Week of March 16

1. Experimental and nonexperimental research
2. Purposes of nonexperimental research
3. Simultaneous regression
4. Forward, backward, and stepwise regression
5. Hierarchical regression

Experimental and Nonexperimental Research

- Experimental research: Participants are randomly assigned to levels of the independent variable(s)
- Nonexperimental research: Participants are not randomly assigned to levels of the independent variable(s)

Internal and External Validity

- Internal validity: Confidence that change in the independent variable is responsible for change in the dependent variable (usually higher in experimental research)
- External validity: Confidence that the results of a study can be generalized to the real world (usually higher in nonexperimental research)

Three Common Purposes of Nonexperimental Research

- Explanation
  - Research question: How much variance in a criterion can be explained by a set of predictors?
  - Most common analysis: Simultaneous regression
- Prediction
  - Research question: What is an efficient set of variables for predicting a criterion?
  - Most common analyses: Forward, backward, or stepwise regression
- Model Testing
  - Research question: How well does a particular causal model fit the observed data?
  - Most common analyses: hierarchical regression (e.g., to test a simple mediation model; see Baron & Kenny, 1986), path analysis, SEM

Simultaneous Regression

- How It Works
  - All predictors are entered in a single step
- What to Look For
  - The overall R^2 of the model, and its significance
  - Absolute and relative sizes of the standardized regression coefficients (Betas)

Simultaneous Regression: Using SPSS

1. Use Regression → Linear
2. Define the criterion as the Dependent
3. Define all the predictors as Independents
4. Click OK to run the analysis

Hierarchical Regression

- How It Works
  - Predictors (or blocks/sets of predictors) are entered in a series of steps
  - The user determines the order in which the predictors are entered
- What to Look For
  - The overall R^2 of the final model, and its significance
  - The change in R^2 at each step, and the significance of these changes
  - Absolute and relative sizes of the standardized regression coefficients (Betas)

Hierarchical Regression: Using SPSS

1. Use Regression → Linear
2. Define the criterion as the Dependent
3. Define the predictors to be added in each hierarchical step as a Block of Independents; use Next and Previous to navigate between Blocks
4. In Statistics, select R squared change
5. Click OK to run the analysis

Forward, Backward, and Stepwise Regression

- How It Works
  - Predictors are entered in a series of steps
  - The regression program determines the order in which the predictors are entered and/or removed
- What to Look For
  - The overall R^2 of the final model, and its significance
  - Which variables are included in and excluded from the final model
  - The unstandardized regression coefficients for the final model (the unstandardized regression equation for the final model is often used to predict the criterion in the real world)

Forward Regression

1. Model starts with no predictors entered
2. At each step, the program checks whether there are any predictors that could be added to significantly increase the overall R^2 (the significance criterion is set by the user)
   - If so, the predictor that would provide the largest increase in R^2 is added to the model
   - If not, the program stops

Backward Regression

1. Model starts with all predictors entered
2. At each step, the program checks whether there are any predictors that could be removed without significantly decreasing the overall R^2 (the significance criterion is set by the user)
   - If so, the predictor that would provide the smallest decrease in R^2 is removed from the model
   - If not, the program stops

Stepwise Regression

1. Model starts with no predictors entered
2. In the first part of each step, the program checks whether there are any predictors that could be added to significantly increase the overall R^2
   - If so, the predictor that would provide the largest increase in R^2 is added to the model
3. In the second part of each step, the program checks whether there are any predictors that could be removed without significantly decreasing the overall R^2
   - If so, the predictor that would provide the smallest decrease in R^2 is removed from the model
4. Once no predictors could be added or removed to significantly change the overall R^2, the program stops

Forward, Backward, and Stepwise Regression: Using SPSS

1. Use Regression → Linear
2. Define the criterion as the Dependent
3. Define all possible predictors as Independents
4. Select the desired Method (Forward, Backward, or Stepwise)
5. If desired, change the Stepping Method Criteria (in Options)
6. In Statistics, select R squared change
7. Click OK to run the analysis

Multi-step Regression: Testing the Significance of Change in R^2

- The textbook recommends testing the significance of each step with an error term calculated using all possible predictors (see pp. 402-405)
- SPSS (as well as most other regression programs) tests the significance of each step with an error term calculated using only the predictors that are currently entered in the model (see pp. 408-409)
- What to do? Take your pick; it shouldn't make much of a difference

Multiple Regression: Some Advice

- Don't use small samples!
  - Recommend at least 10 participants per predictor
  - Need larger samples for forward/backward/stepwise regression
- Look at the correlation matrix first!
- Beware correlated predictors!
- Be cautious about interpreting the regression coefficients of models with many predictors (unless the predictors are *very* independent)!