Two Sample Hypothesis Testing

Independent Means

Population Values Not Know, n is Small (< 20 per group)

$$t = \frac{\overline{X} - \overline{Y}}{S_{\overline{X}-\overline{Y}}} \qquad S_{\overline{X}-\overline{Y}} = \sqrt{S_{p^2}\left(\frac{1}{n_x} + \frac{1}{n_y}\right)} \qquad S_{p^2} = \frac{SS_x + SS_y}{(n_x - 1) + (n_y - 1)}$$

$$SS_x = \sum X^2 - \frac{\left(\sum X\right)^2}{n} \qquad SS_Y = \sum Y^2 - \frac{\left(\sum Y\right)^2}{n}$$

$$df = (n_x - 1) + (n_y - 1)$$

Dependent Means

Population Values Not Know, n is Small (< 40)

$$t = \frac{\overline{X} - \overline{Y}}{S_{\overline{X}-\overline{Y}}} \qquad S_{\overline{X}-\overline{Y}} = \sqrt{S_{\bar{x}}^2 + S_{\bar{y}}^2 - 2rS_{\bar{x}}S_{\bar{y}}}$$

$$s_{\bar{X}} = \frac{s_x}{\sqrt{n}} \qquad \text{s}_\text{x} \text{ – inferential statistic} \qquad s_x = \sqrt{\frac{SS_x}{n-1}}$$

$$s_{\bar{y}} = \frac{s_y}{\sqrt{n}} \qquad \text{s}_\text{y} \text{ – inferential statistic} \qquad s_y = \sqrt{\frac{SS_y}{n-1}}$$

$$\text{r} = \frac{\sum xy}{\sqrt{(SS_x)(SS_y)}} \qquad \sum xy = \sum XY - \frac{\left(\sum X\right)\left(\sum Y\right)}{n}$$

$$SS_x = \sum X^2 - \frac{\left(\sum X\right)^2}{n} \qquad SS_Y = \sum Y^2 - \frac{\left(\sum Y\right)^2}{n}$$

$$df = (n - 1)$$