**Single-Sample T-Tests**

•When can we use z-tests?

• Dependent variable is scale

• Participants are randomly selected

• Population is normally distributed

• Parameters for 1 population (z-test)

**•When can we use t-tests?**

• Dependent variable is scale

• Participants are randomly selected

• Population is normally distributed

• Have population mean (t-test)

• Estimate standard deviation from sample

• However there is a formula problem…

**•Measure of variability (σ) on a theoretical normal distribution is infinite**

•Measure of variability on a theoretical normal distribution is infinite

•However, the sample variability is finite

•Example: range is a measure of variability

• For a population it is infinite

**•Measure of variability (σ) on a theoretical normal distribution is infinite**

•No population standard deviation (σ), no problem

• Estimate based on the finite sample (s)

**•Sample variability is**

• Always less than the population variability

• Need to increase variability by

• Subtracting one from N

• We call N-1 degrees of freedom

**•Degrees of freedom**

• Number of scores free to vary when estimating a population from a sample

• But why “1”

• If N = 3 and M = 5, what are the values of the three numbers?

?, ?, ?

There are an infinite number of solutions, just as long as the average is 5

**6, ?, ?**

There are still an infinite number of solutions, just as long as the average is 5

**6, 5, ?**

The answer is 4. Can it be anything else?

No, it can only be 4. The last value is not free to vary. It is a finite number.

**• In every sample there is one finite value.**

• The rest of the values are infinite

• Convert a finite to an infinite distribution by removing the one finite value in a sample

• The remaining values are free to vary (df)

**We use a t-distribution (Appendix page B-4)**