PSYC*6380: Minor Assignment 9 (Multilevel Regression)

Due: Monday, March 28th, 2022 @ 11:59pm

Part 1:

Background:

After hearing about Scott's foolish airport endeavours today, an industrial/organizational psychology researcher became interested in predicting job performance among airport security personnel. Specifically, the researcher was interested in studying the extent to which a sense of humour was important for success on the job.

To do this, the researcher collected data from 100 different airport security agents, who worked at one of 10 different international airports. The researcher specifically collected self-report data on each security agent's sense of humour (1 = "Sour and Dour"; 12 = "A Hoot at Parties"), as well as supervisor ratings of each agent's performance in the past year (1 = "Low"; 9 = "High").

Being well-versed in multivariate statistics, the I/O researcher knew that job performance data may be empirically nested within the different airports that the agents worked at (as some airports may have stricter mangers; or may have different organizational cultures when it comes to humour on the job). Consequently, the researcher was specifically interested in assessing the predictive relation between humour and job performance using a multilevel approach.

Your task for today is to load the data file for this study, and then look at the relation between humour and job performance using a multilevel regression framework.

Filename: "*multilevelAssignmentData.csv*"

Structure: Comma-separated values

Variables:

Participant ID Number (*ID*): 1-100

Airport Worked At (*Location*): 1-10

Self-Reported Sense of Humour (*Humour*): 1 = "Dour"; 12 = "Fun"

Supervisor-Rated Job Performance (*Performance*): 1 = "Low", 9 = "High"

Missing Data Code(s): N/A (no values are missing in this file)

Your Task:

Use the techniques we covered in today's class (and draw on material from our first class on using *R* to load and clean data) to load your data and run a series of multilevel regressions, which examine the relation between one's sense of humour and their job performance.

Once you've done this, please answer the following questions about the results. Unless otherwise indicated, you do not need to provide full-sentence answers; just the numbers the questions request are fine:

1. The researcher would like to start by assessing whether performance data are empirically nested within airports. To explore this idea, please run a random intercept-only "null" model that tests whether the intercept of job performance varies across different airports. Please report: 1) The fixed intercept of performance; 2) the variance of performance due to airport location; and 3) the intraclass correlation coefficient (*ICC*) of performance. **(1 mark).** Based on your interpretation of the *ICC*, how would you best characterize the extent to which performance data are nested within airports? Please be as exacting as possible. **(0.5 marks).**

2. The researcher thinks that performance may vary by airport because managers at different airports may be more or less strict in their performance ratings (i.e., random intercepts). Following this idea, please run a multilevel regression with random intercepts only (not random slopes), which predicts job performance using sense of humour. Please report: 1) The raw unit fixed slope coefficient for humour (i.e., *b*); and, 2) the 95% confidence intervals around this raw unit slope coefficient. **(0.5 marks).** Based on your interpretation of the confidence intervals, how would you best characterize the plausible predictive relation between humour and performance? Please be as exacting as possible. **(0.5 marks).**

3. The researcher would like to determine the amount of variance in performance that humour actually predicted. To ascertain this, please calculate and report both the conditional and marginal pseudo-R^2 values for the regression model you ran in q2. **(0.5 marks).** What does the conditional pseudo-R^2 tell you about the predictive relation between humour and performance? **(0.5 marks).** How about the marginal pseudo-R^2? **(0.5 marks).** Please be as exacting as possible in how you conceptually interpret these values.

4. While pondering about their data, the researcher began to wonder whether the relation between humour and performance may also vary by airport, because different work cultures may value humour more or less highly (i.e., random slopes). To help explore this possibility, please run a new multilevel regression with random intercepts and random slopes, which still predicts job performance using sense of humour. Please test the difference in fit between this model and the model you ran in q2, and report: 1) The delta chi-square value (i.e., $\Delta\chi^2$); 2) its associated degrees of freedom; and, 3) its associated *p*-value. **(0.5 marks)**. Does allowing slopes to vary by airport significantly improve model fit? **(0.5 marks).**

Part 2:

Background:

To help the researcher better understand how multilevel regressions work, please answer the following conceptual questions in a short answer (i.e., 1-2 sentences) format:

1. In our class today, Scott said that nested data cannot be assessed using normal, single-level regression techniques because nested data structures often violate the parametric assumption of independent observations. What did he mean by this? **(1 mark).**

2. What is the difference between a fixed versus a random coefficient? What is the role that random coefficients play in helping us better understand and model relationships between variables when those variables are nested? **(1 mark).**

3. One seemingly-intuitive workaround for nested data would be to aggregate everything to the team-level (so you're looking at the mean score for each group). But Scott recommended against doing this in class today. Why should you use a multilevel regression on nested data instead of just aggregating data to the team level? **(1 mark).**

Please provide your full *R* script with your submission and leave comments in your script (i.e., using "#") explaining what each command you wrote does. **(1 mark for including a full script; 1 mark for including appropriate commenting).**

Good Luck!