Assignment 6: Analysis of Covariance (ANCOVA)

*Note: Report your code and output whenever using R to compute findings.*

**Use the Viagra dataset from the online JASP data repository to complete this assignment. Assume the outcome in analyses is libido and the covariate is partnerLibido.**

**Description:** This fictional data set, "Viagra", provides men's libido (and that of their partners) after having been administered different doses of viagra.

**Variables:**

* **dose -** Viagra dosage administered (Placebo, Low Dose, High Dose).
* **libido -** Participant's libido (measured over the course of one week).
* **partnerLibido -** Libido of participant's partner (measured over the course of one week).

**Reference:** Field, A. P. (2013). *Discovering Statistics Using IBM SPSS Statistics* (4th ed.). London: Sage. [Fictional data set]

The data set was constructed by Andy Field who therefore owns the copyright. Without Andy Field`s explicit consent, this data set may not be distributed for commercial purposes, this data set may not be edited, and this data set may not be presented without acknowledging its source (i.e., the terms of a CC BY-NC-ND license).

Part A

**Examine the data (5 pts).**

1. What are the factor(s) in this example and How many levels (J) does each factor have?
2. What is the dependent variable in this example?
3. What is the covariate in this example?
4. Examine and briefly report relevant descriptive statistics, including measures of central tendency, variability, normality, and/or counts for each independent and dependent variable. Include your code and results.
5. Check and report the correlations among predictors. Is multicollinearity an issue?

**Hypotheses (5 pts).**

1. Write the null hypotheses as they relate to the population means.
2. Write the alternative hypotheses as they relate to the population means.
3. Using typical language, write the null hypothesis.
4. Using typical language, write the alternative hypothesis.

**Fit ANCOVA & Compare Models (10 pts)**

1. Fit the following models using Type I SS.
   1. An empty model
   2. A model that includes only the covariate effects on the outcome.
   3. A model that includes covariate and main effects on the outcome.
   4. A model that includes covariate, main, and interaction effects.
2. Report your code and output.
3. Using model outputs, compare the fit among models. Report your code and output.
4. Based on your comparison, which model should you choose to interpret?
5. Report the selected ANCOVA Table of Results, including all relevant SS, df, MS, F, and p values. You can use R or create a table by hand. Report in APA style.

**Assumption Check (10 pts).**

1. List all assumptions of ANCOVA.
2. Check all assumptions of ANCOVA and report your logic/results.

Part B.

**Figure of Results (5 pts)**

1. Create a figure to show the results of the final model.

**Contrasts & Simple Effects (10 pts)**

1. Use Effect Coding to examine the difference between doses.
2. Use Dummy Coding to examine the difference between doses.
3. Compute and report the simple effect of dose on libido at the mean value of partner libido.
4. Compute and report the simple effect of dose on libido at partner libido=2.
5. Does the slope between partner libido and libido differ across dose? Use simple slopes to examine this effect.

**Interpretation & Write-up (5 pts)**

1. Using APA formatting, write a concise 1 paragraph report describing the models you tested, model fit, model fit comparisons, model assumptions, model results, contrasts and simple effects, and reference figures/tables relevant for interpreting model results.

**Theory & Concept (10 pts)**

1. True or false. ANOVA is generally robust to violations of normality.
   1. True
   2. False
2. True or false. To be a true contrast, the sum of the contrasts must equal 1.
   1. True
   2. False
3. A post-hoc analysis for testing all pairwise comparisons that is most powerful when the number of groups is large is:
   1. Tukey
   2. Scheffe
   3. Bonferroni
   4. Fisher’s LSD
4. Which sums of squares type tests the unique contribution of each effect separately?
   1. SS Type I
   2. SS Type II
   3. SS Type III
5. The full ANCOVA model shown below defines separate slopes for each group to allow for group differences in the relationship between the covariate and the dependent variable.



* 1. True
  2. False