependent Variable: The film footage seemed more recent than I would have imagined.

Mean	Std. Error	95% Confidence Interval	
		Lower Bound	Upper Bound
3.277	.167	2.945	3.608

3. bw prop 3 groups

Dependent Variable: The film footage seemed more recent than I would have imagined.

bw prop 3 groups	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
0%	3.833	.275	3.286	4.380
1--more than 0%, less than 50%	3.261	.238	2.788	3.734
2--50% through 100%	2.736	.344	2.054	3.418

4. Condition the participant experienced. * bw prop 3 groups

Dependent Variable: The film footage seemed more recent than I would have imagined.

Condition the participant experienced.	bw prop 3 groups	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Color footage	0%	4.583	.450	3.690	5.477
	1--more than 0%, less than 50%	3.522	.325	2.877	4.167
	2--50% through 100%	3.222	.519	2.191	4.254
Black and white footage	0%	3.083	.318	2.452	3.715
	1--more than 0%, less than 50%	3.000	.348	2.308	3.692
	2--50% through 100%	2.250	.450	1.357	3.143

Post Hoc Tests

bw prop 3 groups

Multiple Comparisons

Dependent Variable: The film footage seemed more recent than I would have imagined.

	(I) bw prop 3 groups	(J) bw prop 3 groups	Mean Difference (I-J)	Std. Error	Sig.
Tukey HSD	0%	1--more than 0%, less than 50%	.3043	.35206	.664
		2--50% through 100%	.9167	.42792	.087
	1--more than 0%, less than 50%	0%	-.3043	.35206	.664
		2--50% through 100%	.6124	.41489	.307
	2--50% through 100%	0%	-.9167	.42792	.087
		1--more than 0%, less than 50%	-.6124	.41489	.307
Scheffe	0%	1--more than 0%, less than 50%	.3043	.35206	.689
		2--50% through 100%	.9167	.42792	.106
	1--more than 0%, less than 50%	0%	-.3043	.35206	.689
		2--50% through 100%	.6124	.41489	.341
	2--50% through 100%	0%	-.9167	.42792	.106
		1--more than 0%, less than 50%	-.6124	.41489	.341
LSD	0%	1--more than 0%, less than 50%	.3043	.35206	.390
		2--50% through 100%	.9167*	.42792	.035
	1--more than 0%, less than 50%	0%	-.3043	.35206	.390
		2--50% through 100%	.6124	.41489	.143
	2--50% through 100%	0%	-.9167*	.42792	.035
		1--more than 0%, less than 50%	-.6124	.41489	.143
Bonferroni	0%	1--more than 0%, less than 50%	.3043	.35206	1.000
		2--50% through 100%	.9167	.42792	.104
	1--more than 0%, less than 50%	0%	-.3043	.35206	1.000
		2--50% through 100%	.6124	.41489	.430
	2--50% through 100%	0%	-.9167	.42792	.104
		1--more than 0%, less than 50%	-.6124	.41489	.430
Dunnnett t (2-sided) ^a	0%	2--50% through 100%	.9167	.42792	.060
	1--more than 0%, less than 50%	2--50% through 100%	.6124	.41489	.230

Based on observed means.

Multiple Comparisons

Dependent Variable: The film footage seemed more recent than I would have imagined.

			95% Confidence Interval	
	(I) bw prop 3 groups	(J) bw prop 3 groups	Lower Bound	Upper Bound
Tukey HSD	0%	1--more than 0%, less than 50%	-.5341	1.1427
		2--50% through 100%	-.1024	1.9357
	1--more than 0%, less than 50%	0%	-1.1427	.5341
		2--50% through 100%	-.3756	1.6004
Scheffe	0%	1--more than 0%, less than 50%	-1.9357	.1024
		2--50% through 100%	-1.6004	.3756
	1--more than 0%, less than 50%	0%	-.5714	1.1799
		2--50% through 100%	-.1477	1.9810
LSD	0%	1--more than 0%, less than 50%	-1.1799	.5714
		2--50% through 100%	-.4195	1.6443
	1--more than 0%, less than 50%	0%	-1.9810	.1477
		2--50% through 100%	-1.6443	.4195
Bonferroni	0%	1--more than 0%, less than 50%	-.3948	1.0033
		2--50% through 100%	.0670	1.7663
	1--more than 0%, less than 50%	0%	-1.0033	.3948
		2--50% through 100%	-.2114	1.4362
Dunnnett t (2-sided) ^a	0%	1--more than 0%, less than 50%	-1.7663	-.0670
		2--50% through 100%	-1.4362	.2114
	1--more than 0%, less than 50%	0%	-.5539	1.1624
		2--50% through 100%	-.1264	1.9597
Bonferroni	0%	1--more than 0%, less than 50%	-1.1624	.5539
		2--50% through 100%	-.3989	1.6237
	1--more than 0%, less than 50%	0%	-1.9597	.1264
		2--50% through 100%	-1.6237	.3989
Dunnnett t (2-sided) ^a	0%	2--50% through 100%	-.0343	1.8677
	1--more than 0%, less than 50%	2--50% through 100%	-.3096	1.5344

Based on observed means.

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

a. Dunnnett t-tests treat one group as a control, and compare all other groups against it.

Homogeneous Subsets

The film footage seemed more recent than I would have imagined.

bw prop 3 groups	N	Subset	
		1	2
Student-Newman-Keuls ^{a,b,c}	21	2.6667	
1--more than 0%, less than 50%	43	3.2791	
0%	36	3.5833	
Sig.		.062	
Tukey HSD ^{a,b,c}	21	2.6667	
1--more than 0%, less than 50%	43	3.2791	
0%	36	3.5833	
Sig.		.062	
Duncan ^{a,b,c}	21	2.6667	
1--more than 0%, less than 50%	43	3.2791	3.2791
0%	36		3.5833
Sig.		.129	.448
Scheffe ^{a,b,c}	21	2.6667	
1--more than 0%, less than 50%	43	3.2791	
0%	36	3.5833	
Sig.		.077	

Means for groups in homogeneous subsets are displayed.

Based on Type III Sum of Squares

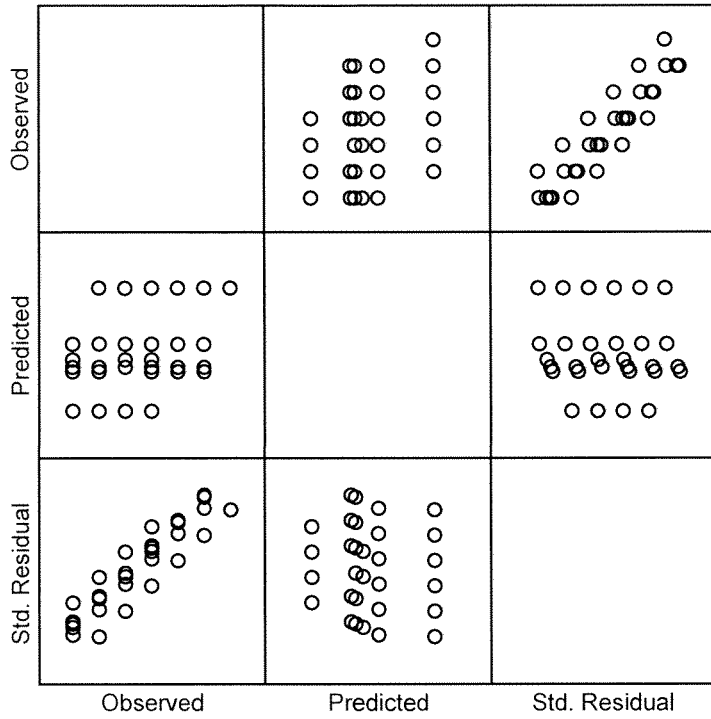
The error term is Mean Square(Error) = 2.429.

a. Uses Harmonic Mean Sample Size = 30.410.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

c. Alpha = .05.

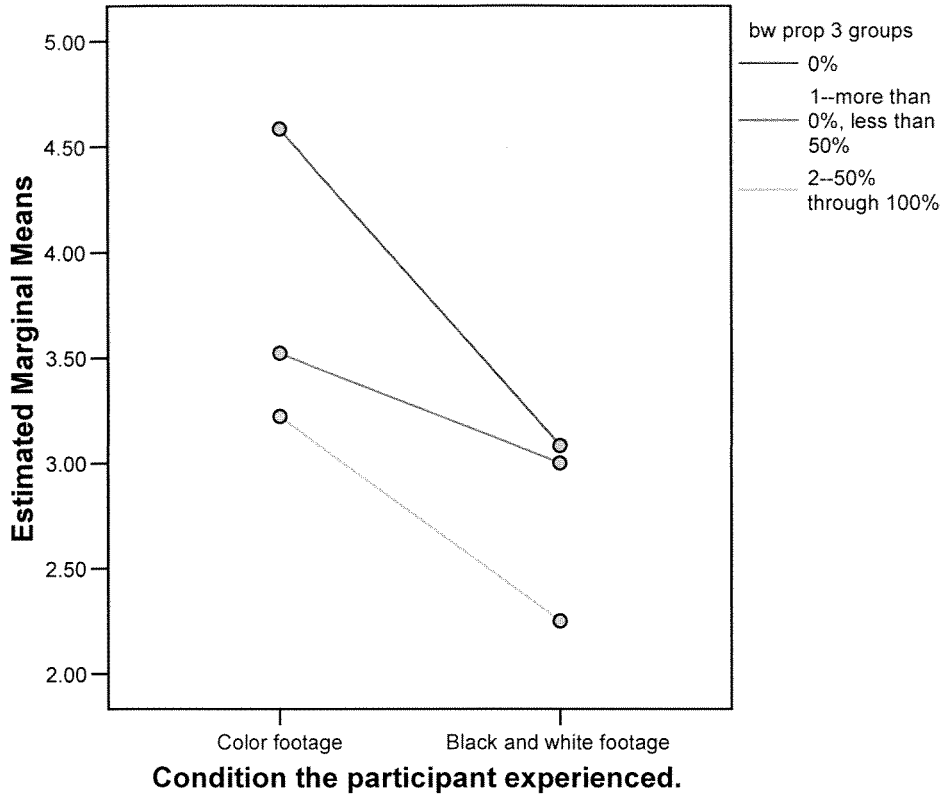
Dependent Variable: The film footage seemed more recent than I would have imagined.



Model: Intercept + condtion + bwpropg3 + condtion * bwpropg3

Profile Plots

Estimated Marginal Means of The film footage seemed more recent than I would have imagined.



Descriptive Statistics

Dependent Variable: The film footage seemed more recent than I would have imagined.

Condition the participant	bw prop 3 groups	Mean	Std. Deviation	N
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	1--more than 0%, less than 50%	3.5217	1.95098	23
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Intercept	936.108	1	936.108	385.441	.000	.804
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		2--50% through 100%	.0670	1.7663
	1--more than 0%, less than 50%	0%	-1.0033	.3948
		2--50% through 100%	-.2114	1.4362
	2--50% through 100%	0%	-1.7663	-.0670
		1--more than 0%, less than 50%	-1.4362	.2114
Bonferroni	0%	1--more than 0%, less than 50%	-.5539	1.1624
		2--50% through 100%	-.1264	1.9597
	1--more than 0%, less than 50%	0%	-1.1624	.5539
		2--50% through 100%	-.3989	1.6237
	2--50% through 100%	0%	-1.9597	.1264
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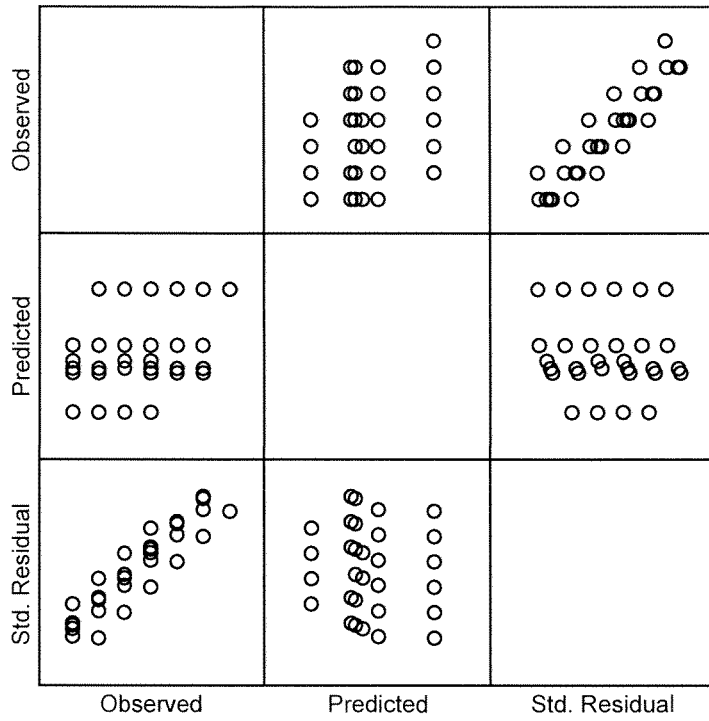
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