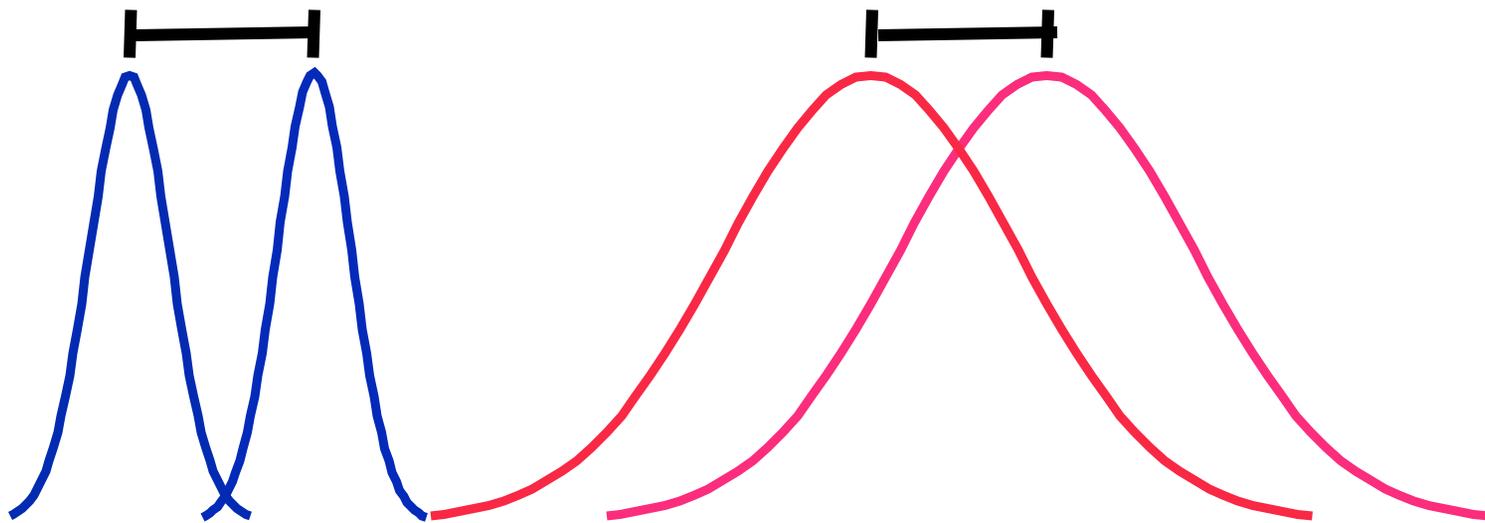# Hypotheses testing I

- Different things are different !
  - Why test them? Can't we just show mean difference?
    - No, because of randomness / chance

  - Can we test that things are different?
    - Logically it is very hard -- because they are

Variance

Within vs. between subject designs

○ Which is better? Why

○ What are the advantages of each?

○ What are the disadvantages of each?

Hypotheses testing II

○ H0 (the null hypothesis)

○ H1(the real hypothesis)

- H0- No difference Group 1 = Group 2
  - $[=, \leq, \geq]$
- H1-Difference Group 1 ≠ Group 2
  - $[\neq, >, <]$

Hypotheses testing III

- H0 & H1-- Examples:
  - Is a coin fair
  - Gender and grades
  - Healing with a new medication
  - Ability to cheat
  - Marriage over time

- For each please write H0 & H1

Hypothesis testing IV

○ Why do we test a hypothesis we don't believe in?

○ What does it mean to reject H0?

○ If H0 is correct, the probability of getting this result (or a more extreme result) is very low -- thus we reject H0 and accept H1

Hypothesis testing IV

○ Probailities
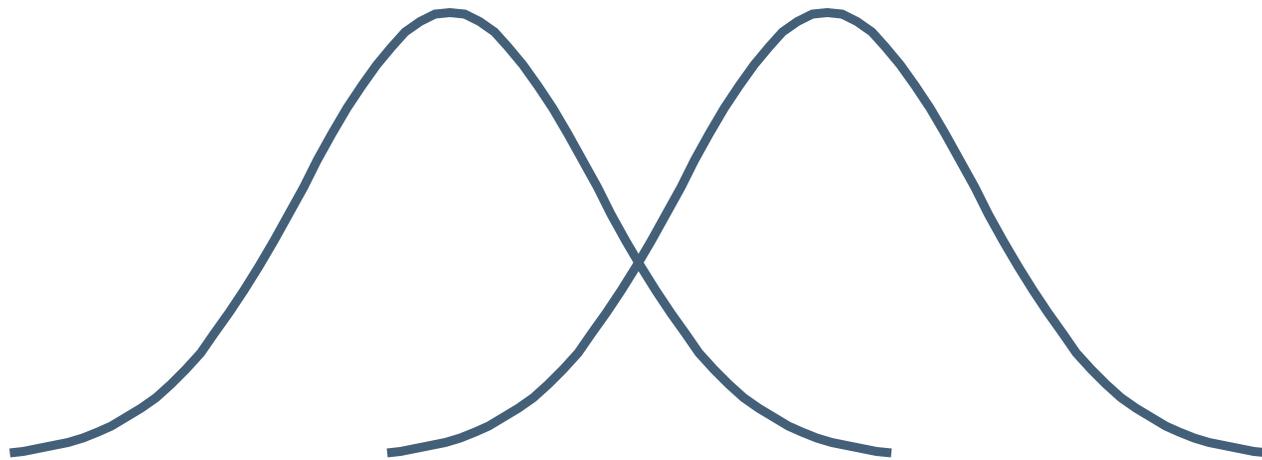
The meaning of p

- What does p means?
- What is the difference between
  - p = 0.03, p = 0.001, & p = 0.11
- What is the relationship between p and confidence?
- What is the relationship between p and effect size?
- What is the relationship between p and number of subjects?

2 types of errors

○ Not conservative and liberal just balancing 2 types of error

H0 is wrong	H0 is correct	
Correct	Type 1 error	**Reject H0**
Type 2 error	Correct	**Accept H0**

The importance of effect size

○ Always give effect size measures
- Mean difference
- Quartile differences
- etc.

Summary

- Hypotheses testing
  - H1 & H0
  - The meaning of p
  - 2 types of errors

  - Effect size !

- Within & between subject designs