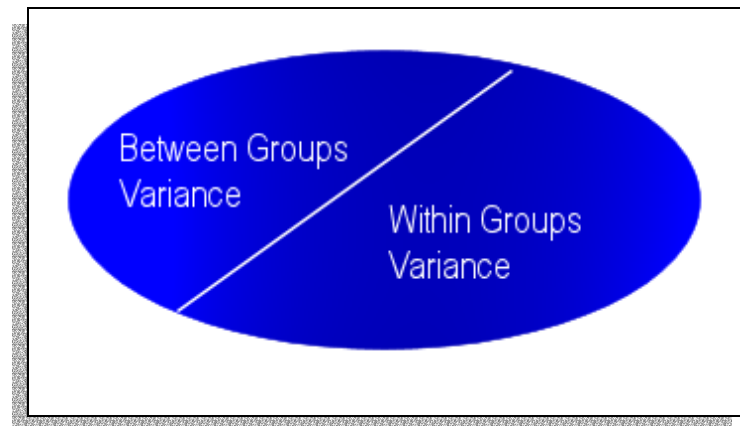


The Single Factor Analysis of Variance

- The single factor analysis of variance extends the independent t-test (analysis of the significance of the difference {or lack thereof} between two means) to three, four or more means in a research design where the three, four or more groups being studied are all exposed to different amounts of the same common factor, or independent variable.
- It examines the **TOTAL VARIANCE** in the pooled data and partitions it into that portion which we can “blame” on our treatment conditions, known as **systematic variance**, and the remaining portion which is due to error factors beyond experimental control, known as **unsystematic variance**.
- **Systematic variance** is also known as **BETWEEN GROUPS** or **TREATMENT VARIANCE** and is believed to be caused by our different treatment conditions. **Unsystematic variance** is also known as **WITHIN GROUPS** or **ERROR VARIANCE** and believed to be caused by error factors beyond our control. **The F statistic looks at the ratio of MS Between Groups/MS Within Groups. If the different treatment conditions--different “amounts” of the same independent variable--actually have had an effect, the numerator will be larger relative to the denominator and the larger it is, the larger the value of F and the greater is the likelihood of reaching statistical significance.**



$$F = MS \text{ Between} / MS \text{ Within} \sim H_0: \text{Mean}_1 = \text{Mean}_2 = \text{Mean}_3, \text{ etc.}$$