# Independent Samples t Test

**Group Statistics**                                          CI % :        95

| Group | N | M | SD | SE | Lower | Upper |
|-------|---|------|------|------|--------|-------|
| 1 | 4 | 2.000 | 2.449 | 1.225 | -1.898 | 5.898 |
| 2 | 4 | 6.000 | 2.449 | 1.225 | 2.102 | 9.898 |
| Total | 8 | 4.000 | 3.117 | 1.102 | 1.394 | 6.606 |

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

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| t | df | p | Diff. | SE | Lower | Upper |
|------|---|-------|--------|-------|--------|-------|
| 2.309 | 6 | 0.060 | -4.000 | 1.732 | -8.238 | 0.238 |

The standard errors for each condition can be calculated separately but note that both groups have the same standard deviation and sample size.:

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

The "SE" is a function of the two groups' individual standard errors. When sample sizes are equal:

$$SE_{DIFF} = \sqrt{SE_1^2 + SE_2^2} = \sqrt{1.225^2 + 1.225^2} = 1.732$$

This value is important for both the significance test and the confidence interval. [Importantly, the computation of the standard error of the difference is more complex for unequal sample sizes.]

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

$$t = \frac{M_{DIFF}}{SE_{DIFF}} = \frac{-4.000}{1.732} = -2.309$$

The $t$ statistic follows a non-normal (studentized or $t$) distribution that depends on degrees of freedom. Here, $df = N - 2 = 8 - 2 = 6$. A $t$ with 6 df that equals 2.309 has a two-tailed probability ($p$) of .060, a finding that is not statistically significant.

This section provides a confidence interval around (centered on) the Mean Difference ("Diff"). Calculation requires the appropriate critical value. Specifically, the $t$ statistic (with 6 $df$) that has a probability of .05 equals 2.447. As a result:

$$CI_{DIFF} = M_{DIFF} \pm (t_{CRITICAL})(SE_{DIFF})$$
$$CI_{DIFF} = -4 \pm (2.447)(1.732)$$

Thus, the researcher estimates that the true population mean difference is somewhere between -8.238 and 0.238 (knowing that the estimate could be incorrect).