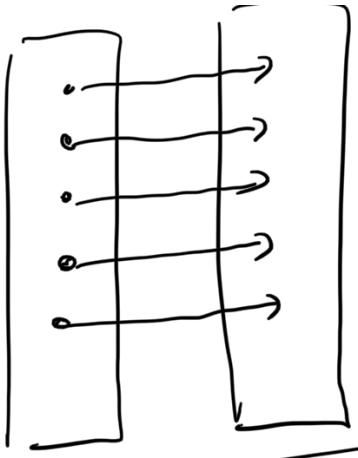
Physics 341 - Lecture 17

Comparing Two Groups of Data.

1. Set 1, Set 2, Set 3, ... Same
2. Set 1 → make change → Set 2
3. Meta analysis
   - → group 1, exp 1
   - → group 2, exp 2
4. Before / After



(5)

n_1	n_2
↑	↑
Random	random.

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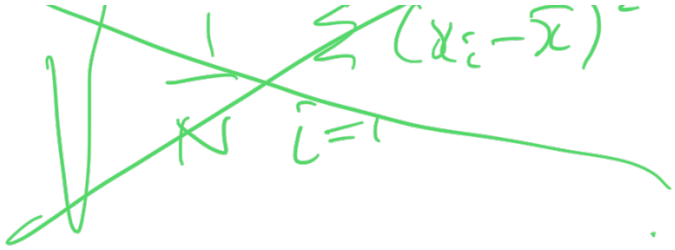
t tests → $\bar{x}$, s, s^2/n

Summary statistics.

$$s = \sqrt{\frac{1}{N-1} \sum_{i=1}^{N} (x_i - \bar{x})^2}$$

$$\sum_{i=1}^{N} (x_i - \bar{x})^2$$



$$t = \frac{\bar{x} - \mu}{S/\sqrt{N}} \leftarrow \text{SEM}$$

single sample

$$t_{\text{two sample}} = \frac{\bar{x}_1 - \bar{x}_2}{\text{SEM}} \leftarrow \text{assuming}$$

Weighted average of $\left(S/\sqrt{N}\right)$

$$\Rightarrow \boxed{\text{SEM} = \sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}} \leftarrow$$

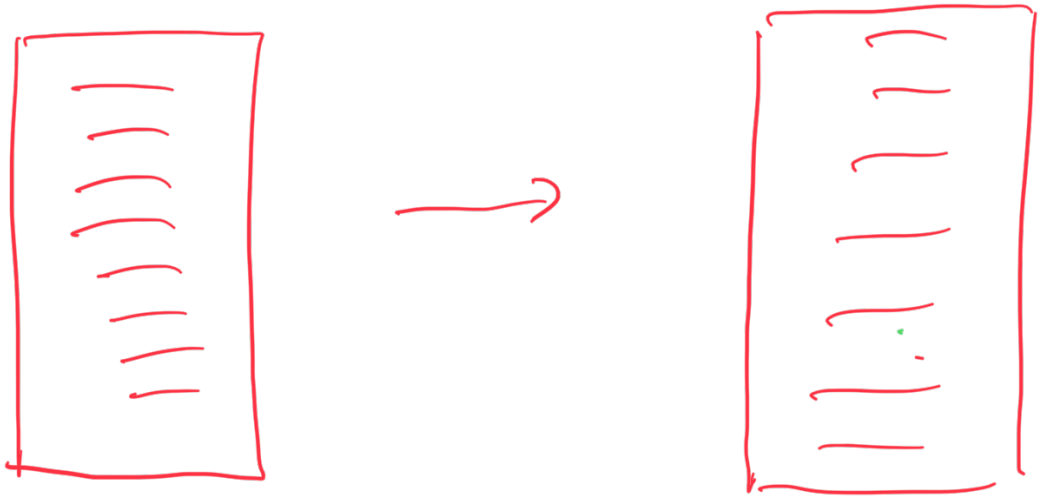
$$\sqrt{\left(\frac{\partial f}{\partial x}\right)^2 \delta x^2 + \left(\frac{\partial f}{\partial z}\right)^2 \delta z^2}$$

$\sigma_{\bar{x}} = \sqrt{(\sigma_1)^2 \; \sigma_4 \; (\sigma_2)}$

Assumption : Expect $\bar{x}_1 = \bar{x}_2$

$\mu_1 = \mu_2$

Process	→ Improvement →	Improved Process
$\mu_1 = 100$	⟶	$\mu_2 = 110$



$n_1, \bar{x}_1$ s_1

$n_2, \bar{x}_2$ s_2

$\bar{x}_1 = 88.4 \longleftrightarrow \bar{x}_2 = 104.$

Has it improved by 10?

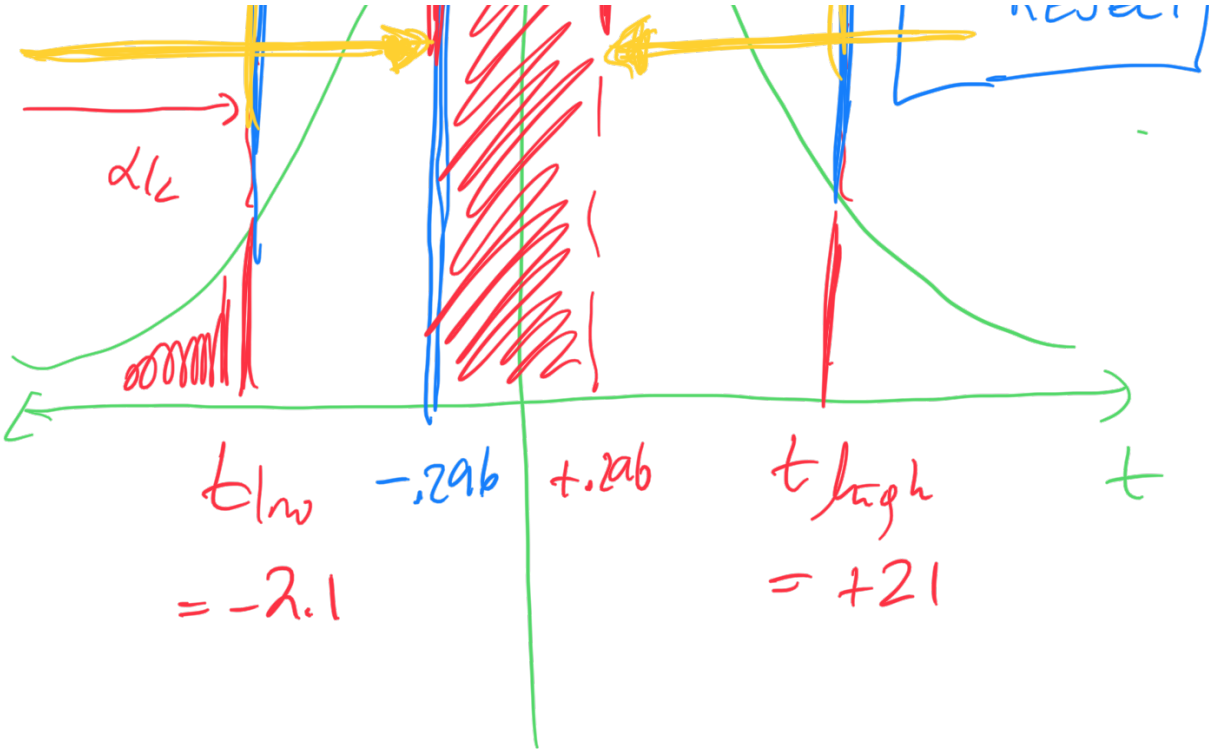
$$t_{\text{two sample}} = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu$$

$$\text{SEM} \uparrow \text{weighted SEM}$$

$$t_{\text{two sample}} = \frac{(\bar{x}_1 - \bar{x}_2) - \overset{0}{(\mu_1 - \mu_2)}}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

$\alpha = .05$

FAIL TO



$$\nu_1 = n_1 - 1 \quad +$$

$$\nu_2 = n_2 - 1 \quad .$$

$$\boxed{\nu = \nu_1 + \nu_2 = n_1 + n_2 - 2}$$

$$\boxed{\mu_1 = \mu_2}$$

Process "Impact" Impact Process

97.12 100.15

P-values → small → effect
→ large → no effect

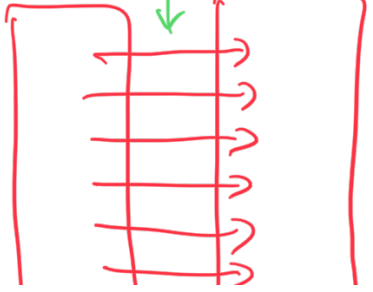
Field

If P-value < α → effect
> α → no effect

Comparison

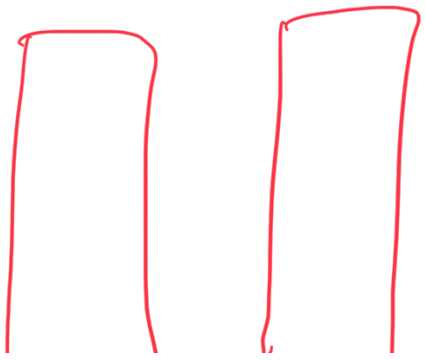
Example 1

- same data
Information!!



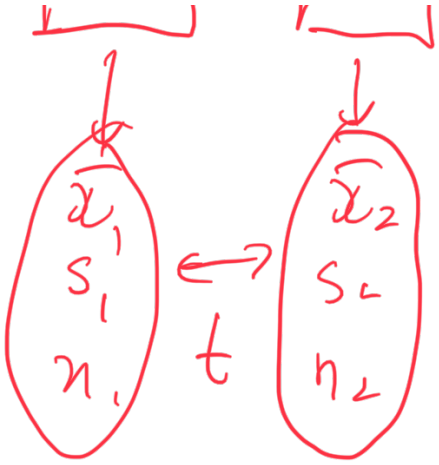
Example 2

- same data.



$P = 0.019$

Effect ✓



$P = 0.771$

NO ~~EFFECT~~

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{SEM}$$

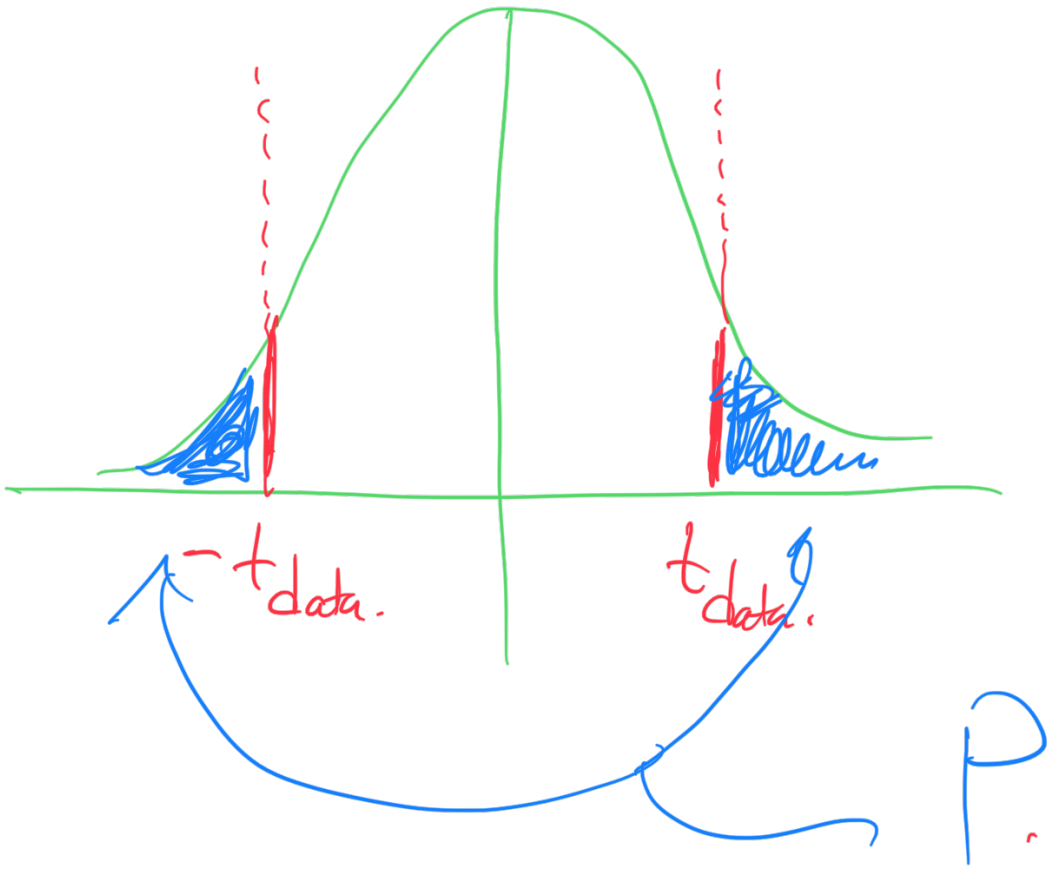
↑ measure of the number of std. deviations away from zero.

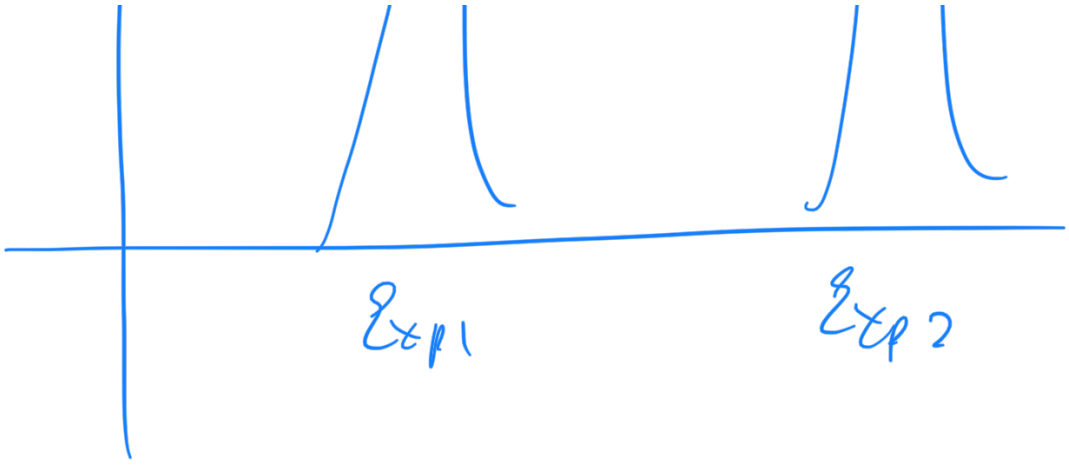
P-value → what would

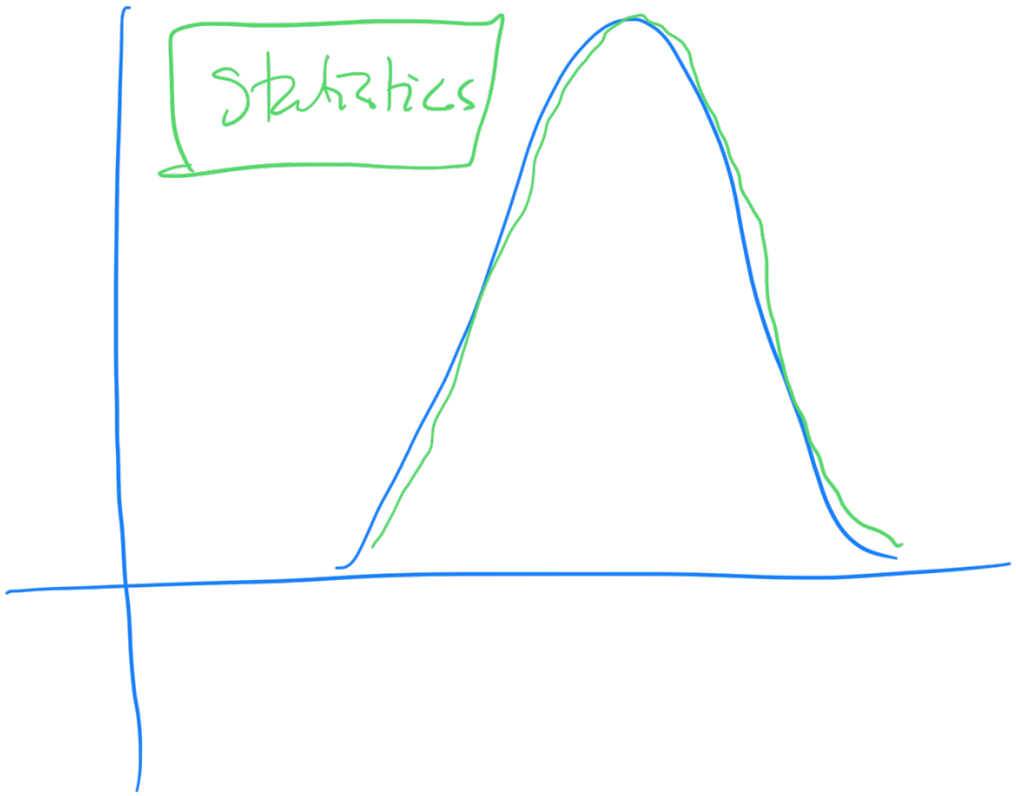
α have to be 1

for us to claim

"no effect"







Race Data

Rue 1

times

Race 2

times

$\mu_1 = 90$ $\mu_2 = 85$

$\sigma_1 = 10$ $\sigma_2 = 10$

$$df = n_1 + n_2 - 2$$

??