Paired Samples t Test

These values of the group statistics are calculated separately for each variable.

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Outcome 1	2.0000	4	2.44949	1.22474
	Outcome 2	6.0000	4	2.44949	1.22474

These are the standard errors for each variable calculated separately. For the first variable:

$$SE_M = \frac{SD}{\sqrt{N}} = \frac{2.449}{\sqrt{4}} = 1.225$$

Notice that the standard errors are equal because the variables have the same standard deviation.

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Outcome 1 & Outcome 2	4	.500	.500

This is the correlation between the scores of the two variables. This correlation is not easily determined from the summary statistics of the output, but rather from the data (and the calculations are therefore not shown here).

Though the statistic is not shown, *t* provides the standardized statistic for testing whether the correlation differs from zero:

$$t = \frac{r}{\sqrt{(1-r^2)/(N-2)}} = \frac{.500}{\sqrt{(1-.500^2)/(4-2)}} = .816$$

The *t* statistic follows a non-normal (studentized or *t*) distribution that depends on degrees of freedom. Here, *df* = *N* – 2 = 4 – 2 = 2. A *t* with 2 *df* that equals .816 has a two-tailed probability (*p*) of .500, which is not a statistically significant finding.

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	Outcome 1 - Outcome 2	-4.00000	2.44949	1.22474	-7.89768	-.10232	-3.266	3	.047

The "Paired Differences" statistics are determined by taking the differences of each person's pairs of scores on the two variables. Thus, the "Std. Deviation" of these is not determinable from the summary statistics. However, the "Mean" here is the difference between the two means provided above.

This confidence interval is centered on the "Mean" of the paired differences of the two variables. Calculation requires the appropriate critical value. Specifically, the *t* statistic (with 3 *df*) that has a probability of .05 equals 3.182. As a result:

$$CI_D = M_D \pm (t_{CRITICAL})(SE_D)$$
$$CI_D = -4.000 \pm (3.182)(1.225)$$

Thus, the researcher estimates that the true population mean difference is somewhere between -7.898 and -.1023 (knowing that the estimate could be incorrect).

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

$$t = \frac{M_D}{SE_D} = \frac{-4.000}{1.225} = -3.266$$

The *t* statistic follows a non-normal (studentized or *t*) distribution that depends on degrees of freedom. Here, *df* = *N* – 1 = 4 – 1 = 3. A *t* with 3 *df* that equals -3.266 has a two-tailed probability (*p*) of .047, a statistically significant finding.