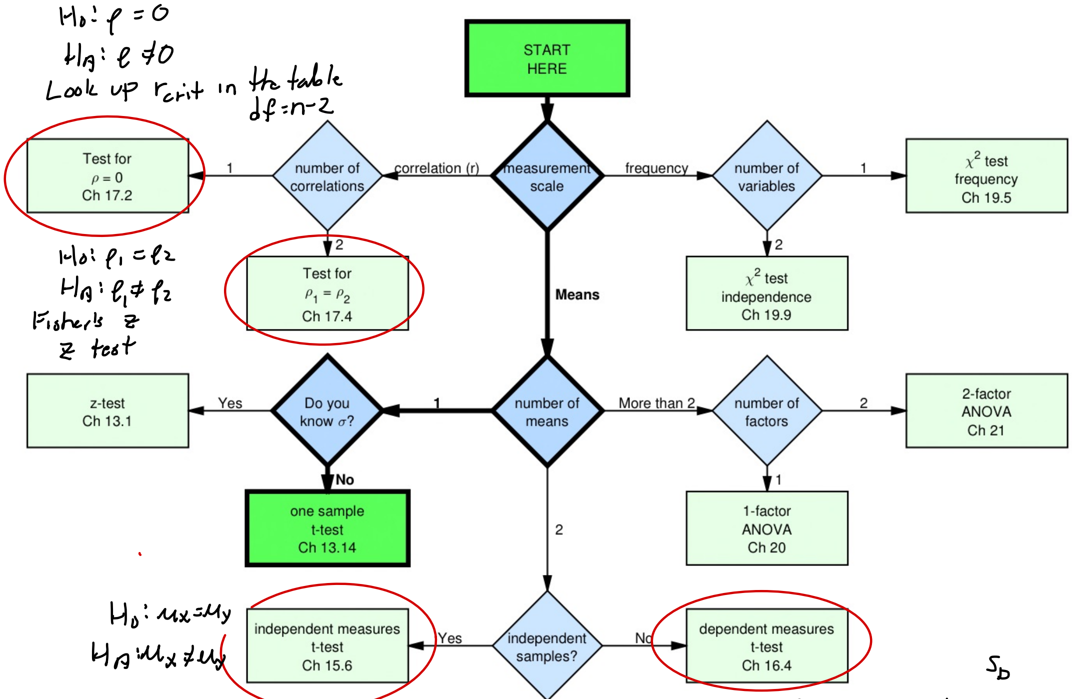
$H_0: \rho = 0$
$H_A: \rho \neq 0$
Look up r_{crit} in the table
$df = n-2$



$H_0: \rho_1 = \rho_2$
$H_A: \rho_1 \neq \rho_2$
Fisher's z
z test

$H_0: \mu_x = \mu_y$
$H_A: \mu_x \neq \mu_y$

$\bar{x}, n_x, s_x$
$\bar{y}, n_y, s_y$
$s_p \to s_{\bar{x}-\bar{y}} \to t$
$df = n_x + n_y - 2$

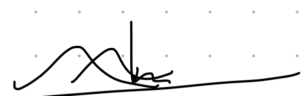
s_D
calculate $\bar{D}$ treat it like a one-sample t-test for
$H_0: \mu_D = 0$ $df = n-1$
\# of pairs

True state of the world		
Decision	H_0 is true	H_0 is false
Fail to reject H_0	1-α	Type II error: β
Reject H_0	Type I error: α	power: 1-β

Power is the probability of rejecting Ho when Ho is false
4 ways to calculate power

Things that affect power			
thing	Pr(Type I error)	effect size	power
increasing effect size	same	increases	increases
increasing sample Size	same	same	increases
increasing alpha	increases	same	increases
two-tailed test	same	same	decreases

1) shifting normal distributions
2) Power curves
3) Stats excel power calculator
4) power.t.test in R



need to know: 4 things
sample size, n
effect size, d
α, one or two-tailed

Test for difference between two correlations:

5)

Your advsor asks you to sample 40 balloons and 16 dinosaurs from their populations and measure both their price and their traffic. You calculate that for balloons their price correlates with traffic with 0.72 and for dinosaurs the correlation is 0.88.

Using an alpha value of $\alpha = 0.01$, is the observed correlation for balloons significantly less than for dinosaurs?

6)

balloons $r_1 = 0.72, \quad n_1 = 40$

dinosaurs $r_2 = 0.88, \quad n_2 = 16$

$H_0: \rho_1 = \rho_2$

$H_A: \rho_1 < \rho_2$

Fisher's z

$z_1' = .908$

$z_2' = 1.376$

$$z = \frac{z_2' - z_1'}{\sigma_{z_1' - z_2'}}$$

$$\sigma = \sqrt{\frac{1}{n_1 - 3} + \frac{1}{n_2 - 3}}$$

$= 0.3224$

$z = 1.45$

$p = \underline{0.07325} > .01$ fail to reject

for z_{crit} use t-table with $df = \infty$

$z_{crit} = 2.326 > 1.45$ fail to reject

Test for difference between two means

4) Your stats professor asks you to measure the happiness of 98 proud and 31 infamous brothers and obtain for proud brothers a mean happiness of 33.24 and a standard deviation of 5.4555, and for infamous brothers a mean of 34.76 and a standard deviation of 6.0071.
Make a bar graph of the means with error bars representing the standard error of the means
Using an alpha value of 0.01, is the mean happiness of proud brothers significantly different than for the infamous brothers?
What is the effect size?
What is the observed power of this test?

x proud brothers $\qquad \bar{x} = 33.24 \quad n_x = 98 \quad s_x = 5.4555$

y infamous brothers $\qquad \bar{y} = 34.76 \quad n_y = 31 \quad s_y = 6.0071$

$H_0: \mu_x = \mu_y \qquad \alpha = .01$, two-tailed test

$H_A: \mu_x \neq \mu_y$

$$s_p = \sqrt{\frac{(n_x-1)s_x^2 + (n_y-1)s_y^2}{n_x+n_y-2}} = 5.58326$$

$$s_{\bar{x}-\bar{y}} = s_p \cdot \sqrt{\frac{1}{n_x}+\frac{1}{n_y}} = 1.1505$$

$$t = \frac{\bar{x}-\bar{y}}{s_{\bar{x}-\bar{y}}} = \boxed{1.32}$$

$$df = n_x+n_y-2 = 98+31-2 = 127$$

fail to reject

see the answer from the tutorial!

4) The happiness of proud and infamous brothers

$\bar{x} - \bar{y} = 33.24 - 34.76 = -1.52$

$s_p = \sqrt{\frac{(98-1)5.4555^2 + (31-1)6.0071^2}{(98-1)+(31-1)}} = 5.5907$

$s_{\bar{x}-\bar{y}} = 5.5907\sqrt{\frac{1}{98} + \frac{1}{31}} = 1.152$

$t = \frac{\bar{x}-\bar{y}}{s_{\bar{x}-\bar{y}}} = \frac{33.24-34.76}{1.152} = -1.32$

$t_{crit} = \pm 2.62 (df = 127)$

We fail to reject H_0.

The happiness of proud brothers (M = 33.24, SD = 5.4555) is not significantly different than the happiness of infamous brothers (M = 34.76, SD = 6.0071) t(127) = -1.32, p = 0.1892.

The effect size is $d = \frac{|\bar{x}-\bar{y}|}{s_p} = \frac{|33.24-34.76|}{5.5907} = 0.27$
This is a small effect size.

The observed power for two tailed test with an effect size of d = 0.27, n = $\frac{(98+31)}{2}$ = 65 and $\alpha = 0.01$ is 0.1400.
$s_{\bar{x}} = = \frac{5.4555}{\sqrt{98}} = 0.5511$

$s_{\bar{y}} = \frac{6.0071}{\sqrt{31}} = 1.0789$