Homework 6 Part a: Meta Analysis

In this part you will perform a simple meta-analysis on 20 studies comparing two groups each.

Work with the Excel file **HW 6 population data.xls** on Canvas. This file contains two columns of random normal data on a dependent variable that you need to creatively name yourself. A population of "Fify" people ($N = 2000$) has parameters $\mu_f = 5$ and $\sigma_f = 3$, and a population of "Sixy" people ($N = 2000$) has parameters $\mu_s = 6$ and $\sigma_s = 2$. This corresponds to a population difference of $d = 0.40$ between the two groups. You will draw samples of "studies" from these two populations, and in each study you will compare the Fify and Sixy groups against each other, for a between-subjects "significance" test per study.

1. Generate **twenty studies**, each time randomly drawing a sample of 15 Fify cases and 15 Sixy cases from their respective populations.

    I have built one way of doing this into the Excel file. In the leftmost column you'll find a randomizer. Each time you double-click on a cell and hit return, the 2000 random numbers will refresh. After one such refresh, copy the contents of the yellow column into column E, using **Edit | Paste Special…** click **Values**. Then mark columns C through G and go into **Data | Sort…** There, click on Header row and sort by the column RANDOM (either ascending or descending). Now you can copy the first 15 Fify cases and first 15 Sixy cases and designate them your first study. Return to the yellow RANDOM column, refresh it, and so on.

    You don't have to use Excel, however; you can do it in SPSS (for seasoned SPSS users), Matlab, etc.. Either way, just make sure you have 20 independent random draws and describe how you did it.

2. For **each** of these "studies" (in which you sampled 15 Fify + 15 Sixy cases each), run an independent-sample t test of "Fify vs. Sixy" and record Ms, SDs, ts, ps, and whether the difference was "significant," $p < .01$. You can do this in Excel or in SPSS, running a t test on each "study" of 15 Fify + 15 Sixy cases. (Cutting and pasting groups of cells from Excel into SPSS works, at least on my Mac...).

3. Then calculate the (sample-bias corrected) effect size d for *each* of the twenty studies (using the **Cohen_d_formula.xls** file) and the average effect size *across all* twenty studies (don't worry about inverse weights, random effects, or the like.)

4. Plot the resulting distribution of twenty effect sizes (i.e., group differences of Fify vs. Sixy in units of d). (A dot plot would be suitable.) Mark the average of these 20 effect sizes and mark the effect size at which the group difference in any single study would become significant at $p < .05$ (let's call this the "minimum effect size for significance"). Comment on what the overall effect size distribution tells you, and explain why the minimum effect size for significance is higher than the average effect size.

5. How much statistical power ($1 - \beta$) did each of your twenty studies have? (There are several free websites that allow you to calculate the statistical power of your group comparisons.)

Part b: Item Analysis

1. Use EDA to inspect the data before you run the main analyses. After gathering distributional information on all 32 items, comment (in a few sentences) on degree of normality and frequency of outliers across the set of 32 items. You do not have to apply any transformations, and you do not have to include any SPSS output in your homework file, only brief commentary.

2. Begin with the following set of 12 items:

   ```
   RELIAB VAR = KIND OPPOSING APPROVIN HARSH PERSEVER  FRIENDLY CONTRARY COOPERAT
     QUIET CRITICAL LAX SHY
     /SCALE (AGREEABLENESS) =   KIND OPPOSING APPROVIN HARSH PERSEVER
     FRIENDLY CONTRARY COOPERAT QUIET CRITICAL LAX SHY
     /STA = CORRELATION
     /SUM = TOTAL CORR.
   ```

   Through systematic inspection of intercorrelations and Cronbach alphas, and through item deletion and recoding, develop a reliable measure of "agreeableness." The items are part of a system called the "Big Five" personality model, which assumes that personality can be captured along five dimensions, with each dimension measured by a set of semantically (and psychologically) related items. For the meaning of these dimensions and representative items, look at the file **BigFiveTable.jpg** in the HW6 folder.

   When I did the item analysis, the alpha of my final measure was 0.77; yours should not be lower.

   Turn in the output of your final run, but add a verbal description of your steps that led you to this final run, along with justifications for why you took those steps.

3. Now construct a scale for a second construct that should be internally consistent. Choose one of the Big Five constructs that appears to be well-represented by a subset of the adjectives and run RELIABILITY analyses until you have a scale of reasonable length, meaningful items, and at least a decent (> 0.70) alpha.

4. Write a summary of the construction of the two measures.