Repeated Measures ANOVA

(Note that some aspects of this output have been deleted and rearranged for the sake of presentation!)

Within-Subjects Factors

Measure: MEASURE_1

Factor	Dependent Variable
1	Outcome 1
2	Outcome 2

This provides a description of the variable levels (i.e., columns in the data set) that are linked by being separate instances of the dependent variable.

Descriptive Statistics

	Mean	Std. Deviation	N
Outcome 1	2.0000	2.44949	4
Outcome 2	6.0000	2.44949	4

These values of the descriptive statistics are calculated separately for each level or condition of the within-subjects factor. They are identical to what would be obtained if the "Frequencies" or "Descriptives" procedure had been used separately for each.

Because sample sizes are equal, a grand mean can be determined by averaging these two level means:

$$M_{TOTAL} = (M_{LEVEL} + M_{LEVEL})/2 = (2.000 + 6.000)/2 = 4.000$$

Estimated Marginal Means

Factor

Measure: MEASURE_1

Factor	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	2.000	1.225	-1.898	5.898
2	6.000	1.225	2.102	9.898

This section provides a confidence interval around (centered on) each condition's mean separately. Calculation requires the appropriate critical value. Specifically, the *t* statistic (with 3 *df*) that has a probability of .05 equals 3.182. For example, for the first time:

$$CI_M = M \pm (t_{CRITICAL})(SE_M) = 4.000 \pm (3.182)(1.225)$$

Thus, the researcher estimates that the true population mean for the measure for the Outcome 1 is somewhere between -1.898 and 5.898 (knowing that the estimate could be incorrect).

Tests of Between-Subjects Effects

Measure: MEASURE_1
Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	128.000	1	128.000	14.222	.033
Error	27.000	3	9.000		

The "Between-Subjects Intercept" here refers to the average score of the participants in the study and the significance test determines whether that average is different from zero. This is often not an informative test.

"Between-Subjects Error" refers to the average differences across the participants of the study. This Sum of Squares is not easily determined from the summary statistics output, but rather from the data (and the calculations are therefore not shown here). However:

$$df_{SUBJECTS} = \#subjects - 1 = 3$$

The "Mean Square" is the usual ratio of the Sum of Squares to the degrees of freedom.

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Factor	Sphericity Assumed	32.000	1	32.000	10.667	.047
	Greenhouse-Geisser	32.000	1.000	32.000	10.667	.047
	Huynh-Feldt	32.000	1.000	32.000	10.667	.047
	Lower-bound	32.000	1.000	32.000	10.667	.047
Error(time)	Sphericity Assumed	9.000	3	3.000		
	Greenhouse-Geisser	9.000	3.000	3.000		
	Huynh-Feldt	9.000	3.000	3.000		
	Lower-bound	9.000	3.000	3.000		

The statistics for the effect (or change) on the "Factor" are functions of the means of the levels or conditions and the sample sizes:

$$SS_{EFFECT} = \sum n_{LEVEL}(M_{LEVEL} - M_{TOTAL})^2$$
$$SS_{EFFECT} = 4(2.0 - 4.0)^2 + 4(6.0 - 4.0)^2$$
$$SS_{EFFECT} = 32.000$$
$$df_{EFFECT} = \#levels - 1 = 1$$

The "Mean Square" is the usual ratio of the Sum of Squares to the degrees of freedom.

$$MS_{EFFECT} = \frac{SS_{EFFECT}}{df_{EFFECT}} = \frac{32.000}{1} = 32.000$$

The "F" statistic is a ratio of the effect and within-subjects error variance estimates:

$$F = \frac{MS_{EFFECT}}{MS_{ERROR}} = \frac{32.000}{3.000} = 10.667$$

An *F* with 1 and 3 *df* that equals 10.667 has a two-tailed probability of .047, a statistically significant finding.

These rows provide statistics adjusted for the "Sphericity" test (not shown). Because that test showed no violation of the assumption, these statistics show the exact same results as those in which sphericity is assumed.

The "Within-Subjects Error" is a function of variabilities of the separate levels or conditions of the factor and the "between-subjects error" given above. Because SS for each level can be determined ($SS = SD^2$ $x\ df$, which equals 18.000 for each of the two outcomes):

$$SS_{ERROR} = SS_1 + SS_2 - SS_{SUBJECTS}$$
$$SS_{ERROR} = 18.000 + 18.000 - 27.000 = 9.000$$
$$df_{ERROR} = df_1 + df_2 - df_{SUBJECTS} = 3 + 3 - 3 = 3.000$$

The "Mean Square" is the usual ratio of the Sum of Squares to the degrees of freedom.