

## 11.4: Independent Samples t-statistic

The test statistic for our independent samples  $t$ -test takes on the same logical structure and format as our other  $t$ -tests: our observed effect minus our null hypothesis value, all divided by the standard error:

$$t = \frac{(\overline{X}_1 - \overline{X}_2) - (\mu_1 - \mu_2)}{s_{\overline{X}_1 - \overline{X}_2}} \quad (11.4.1)$$

This looks like more work to calculate, but remember that our null hypothesis states that the quantity  $\mu_1 - \mu_2 = 0$ , so we can drop that out of the equation and are left with:

$$t = \frac{(\overline{X}_1 - \overline{X}_2)}{s_{\overline{X}_1 - \overline{X}_2}} \quad (11.4.2)$$

Our standard error in the denomination is still standard deviation ( $s$ ) with a subscript denoting what it is the standard error of. Because we are dealing with the difference between two separate means, rather than a single mean or single mean of difference scores, we put both means in the subscript. Calculating our standard error, as we will see next, is where the biggest differences between this  $t$ -test and other  $t$ -tests appears. However, once we do calculate it and use it in our test statistic, everything else goes back to normal. Our decision criteria is still comparing our obtained test statistic to our critical value, and our interpretation based on whether or not we reject the null hypothesis is unchanged as well.

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