T-Test

These values of the group statistics are calculated separately for each group. There are not identical to the values obtained from analyzing the variable as a whole.

Group Statistics

	Lab Group	N	Mean	Std. Deviation	Std. Error Mean
Score on Quiz	Control	4	6.0000	.81650	.40825
	Experimental	4	8.0000	.81650	.40825

These are the standard errors for each mean separately.

$$SE_M = SD/\sqrt{N} = .81650/\sqrt{4} = .40825$$

Notice that the standard errors are equal because both groups have the same standard deviation and sample size.

"Levene's Test" determines whether the variability from the two groups is significantly different. If this were significant, one might consider using the t-test for unequal variances.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Score on Quiz	Equal variances assumed	.000	1.000	-3.464	6	.013	-2.00000	.57735	-3.41273	-.58727
	Equal variances not assumed			-3.464	6.000	.013	-2.00000	.57735	-3.41273	-.58727

The "t", "df", and "Sig." columns provide the results of the statistical significance test. First, "t" provides the standardized statistic for the mean difference:

$$t = \frac{M_1 - M_2}{SE_D}$$

$$= -2/.57735 = -3.464$$

The *t* statistic follows a non-normal (studentized or *t*) distribution that depends on degrees of freedom. Here, df = N – 2 = 8 – 2 = 6. SPSS calculated that a *t* with 6 df that equals -3.464 has a two-tailed probability of .013.

The "Mean Difference" is the difference between the two group means. For the example, the group one's mean was 2 points lower.

The "Standard Error of the Difference" is a function of the two groups' variabilities. When sample sizes are equal:

$$SE_D = \sqrt{SE_1^2 + SE_2^2}$$

$$= \sqrt{.40825^2 + .40825^2} = .57735$$

These values are important for both the significance test and the confidence interval.

This section provides a confidence interval around (centered on) the "Mean Difference." Calculation requires the appropriate critical value. Specifically, the *t* statistic (with 6 df) that has a probability of .05 would equal 2.447 (see Critical Values of the *t* Distribution).

$$CI_D = M_D \pm (CV_t)(SE_D)$$

$$= -2 \pm (2.447)(.57735)$$

Thus, the researcher would have 95% confidence that the interval ranging from -3.41273 to -.58727 covers the true population mean difference.