Notes on the Matched Groups or Related Measures t-test, also known, depending on the circumstances, as the Correlated t-test

- **…the first thing to remember is that this statistic does not calculate a correlation**. Instead, it determines whether two means are sufficiently different from each other to conclude that they are from two different populations. It is another kind of t-test used in special cases.

- …this test is employed in EITHER of the two following situations:

  - …in the first case, a researcher believes that some *potentially confounding extraneous variable* in an experiment ought to be controlled so she decides to MATCH subjects in her two groups on the *extraneous variable* and by doing so control its impact. For example, if she believed that *intelligence* could have a confounding effect on the performance of men and women on a test of mechanical ability, meaning that it might influence their performance and cloud the results, she could control it and make certain through MATCHING that both the groups had people from specific IQ Ranges, *e.g*, 70~79, 80~89, 90~99, 100~109, 110~119, 120~129, …, and so on. In this case, she would have what is called a MATCHED GROUPS RELATED MEASURES DESIGN.
  - …in the second case, a researcher wishes to use a SINGLE GROUP OF SUBJECTS and have them act as their "own control group." This research design, sometimes referred to as a BEFORE-AFTER RESEARCH DESIGN, tests a SINGLE GROUP OF SUBJECTS *BEFORE* they receive some experimental treatment condition (the independent variable), and then again *AFTER* exposure to the experimental treatment condition. Since the subjects in the *BEFORE* condition are the same as those in the *AFTER* condition the SUBJECTS ARE RELATED and their data CORRELATED. I could, for example, pre-test a group of subjects on a reaction time dependent variable *BEFORE* and then again *AFTER* giving them all a tranquilizer. If their performance ***AFTER*** the tranquilizer was significantly different from their performance ***BEFORE***, & all other extraneous variables were controlled, I could blame difference in performance on the drug.

- **IN BOTH CASES, THE t-test FOR RELATED MEASURES, aka, THE CORRELATED t-test, IS THE TEST CALLED FOR.**

$$t = \frac{\bar{X} - \bar{Y}}{\sqrt{\frac{\Sigma D^2 - \frac{(\Sigma D)^2}{N}}{N(N-1)}}}$$

D = the DIFFERENCE between a value on the X variable and its matching pair on the Y variable
N = the NUMBER OF PAIRS OF VALUES OR OBSERVATIONS
The means of the two groups are in the numerator, just like the Independent t statistic
df = N - 1