Independent Samples t-test

We will continue using the Anorexia dataset for this exercise. Open the file as an SPSS file. If you like, you can enter the Value Labels for "Group".

Independent Samples *t***-test**

In the first exercise, we will use an Independent Samples *t*-test to answer the following question: Are there differences in pre-treatment weight across the treatment and control conditions?

Concept Check

- 2. In the larger context of evaluating whether or not the Family Therapy intervention works, why is this analysis important?
- 3. Assuming that participants were randomly assigned across the two conditions, what would we expect to find, and how does this relate to our Null Hypothesis?
- 4. What are the Research and Null Hypotheses (state the Null Hypothesis in words and statistical notation)?

To compute an Independent Samples t – test in SPSS...



When you click on "Define Groups", the following box opens:



Define Groups: In our case, we only have 2 groups, so we would enter "1" for Group 1 and "2" for Group 2. Note that if your variable is defined as "0" and "1" (instead of 1 and 2), you would enter these values in the respective boxes. Sometimes, you will have a variable with more than 2 groups. For example, a study may include Republicans (1), Democrats (2), and Independents (3) for Political Party. If the researcher is only interested in comparing Democrats and Independents, then "2" and "3" would be entered under "Use Specified Values". Note that if the research question concerned all 3 groups, then a *t*-test should not be conducted (An ANOVA is appropriate in this case, which we will cover later this semester).

Cut Point: Sometimes, researchers are interested in dichotomizing a *continuous* variable into groups so that a *t*-test can be used. For example, a researcher might use a continuous measure of Self-Esteem (possible scores range from 0 – 40, with higher scores indicating higher self-esteem). This researcher may want to compare people "high" in self-esteem with people "low" in self-esteem on some other measure, the Dependent Variable. One option in this case is to use "Cut Point", where SPSS will create a dichotomy on a continuous variable based on the specified cut point values. (i.e., SPSS will treat the continuous variable as a dichotomous categorical variable ---- and the cut point will be used to specify which participants are in the "high" versus "low" group.) In this self-esteem example, if 20 is entered as the cut-point, participants with self-esteem scores between 0 and 20 will be defined as "low self esteem", whereas participants with scores greater than 20 will be defined as "high self-esteem". Although this practice is somewhat common, I strongly discourage this practice in most situations. Detailed rationales against dichotomizing variables that are continuous are discussed in the following papers (not required reading for the course, but something that may be of interest at some point in your careers): MacCallum, R. C., Zhang, S., Preacher, K. J., & Rucker, D. D. (2002). On the practice of dichotomization of quantitative variables. *Psychological Methods*, 7, 19-40.

Preacher, K. J., Rucker, D. D., MacCallum, R. C., & Nicewander, W. A. (2005). Use of the extreme groups approach: A critical reexamination and new recommendations. *Psychological Methods*, *10*, 178-192.

After defining the groups, select [Continue], and then Click [OK]. The output, displayed on the next page, is fairly straightforward:

Group Statistics: This box offers basic descriptive statistics for the DV, specific to each group. If a result is significant, you can refer to this box to determine directionality. You will also need this information for the final write-up, because you will need to report Means and SD's of each group.



+ T-Test

[DataSet1]

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Group Statistics

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Std. Error

Levene's Test: This test, automatically generated by SPSS, tests a key assumption of the Independent Samples *t*-test: Homogeneity of Variances. As the term implies, results of a standard *t*-test are generated with an assumption: that dispersion (i.e., variance) is roughly equivalent across the two groups. If this assumption is violated, then the *t*-test needs to be adjusted mathematically. The Null Hypothesis of Levene's Test is that there are *NO* differences across groups. Thus, if the F-statistic is NOT significant (i.e., if p > .05), then the assumption is met, and you continue interpreting and reporting results under the condition that "Equal Variances Assumed" (top line in results). If the F-statistic *is* significant (i.e., if p < .05), then the Null is rejected, and it CANNOT be assumed that variances are equal. Therefore, you continue interpreting and reporting results under the condition that "Equal Variances are Not Assumed" (bottom line in results).

Concept Check:

- 5. Write the results in APA format (include effect size, which you will have to compute).
- 6. Test the post-treatment weights across the two conditions. Write results in APA format (include effect size).
- 7. Integrate all results you conducted for these exercises (single sample, paired samples, and independent samples *t*-tests). Write a summary of the findings without reporting ANY statistics (i.e., no numbers; the point is to think conceptually about the numbers). How do the results relate to the larger question of "Does the treatment work?"

HINT: Think to yourself, "What was the purpose of each test?" Communicate these purposes and the meaning of results of each test.