3 Multiple comparisons, power, and limitations of NHST

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Type I and Type II error

- We already mentioned this in the previous lecture

| H0 is true | H1 is true

———————|———————-|————— H0 not rejected | correct | β, Type II error H0 rejected | α, Type I error| Power

Example

	H0 is true	H1 is true
H0 not rejected	correct	β, Type II error
H0 rejected	α, Type I error	Power

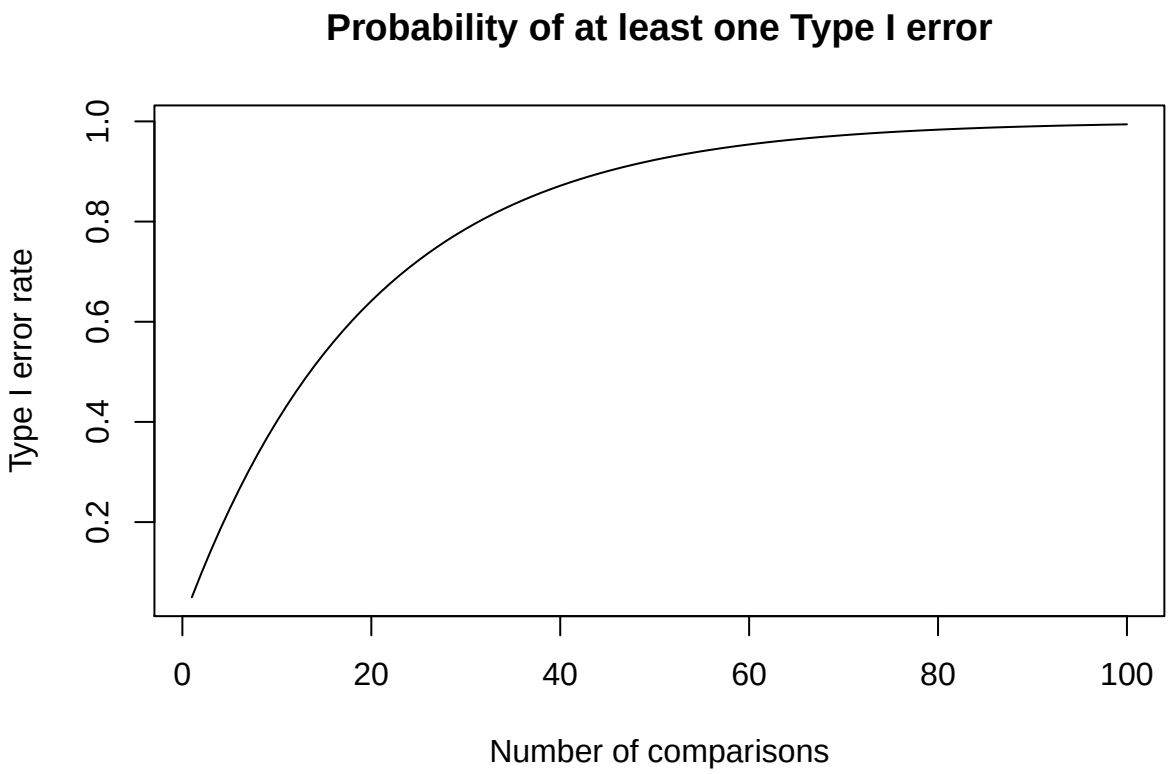
Controlling the Type I error rate

- Seems trivial: just set α to an appropriate level (0.05)
- However, there are many factors that can increase the Type I error rate:
- Multiple comparisons
  - See Week 3 In-Class activity Question 1
  - Each test has an individual α of .05.
    - But if you do a lot of tests, these individual alphas add up

Type I error rate for multiple comparisons

This is not particularly complicated, it's just the function

$$y = .95^x$$



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Slide With Code

```
summary(cars)
```

```
##      speed           dist
##  Min.   : 4.0   Min.   :  2.00
##  1st Qu.:12.0   1st Qu.: 26.00
##  Median :15.0   Median : 36.00
##  Mean   :15.4   Mean   : 42.98
##  3rd Qu.:19.0   3rd Qu.: 56.00
##  Max.   :25.0   Max.   :120.00
```

Slide With Plot