General Linear Model

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

Within-Subjects Factors

Measure: MEASURE_1

time	Dependent Variable
1	t1score
2	t2score

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
Score on First Quiz	6.4000	1.14018	5
Score on Second Quiz	7.8000	.83666	5

These values of the group statistics are calculated separately for each level of the dependent variable. There are identical to what would be obtained if the "Frequencies" or "Descriptives" procedure had been used for each.

Estimated Marginal Means

Time

Measure: MEASURE_1

Time	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	6.400	.510	4.984	7.816
2	7.800	.374	6.761	8.839

This section provides a confidence interval around (centered on) each mean separately. Calculation requires the appropriate critical value. Specifically, the t statistic (with 4 df) that has a probability of .05 would equal 2.776 (see Critical Values of the t Distribution). For example, for the first time:

$$CI_M = M \pm (CV_t)(SE_M) = 6.4 \pm (2.776)(.510)$$

Thus, the researcher would have 95% confidence that the interval ranging from 4.984 to 7.816 covers the true population mean for the measure at time 1.

Tests of Between-Subjects Effects

Measure: MEASURE_1
Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	504.100	1	504.100	272.486	.000
Error	7.400	4	1.850		

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. The Sum of Squares are not easily determined from the summary statistics of the SPSS output, but rather from the data (and the calculations are therefore not shown here).

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
time	Sphericity Assumed	4.900	1	4.900	32.667	.005
	Greenhouse-Geisser	4.900	1.000	4.900	32.667	.005
	Huynh-Feldt	4.900	1.000	4.900	32.667	.005
	Lower-bound	4.900	1.000	4.900	32.667	.005
Error(time)	Sphericity Assumed	.600	4	.150		
	Greenhouse-Geisser	.600	4.000	.150		
	Huynh-Feldt	.600	4.000	.150		
	Lower-bound	.600	4.000	.150		

The statistics for the effect (or change) over time are functions of the group means and sample sizes:

$$SS_{EFFECT} = \sum n(M - M_Y)^2$$
$$= 5(6.4 - 7.1)^2 + 5(7.8 - 7.1)^2$$
$$= 4.900$$

df_{EFFECT} = # levels – 1 = 1

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

The "F" statistic is a ratio of the between and within group variance estimates:

$$F = \frac{MS_{EFFECT}}{MS_{ERROR}} = \frac{4.900}{.150} = 32.667$$

SPSS calculated that an F with 1 and 4 df that equals 32.667 has a two-tailed probability of .005.

These rows provide statistics adjusted for the "Sphericity" test (not shown). Since that test showed absolutely no problem, these statistics show the exact same results as those in which sphericity is properly assumed.

The "Within-Subjects Error" is important for the F ratio. It is a function of variabilties of the separate levels of the dependent variable and the "between-subjects error" given above. Because SS for each level can be determined (SD^2 = SS/df, equals 5.20 and 2.80 for time 1 and 2 respectively):

$$SS_{ERROR} = SS_1 + SS_2 - SS_{SUBJECTS}$$
$$= 5.20 + 2.80 - 7.40 = .60$$

$df_{WITHIN} = df_1 + df_2 = 4$

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