Factorial ANOVA

Descriptive Statistics

Dependent Variable: Outcome

FactorA	FactorB	Mean	Std. Deviation	N
Level 1	Level 1	2.0000	2.44949	4
	Level 2	7.0000	2.44949	4
	Total	4.5000	3.50510	8
Level 2	Level 1	6.0000	2.44949	4
	Level 2	5.0000	2.44949	4
	Total	5.5000	2.32993	8
Total	Level 1	4.0000	3.11677	8
	Level 2	6.0000	2.50713	8
	Total	5.0000	2.92119	16

These descriptive statistics are calculated separately for each condition as defined by the factors. They are not identical to the values obtained from analyzing the variable as a whole.

These descriptive statistics are calculated separately for each factor. They represent the marginal means of one factor collapsing across the levels of the other factor. They are not identical to the values obtained from analyzing the variable as a whole.

These descriptive statistics represent the grand (or overall) values obtained from analyzing the variable as a whole. They are identical to what would be obtained if the "Frequencies" or "Descriptives" procedure had been used.

Dependent Variable: Outcome

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	56.000[a]	3	18.667	3.111	.067
Intercept	400.000	1	400.000	66.667	.000
Factor A	4.000	1	4.000	.667	.430
Factor B	16.000	1	16.000	2.667	.128
Factor A * Factor B	36.000	1	36.000	6.000	.031
Error	72.000	12	6.000		
Total	528.000	16			
Corrected Total	128.000	15			

a. R Squared = .438 (Adjusted R Squared = .297)

The "Intercept" statistics are generally not informative.

The "Corrected Model" statistics reflect the overall between-group variability. They are a function of the group means and sample sizes.

$$SS_{MODEL} = \sum n_{GROUP}(M_{GROUP} - M_{TOTAL})^2$$
$$SS_{MODEL} = 4(2.000 - 5.000)^2 + 4(7.000 - 5.000)^2 + 4(6.000 - 5.000)^2 + 4(5.000 - 5.000)^2$$
$$SS_{MODEL} = 56.000$$
$$df_{MODEL} = \#groups - 1 = 3$$

"Mean Squares" are estimates of the variances associated with each source. For the "Factor A * Factor B" interaction:

$$MS_{INTER} = \frac{SS_{INTER}}{df_{INTER}} = \frac{36.000}{1} = 36.000$$

The "F" statistic is a ratio of the effect and within group (error) variance estimates. For the "Factor A * Factor B" interaction:

$$F_{INTER} = \frac{MS_{INTER}}{MS_{ERROR}} = \frac{36.000}{6.000} = 6.000$$

An *F* with 1 and 12 *df* that equals 6.000 has a two-tailed probability of .031, which is a statistically significant finding.

The "Factor A * Factor B" (interaction) statistics reflect the between- group variability not accounted for by the factors taken individually:

$$SS_{INTER} = SS_{MODEL} - SS_{FACTORA} - SS_{FACTORB}$$
$$SS_{INTER} = 56.000 - 4.000 - 16.000 = 36.000$$
$$df_{INTER} = df_{MODEL} - df_{FACTORA} - df_{FACTORB} = 1$$

The "Factor A" and "Factor B" statistics are a function of the level (marginal) means and sample sizes. For "Factor B":

$$SS_{FACB} = \sum n_{LEVEL}(M_{LEVEL} - M_{TOTAL})^2$$
$$SS_{FACTORB} = 8(4 - 5)^2 + 8(6 - 5)^2$$
$$SS_{FACTORB} = 16.000$$
$$df_{FACTORB} = \#levels - 1 = 1$$

"Error" statistics are a function of the within group variabilities. Because SS for each group can be determined (*SS = SD² x df*):

$$SS_{ERROR} = SS_1 + SS_2 + SS_3 + SS_4$$
$$SS_{ERROR} = 18.000 + 18.000 + 18.000 + 18.000 = 72.000$$
$$df_{ERROR} = df_1 + df_2 + df_3 + df_4 = 12$$