PSYC 7014, Week 5 stats lab: t-tests

The data set **"cognitiveTraining.txt"** (found in the datasets folder) contains data related to a study testing whether a Gamified Cognitive Training regiment produced positive results for individuals:

- We selected 20 undergraduates from the University of Cincinnati who reported regular use of the Luminosity app in their personal time.
- We recruited **another** 20 that reported never using Luminosity.

These data reflect their scores on the Davis Cognitive Performance Scale.

1. what kind of design is this study? What kind of t-test should you use?

2. given your answer to (1), run the appropriate assumption tests on this data (normality, homogeneity of variance a.k.a homoscedacity.

3. Plot the data using a bar graph to compare means (Luminosity v. Non-luminosity). Be sure in your plot to include error bars, AND be sure in your figure caption to tell me what the error bars are (standard error, 95% CI).

4. Perform a t-test, making the appropriate modifications based upon your assumption tests (i.e., was the data normal, are the variances equal?)

5. Report your findings using the examples from Sections 9.5.2.9, 9.6.3.9 of the Field text.

6. As an exercise, rerun your t-test, this time assuming that your Levene's Test yielded the opposite result—i.e., if you originally got a rejection of homoscedasticity, pretend that you that found a null result. If you originally got a null result, assume you rejected homoscedasticity. Note everything that changes.

7. As an exercise, rerun your t-test, this time assuming that both measures were coming from the same participants (think of NoLuminosity as ***pre-Luminosity*** and YesLuminosity as ***post-Luminosity*** exposure. One thing to keep in mind, from McDonald (p. 188): *"The paired t–test does not assume that observations within each group are normal, only that the differences are normal. And it does not assume that the groups are homoscedastic."* This means that if you end up running a paired t-test you would need to evaluate the normality of the difference scores. If your data is in **long format** this might end up looking something like:

```
difference_scores <- filter(data_frame_name, group=="noLuminosity")-
filter(data_frame_name, group=="yesLuminosity")
```

You would then run the appropriate tests for normality on `difference_scores`.

8. Are these results (from Q7) different from when you ran the test as an independent samples t-test? If so, can you provide a technical reason? (i.e., what mathematical considerations changed in the test). Conceptually what does this suggest about the relative effectiveness of paired samples v. Independent samples designs?

9. Rerun steps 1-5 using your own data.