

Power is the probability of rejecting  $H_0$  when  $H_0$  is false

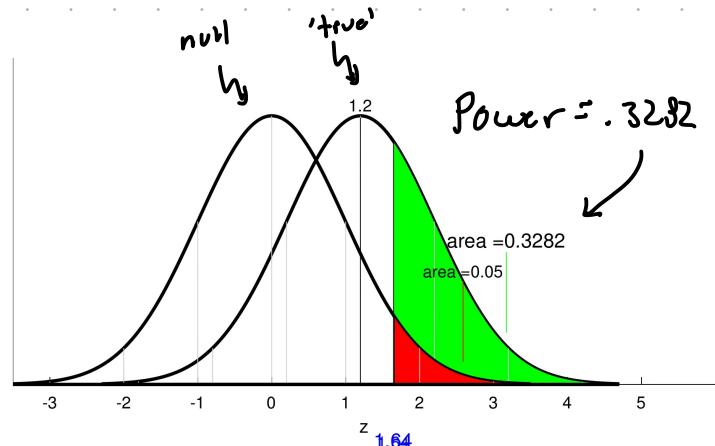
o) Hypothesis test on IQ's     $H_0: \mu_{H_0} = 100$   
 $H_a: \mu_{H_0} > 100$   
 $\sigma_x = 15$

$n = 9, \mu_{true} = 106, \alpha = .05$ , one-tailed

$$\sigma_{\bar{x}} = \frac{\sigma_x}{\sqrt{n}} = \frac{15}{\sqrt{9}} = \frac{15}{3} = 5$$

$$Z_{true} = \frac{\mu_{true} - \mu_{H_0}}{\sigma_{\bar{x}}} = \frac{106 - 100}{5} = 1.2 \quad \text{'medium'}$$

$$\text{effect size: } \frac{\mu_{true} - \mu_{H_0}}{\sigma_x} = \frac{106 - 100}{15} = 0.4$$

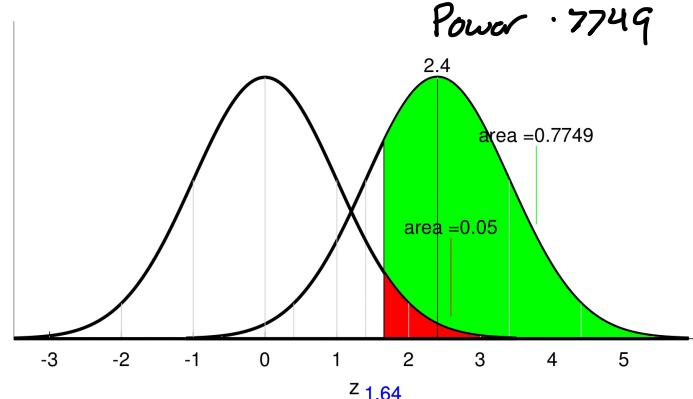


1) Increasing effect size:

$n = 9, \mu_{true} = 112, \alpha = .05$ , one-tailed  
 $Z_{true} = \frac{112 - 100}{5} = 2.4, d = \frac{112 - 100}{15} = 0.8 \leftarrow \text{'large'}$

2) Increasing sample size:

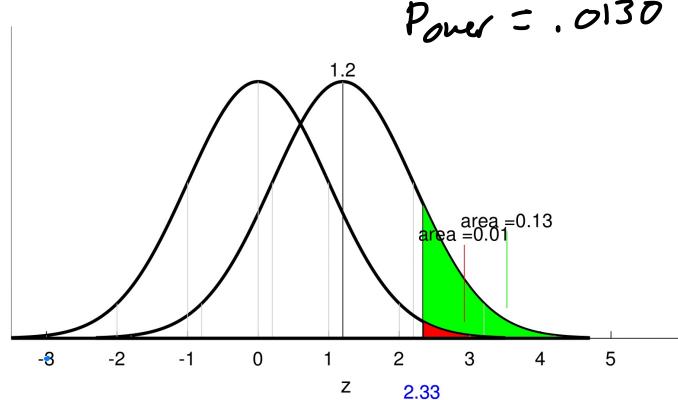
$n = 36, \mu_{true} = 106, \alpha = .05$ , one-tailed  
 $\sigma_{\bar{x}} = \frac{15}{\sqrt{36}} = \frac{15}{6} = 2.5 \quad \text{'medium'}$   
 $Z_{true} = \frac{106 - 100}{2.5} = 2.4, d = \frac{106 - 100}{15} = 0.4$



3) Decreasing  $\alpha$

$n = 9, \mu_{true} = 106, \alpha = .01$ , one-tailed

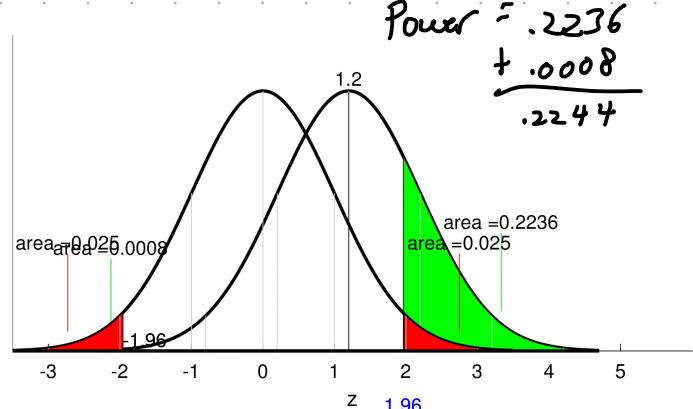
$Z_{crit}$  increases from 1.64 to 2.33



4) Changing from 1-tailed to 2-tailed test:

$n = 9, \mu_{true} = 106, \alpha = .05$ , two-tailed

$Z_{crit}$  changes from 1.64 to  $\pm 1.96$



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